

Radio World

Vol 16, No 1

Radio's Best Read Newspaper

January 8, 1992

Opera Broadcast Worldwide

by Frank Beacham

NEW YORK From the time radio pioneer Lee de Forest broadcast an opera to the handful of New Yorkers with receivers by putting two telephone transmitters on the stage, Metropolitan Opera performances literally have tracked the history of radio technology throughout the 20th century.

Today, the Texaco-Metropolitan Opera International Radio Network, now in its 52nd consecutive season, reaches a worldwide audience so large it defies accurate counting.

In addition to a 300 U.S. station network, the live broadcasts are carried by the Canadian Broadcasting System and distributed by the European Broadcasting Union (EBU) to Bulgaria, Czechoslovakia, Denmark, France, Finland, Germany, Italy, Poland, Romania, the Soviet Union, Spain, Sweden, Switzerland and the United Kingdom.

As radio programs go, the Met broadcast is the marathon champion. The series is the longest continuously-sponsored network broadcast in the history of American



Live from New York:
Metropolitan Opera broadcasts from Lincoln Center.

radio. It has evolved from a mono feed via unequalized voice-quality telephone lines to today's complex delivery system of satellites and fiber optics.

Complex remote

The EBU feed leaves Lincoln Center via a digital fiber optic link to the IDB Teleport on Staten Island. The 15 kHz IDAT feed remains in digital form until it reaches major distribution points in Europe.

The American and Canadian analog feed travels from Lincoln Center via microwave to a receive dish on the 82nd floor of the Empire State Building and then on to a Keystone Communications uplink facility in Rutherford, N.J. Keystone sends simultaneous stereo feeds to Transponders 3 (National Public Radio) and 4 (Multicomm) on the Galaxy VI satellite.

A complex series of backup systems

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NEWSWATCH

Fee Waiver Adopted

WASHINGTON The FCC has approved a feeless radio telephone operator permit for personnel who work at non-commercial stations.

Last year, several groups opposed imposing the \$35 fees on the non-commercial licenses. The new fee was slated for all radio operator licensee.

The FCC has decided, however, to dispense with it for non-commercial stations after receiving comments that many on-air personnel for college stations could suffer an economic hardship.

To get an fee-exempt radio telephone operator permit, an applicant must file FCC form 703 and send a signed certification stating that the permit only will be used at a non-commercial station.

Regular radio operator permits still cost \$35.

Tower Safety Improves

WASHINGTON Radio broadcasters have increased compliance with radio tower painting and lighting requirements, according to the FCC's Field Operations Bureau.

In 1991, the compliance levels increased to approximately 95 percent, up from the low 70 percent compliance range from three years ago.

The FCC embarked upon an aggressive education and enforcement program promoting tower safety in 1989. Proper painting and lighting reduces air navigational hazards, the

continued on page 2 ▶

First live trans-Atlantic broadcast of "The Last Night of the Proms." See page 15

NASA, VOA Demo Sat DAB Gear

by Alex Zavistovlch

WASHINGTON The Voice of America (VOA) hosted a NASA-led demonstration of digital audio broadcasting (DAB) at L-band frequencies this winter to show the feasibility of the system for satellite applications.

A low bit rate (16 kbps) broadcast from INMARSAT satellite Marex B was received by a mobile van during a demonstration in D.C. in December. According to Don Messer, an assistant deputy for communications with VOA, a modified vocoder converted a 3 kHz audio band to a 16 kbps signal. Forward error correction was also used, he said.

The demonstration is the culmination of a process that began with tests at NASA's Jet Propulsion Laboratory in Connecticut a year and a half ago. Messer said. A demonstration of Eureka technology originally had been planned, he said, but was scrapped after researchers determined the system could not handle the low powers of current satellites.

The satellite used in the D.C. demonstration provided four watts of power, spread over a beam covering much of the Atlantic and its inland areas. Messer said.

Although Messer acknowledged that the demonstration provided audio quality of only "roughly AM quality," he noted that "power flux density was approximately 20 dB lower than would be used in a commercial system."

Messer said the signal was "of decent quality" as long as a direct line of sight was available between the mobile vehicle and the satellite, but that the signal would "conk out" if it were obstructed or partially shielded from the receiver. He stressed, however, that the demonstration was conducted only to prove that L-band DAB is "a commercial possibility."

The demonstration was received enthusiastically by Gary Noreen, Chairman of Radio Satellite Corp. (RadioSat), a California-based company which is aiming at providing interactive radio services. The NASA tests "show that audio programming can be sent to mobiles in most of North America through L-band MSAT transmissions," he said.

Noreen's company is awaiting the launch of Telesat's MSAT satellite in 1994 for channels from which RadioSat can deliver its service.

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NEWSWATCH

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Commission said. In recent years, there have been aircraft collisions with towers that were not properly illuminated.

"The Commission takes its responsibility to the safety of air traffic seriously, and it appreciates that its licensee do also," the FCC said.

SPARS Code Dropped

LAKE WORTH, Fla. The Society of Professional Audio Recording Services (SPARS) has recommended elimination of the SPARS code label on recordings. The de-

cision was made at a SPARS meeting during the 1991 AES convention.

The SPARS code was introduced in the mid-1980s to provide information about which portions of the recording were digital or analog. The first letter represented the recording, the second the mixing and the third the mastering process.

But the association believes the code no longer serves its intended purpose. "The SPARS code no longer fairly reflects the complexity of the technology we use today," SPARS Chairman Pete Caldwell

said of the decision to drop the code.

He said that simply labeling a disc or tape AAD, DDD or DAD no longer conveys enough information to be useful to consumers.

Also, some perceptions have developed about the SPARS code that have led consumers to view recordings labeled analog as substandard to digital, a view that is not widely held by recording engineers.

"The code has been in danger of denigrating to simply a marketing device rather than a useful piece of information," Caldwell said.

Since the SPARS code has always been voluntary and not universally implemented, SPARS speculated that removal of the code would be a "slow transition."

FCC Clerk Fatally Shot

NEW YORK An FCC automation clerk was shot and killed outside the New York City field office Nov. 17, prompting the FCC to reevaluate its security measures.

Catherine Forster, a clerk with the New York field office, was shot outside the building as she was heading for the post office, according to police.

Police have identified the assailant as Jeanette Demarest of Greely, Colorado. She reportedly visited FCC field office in Denver and Washington in the past, complaining she was "under surveillance" and experiencing "radio problems."

The FCC has said it will review

its security policies in light of the assault, but noted that increased security measures probably would not have prevented the attack on Forster.

Westwood Expands News

WASHINGTON Westwood One Radio News expanded its overseas news operations to provide additional coverage of international events for its NBC Radio and Mutual Broadcasting Networks affiliates.

Westwood One VP of News Ron Nessen announced that London correspondent Vicki Barker has been named Chief Overseas Correspondent, and Western Bureau Chief Rich Landesberg has been named manager, European News Operations. Both journalists will be based in London.

Vicki Barker also will produce and anchor "The World Beat," a daily analytical report featuring commentary on international affairs.

RAB, NAB Push OES

NEW YORK The Radio Advertising Bureau (RAB) has announced that it will cooperate with the NAB in expanding the use of optimum effective scheduling (OES) by radio stations, advertising agencies and clients.

The RAB will use the OES system in its sales training, and will also function as a resale agent for the best-selling OES book produced by the NAB.

OES is a system designed to help radio sales executives. The system uses two formulas to show how to calculate the appropriate frequency and timing to ensure the maximum effectiveness of radio advertising dollars.

continued on page 3 ►

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NEWSWATCH

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Record \$70 million for AM

NEW YORK Emmis Broadcasting has reached an agreement in principle to sell its New York AM all-sports station, WFAN, for \$70 million to Infinity Broadcasting.

The price is among the highest ever paid for a stand-alone AM property. Emmis Broadcasting purchased the property from NBC in 1987 for about \$15 million.

Infinity Broadcasting will have to divest itself of WZRC New York to remain in compliance with FCC ownership rules. The company also owns WXRK-FM, the home of national television and radio personality, Howard Stern.

MAB Changes Expo Name

LANSING, Mich. The Michigan Association of Broadcasters (MAB) has changed the name of its annual mid-winter conference to the Great Lakes Broadcasting Conference and EXPO. The 1992 show is scheduled for Feb. 25-26.

The names was changed to reflect the MAB conference's large regional attendance, which has brought in broadcasters from Ohio, Indiana, Illinois and Canada. In 1991, the conference attracted nearly 1,000 attendees and 100 exhibitors.

Although the conference is listed as a broadcasting expo, the show is known for its mix of telecommunications subjects including engineering, management, news, and video.

For more information, contact Leslie Staniszewski at 517-484-7444.

World DAB Standard May Differ from U.S.

WASHINGTON Government and military opposition to releasing any L-band spectrum for DAB could leave the U.S. at odds with the rest of the world, according to a report issued by Congress's Office of Technology Assessment.

The report came out just prior to the FCC and NTIA (National Telecommunications and Information Administration) announcement that they will support S-band DAB instead of L-band at the 1992 World Administrative Radio Conference (WARC) in Madrid.

If the rest of the world decided to go with L-band or another spectrum allocation for DAB that the U.S. did not, "the systems would be incompatible," the report said.

As a result, the report concluded, "it would then be difficult to establish worldwide services, such as international broadcasting, using this new technology."

The report also said that shortcomings of the U.S. WARC

preparation process are an indictment of the nation's overall telecommunications policy process.

OTA said the process is hindered by the diverse number of interests represented without cohesive government direction. Obstacles include fragmentation of the systems with no single agency or focal point for long range policy. Also, the report said that "goals and priorities are not being cooperatively set" by the responsible federal agencies and with sufficient input from the private sector.

The telecommunications policy process also is marred by a "lack of commitment" and attention by the federal government—although that seemed to have improved somewhat recently, the report noted.

Although some critics have called for a separate agency to coordinate international policy, the report acknowledged that others have said a centralized authority could reduce private and industry input.

Strother, Schober Boycott DAB Group

by John Gatski

WASHINGTON Two in-band digital audio broadcasting (DAB) systems proponents have declined to participate in the NAB's DAB Technical Advisory Group systems presentation, scheduled here Jan. 23-24.

Strother Communications and American Digital Radio objected to letting the task force evaluate their systems at the meeting because the task force membership includes backers of Gannett's USA Digital in-band DAB system.

The Task Force has promised that its USA Digital proponent members, Gannett Radio VP of Engineering Paul Donahue and CBS Radio VP of Engineering Tony Masiello, would leave the

room during presentations by other proponents.

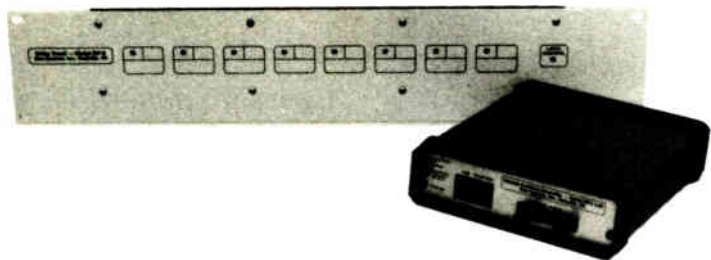
American Digital Radio and Strother Communications said that the Task Force's promise, however, does not go far enough. In a letter to the DAB Task Force, American Digital Radio (ADR) President Ted Schober said that his company would not participate and that it "cannot expect the Advisory Group with its present membership to be able to provide unbiased evaluations of DAB technology."

Schober added that ADR would keep the date open to participate if the NAB shed its "special relationships" with other systems' proponents.

Strother Communications President Ron Strother echoed Schober's concerns, emphasizing his reluctance to attend the January meeting in the presence of CBS and Gannett on the task force. "Groups formed to objectively evaluate and test DAB technology should not appoint proponents to their membership," Strother said.

Other DAB system proponents also have expressed concern about USA Digital's representation on the Task Force.

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Local Music: A Boon to Small Stations?

by Alex Zavistovich

WASHINGTON Before I get to this week's topic, I'd like to mention *RW's* new look. We've changed our format to what we believe is a cleaner page that actually packs more information. We hope you find it easier to read.

For some time now I've kicked around a programming idea that would embrace the concept of localism while serving a large but usually ignored market segment. What's the secret? Two little words:

Local music.

First, I'd buy a modest local AM

station. If it weren't AM stereo, I'd convert it. Then, in addition to the usual local-interest talk shows and news reports, I'd program local music—songs from musicians in the community.

I'm not the only one who's come up with that angle. A lady named Liz Roberts is planning to provide local music programming to the audience of WTRI-AM, Brunswick, Md.

WTRI is a 500 W AM stereo-equipped daytimer broadcasting at 1520 kHz from Brunswick, located a "real estate hour" northwest of Washington, as Liz puts it. At press time, her Tri-State Broad-

casting company was scheduled to go on the air with the new format Jan. 1.

Liz, who has worked both with the BBC and in domestic radio, pointed out that most of the people in Brunswick live there by choice. She believes their music should reflect that.

Planning originally to air local music as a promotion only during the station's first two days of operation, Liz said she was swamped with local cassettes once word of mouth began to spread. Now she's planning to work a variety of local artists into the station format, tackling everything from rock to "stained glass bluegrass."

The station covers much of western Maryland and northern Virginia and on a good day might get down to the northern reaches of D.C.'s coverage area, courtesy of an old 500 W Gates transmitter. Liz and her engineer Harold Isaacs also have plans to go fulltime, provided they can avoid getting trampled by a strong nighttime signal from Buffalo, N.Y.

Why do I think this is a good idea? I'm an amateur musician myself. In D.C. alone—which is not a big music town—there are literally hundreds of bands playing good, original music. Almost every one has a good studio-quality demo tape. Some even have DATs and CDs.

These amateur musicians are usually stonewalled at radio stations because many people equate "amateur" with "amateurish." That's just not true. Many

of these musicians have recorded material that often is as good as that of major label artists.

The point is, if you're a local station, and you believe in the importance of the localism concept, then you should try to reflect that interest in all aspects of your programming, including music.

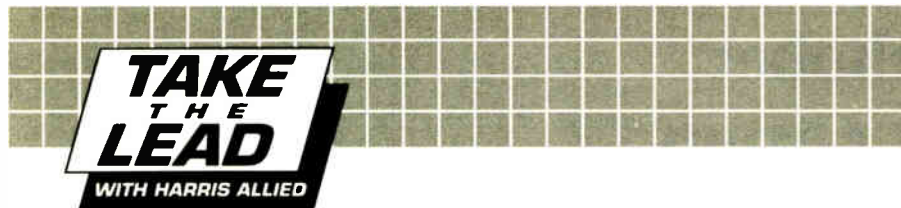
Local music comes with a built-in audience. Each band has devoted followers who could become devoted listeners if they knew where to tune in to hear their local heroes. *Local* listeners. *Local* shoppers.



The whole local music scene also provides an untapped source of new advertising. Music supply houses, clubs, underground fashion boutiques, local music magazines—even the bands themselves could afford ad packages at a local station's rate.

But best of all, a station like that would be the only game in town. It's a new niche, perfect for the local market. Good luck to WTRI in this groundbreaking effort. We'll be watching.

That's it for now. Tune in next time,

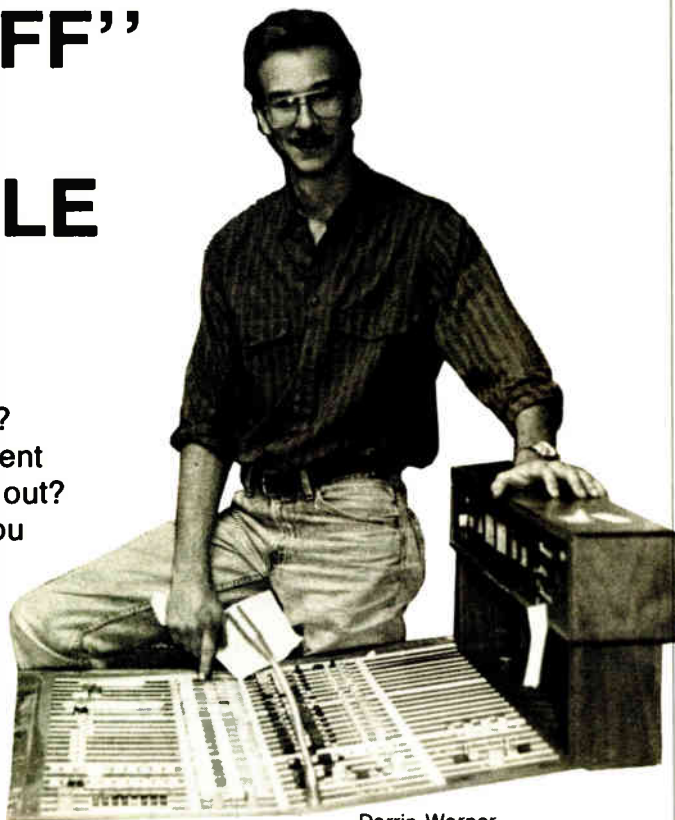


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Lighting a fire for EBS

Dear RW,

I must commend Frank Beacham for his rather thorough article on the Emergency Broadcast System ("WCBS Embroiled in EBS Furor," RW, Oct. 9, 1991). As he did with the EBS problems rising out of the Loma Prieta earthquake in the San Francisco area two years ago, Mr. Beacham managed to sort his way nicely through a lot of smoke and mirrors.

However, he missed the mark on three critical points . . .

While a duly constituted majority of a State Emergency Communications Committee may take such action, its individual members hold no authority to unilaterally drop a broadcast station from primary Common Program Control Station (CPCS-I) status on the state and local levels of EBS. And, if such individual authority did exist, I can assure you that I would not use it. I made this point to Mr. Beacham repeatedly when he called me early in his story research to confirm information previously published in *Newsday*.

The fact of the matter that, during telephone discussions of the Hurricane Bob situation and its impact, a majority of our members voiced the opinion that WCBS-AM and WCBS-FM had clearly demonstrated that these stations should not serve as CPCS-I facilities in New York State *until such time as their long-standing EBS participation commitments were clearly reaffirmed by present-day management*.

This consensus opinion—and the related Committee belief that similar reaffirmation action should be recommended to the FCC with regard to the national EBS plan—was based on our total inability the day after Hurricane Bob to effect a resolution of the underlying operational problems directly with first-line management at the two stations. This very same opinion was later voiced by Frank Lucia of the FCC EBS staff in Washington during his quoted interview with Mr. Beacham.

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**Next Issue of
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 January 22, 1992**

For the record, it should be noted that chairman John Kelly was *not* a party to these contemporaneous discussions. He began a previously-scheduled vacation two days prior to Hurricane Bob's arrival in the New York area.

As for my submitting my resignation, this action was actually taken twice in the aftermath of Hurricane Bob—without acceptance either time.

Mr. Beacham was aware of, but overlooked the first instance, which came in direct response to damage-control efforts taken after the fact by an obviously embarrassed WCBS-AM and, on the station's behalf, by a number of individual broadcasters. These efforts included the "suggestions" that I tender my resignation and write a personal apology to the staff and management of WCBS-AM.

They also included the concurrent release of a statement saying that the station complied with its EBS responsibilities during the hurricane activation. The statement was issued in the Committee's name, on Committee letterhead, but the sad truth is that it was actually written by representatives of the CBS Radio Division, under which the two stations operate.

With the exception of one important detail, Mr. Beacham accurately attributes the second proffered resignation to "a lack of trust." A lack of trust was involved, but as I explained to Mr. Beacham at the time, it was not over a question of judgment.

To the contrary, it was a matter of Chairman Kelly not believing me when I told him that: a) I wasn't the one who was responsible for Mr. Beacham's calling to interview him for this article late last month; and b) I had not broken from my then month-old commitment that, right or wrong, I would make no further public comment on the WCBS matter. His negative comments at the time left clear personal doubt as to his trust in my word, a doubt that has since been satisfactorily resolved—in large part as a result of WCBS's recent *mea culpa*.

Mr. Beacham also appears to have overlooked an important contextual detail with regard to my "read my lips" comment regarding the allegations of operational improprieties that were first brought against WCBS-AM on 19 August by a number of Long Island and New York City broadcasters.

The comment itself is quoted correctly, but Mr. Beacham should have told his readers that it came in response to his repeated attempts during an audience Q&A session immediately following a Committee EBS presentation in Manhattan on Sept. 4 to have me restate the allegations, which did *not* originate within the Committee. Prior to the Q&A, all members of the audience were told quite clearly that no questions regarding WCBS's participation in the Hurricane Bob EBS operation could or would be entertained.

I think it is safe to say that, after reviewing all aspects of this particular EBS operation, the entire membership of the New York State Emergency Communications Committee believes that Hurricane Bob, its related severe inland weather

Leave LMA Option to the Market

Local Marketing Agreements (or LMAs) give radio operators the chance to enter into an economically advantageous, joint operating venture—be it a network agreement for programming, a sales packaging agreement or some form of both. Currently, there is no standard LMA agreement; the details vary from marketplace to marketplace, from broadcaster to broadcaster.

Let the marketplace continue to decide what form LMAs should take. The debate that LMAs have stirred in Washington is troublesome. On one hand, there are those who would embrace every idea that exists as an opportunity and on the other, those who would restrict the ideas with regulation.

No one needs to be reminded that times have changed. Not only is the recession lingering, too many stations are competing for a shrinking revenue pie. Enterprising broadcasters are trying to make money being broadcasters and, in many cases, ensure their survival.

Managers and owners can take advantage of recent technological options available to them to put a station on the air full-time with a minimal expenditure and staff (the FCC requires two full-time staffers on the premises).

To date, these operators have navigated under guidelines the FCC Enforcement division has issued on a case-by-case basis—all under the aegis of a 1989 rulemaking on time brokerage agreements. So far so good.

Now Congress wants in on the action. In an effort to protect smaller stations from a perceived danger of being engulfed by larger stations, Congress has introduced legislation to restrict what seems to be a legitimate opportunity for survival. Under this plan, stations trying to stay on the air, via an LMA, would sacrifice license renewal expectancy.

The industry doesn't need this intrusion. There are roughly 10,000 licensed radio stations in the U.S. There seems to be little danger of losing diversity of broadcast voices if LMAs are allowed, but there is a real danger of losing voices, period, if they are not.

Radio operators in all size markets know what a daily street battle it is to stay afloat. The last thing they need is an unnecessary legislative or regulatory harness wrapped around their necks.

—RW

problems and all of the after-action furor has served well to reinforce the Committee's longstanding position that government, industry and the general public must be made aware of and understand what EBS is, how it works and what it can and cannot do to help protect and preserve the safety of lives and property in the event of actual or threatened hazards, natural or man-made, and national security emergencies.

For us to reach this goal, however, will require the development, preparation and implementation of—and appropriate public- and private-sector funding for—an ongoing multilevel program of education and training for three interrelated audiences: government, the broadcast industry and the general public.

Such coordinated action among EBS's government users and industry providers on the national, state and local levels will go a long way toward assuring the proper preparation and dissemination of "official instructions, news and information" when and as the need arises. More important, it will assure the regular use of EBS as the timely all-hazards communications vehicle it is intended to be.

This, in turn, will help re-condition the general public into accepting EBS as a reliable, firsthand source of information that could play a critical role in helping them protect their lives and property when faced with disaster or emergency.

EBS's government users and industry providers also need to join together in bringing about certain clarifications of the system's current FCC rules and regulations.

Tony Masiello, vice president of technical operations for the CBS Radio Division (CRD), is quite correct in that the rules and regulations aren't as clear as they should be on the fact that only FCC type-accepted tone encoders may be used to generate the special two-tone EBS attention signal properly. Infrequent public notices aren't sufficient to get this kind of information all the way down into the trenches.

And Helene Blienberg, director of communications for CRD, pointed out another one of the critical shortcomings in her interview with Mr. Beacham: Although EBS participation on the state and local levels is totally at station discretion, there are no policy of procedural provision in the applicable rules and regulations for notifying other stations that their CPCS-I has decided not to participate.

Perhaps Mr. Beacham's article will help light the much-needed fire!

Having spent the past two years working full time on the \$1 million EBS modernization and expansion program in New York State, I, for one, certainly hope so.

John W. Nelson, vice chairman
 New York State Emergency
 Communications Committee
 Wynantskill, N.Y.

More about S-Band Interference

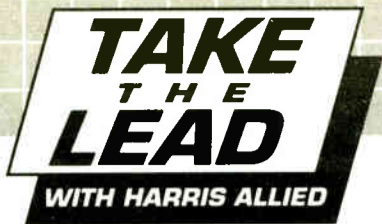
Dear RW,

I read with great interest Steve Crowley's article on the subject of microwave oven interference in the S-band (RW, Nov. 20, 1991).

I wish to add to his closing remarks on interference in the broadcast auxiliary 2.5 GHz microwave channels. I agree with his point that STL receivers are unlikely to suffer from oven interference because of the placement of the receive antenna. This spectrum also is used for wireless microphones that are used for TV cameras.

In such use, where the receiver may be on the roof of an apartment building filled with microwave ovens, interference definitely is noticeable and must be accepted or worked around. Interestingly enough, the noise floor in this band drops each weekend in New York City as the ISM use in the industrial areas in Brooklyn, Queens and northern New Jersey drops.

Michael V. Chiarulli
 RF Engineering and Operations
 ABC Broadcast Operations and Engineering
 New York, N.Y.



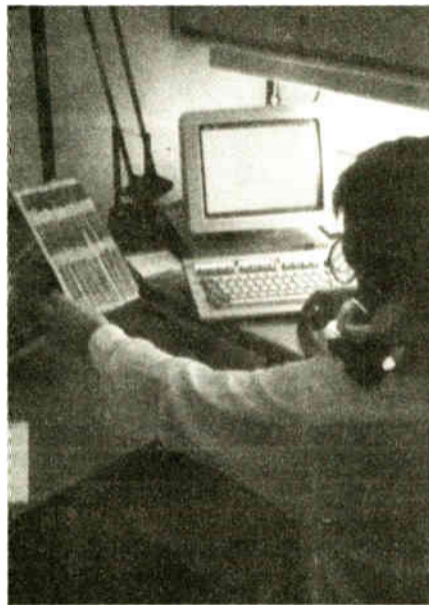
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Sat CD Radio Waits for FCC Action

by Judith Gross

WASHINGTON Satellite CD Radio is trying to get the FCC to act on its long-standing request to begin satellite DAB, but the Commission is maintaining its waiting posture in the company's most recent filing.

Satellite CD Radio began the entire DAB debate with its original filing over a year-and-a-half ago, requesting authority to construct a satellite and begin offering satellite DAB service for

But because the FCC expects to begin a second NOI into DAB this spring, it is holding off on any action to begin a DAB service and has yet to act on Satellite CD Radio's first petition.

Passive carrier

Since that first filing, however, Satellite CD Radio has shifted its plans. The company is no longer working with Stanford-Telecom and has decided to become, instead, a "passive carrier" of whatever DAB modulation system is cho-

manufactured, to receive satellite broadcasts "all you would need is an antenna." He said he already has an agreement with Dolby for the AC-2 chips and was working out similar agreements with Comstream and Ball Aerospace. He also said there would be another demonstration of the equipment this spring.

Satellite CD Radio's plan now calls for ten national CD-quality DAB channels by satellite, which will be either subscription or paid for by the program provider, who would then be free to sell commercial time.

The shift to S-band, instead of the hoped for L-band (1.5 GHz) spectrum, Rothblatt said, would simply mean that the cost of each program channel would go up, but it would not increase the cost of receivers.

Newest filing

Apart from the demonstration and the company's modified DAB plans, Satellite CD Radio recently filed yet another request with the FCC. This one asks to begin construction of the satellite on a conditional basis.

"We're asking permission to begin building the satellite," Rothblatt said, "since it takes three or four years to complete construction, and since the DAB issues will no doubt be settled before then."

The new filing said that under this conditional go-ahead, Satellite CD Radio will agree to spend only \$10 million in the first 12 months before returning to the FCC for further authority. The total estimated cost of constructing the satellite is about \$200 million, according to Rothblatt.

Rothblatt did acknowledge that this recent request was made in the hope that the FCC would begin to move the process along. He also acknowledged that those who oppose satellite DAB could see it as a way to circumvent a full-scale look at all the issues that must be settled before DAB becomes a reality.

"But since the FCC started looking at satellite delivery back in 1966 it has never refused to authorize satellite service," Rothblatt said. "We don't want a monopoly, we just want to minimize the delays," he added.

Because of the previous petitions, the Commission has decided to treat the company's most recent request as restricted under the ex parte rules. It has lumped it together for consideration with Satellite CD Radio's past petitions. And there is no indication that there will be any action forthcoming before the rest of the DAB questions are settled domestically, although Rothblatt said he remains "hopeful."

Because the FCC expects to begin a second NOI into DAB this spring, it is holding off on any action to begin a DAB service and has yet to act on Satellite CD Radio's first petition

100 CD-quality channels.

The first plan would have split the continental U.S. into three regions and offered 66 national and 34 local stations in each of the three. At the time, Satellite CD Radio was working with Stanford-Telecom and hoped to use that company's satellite DAB modulation system, which is similar to the Eureka 147 DAB system.

That first filing, and subsequent modifications to the plan, were put out for comments and reply comments in late 1990 and early 1991.

While Satellite CD Radio received the support of companies such as General Motors, which favors a national radio service, radio broadcasters vigorously opposed the plan, which they said would destroy radio's localism.

Since the original petition by Satellite CD Radio, the Commission has also completed one Notice of Inquiry (NOI) on DAB, and has finished its work in preparation for WARC, where it will support S-band (2.3 GHz) frequencies for satellite DAB service.

sen, according to company president Martin Rothblatt.

"We think the USA Digital system is the most likely one to become a standard in the U.S.," Rothblatt noted, "but we are prepared to carry any system for which DAB radios are made in the U.S., as long as they meet the basic specifications of our system."

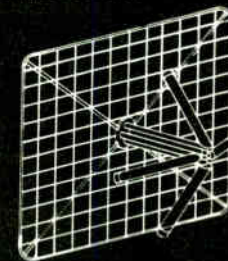
To that end, Satellite CD Radio recently demonstrated a CD-quality system using a signal from C-band (3.7 GHz) satellites with a demodulator from Comstream, encode-decode from Dolby AC-2 and a flat plate antenna from Ball Aerospace.

"The demo showed that the envelope was compatible both with Eureka and Acorn (USA Digital) DAB. It was wide enough to accommodate both of them," Rothblatt said. He added that the next step would be to actually transmit each system, and said he is talking to both system proponents, "as well as others."

Rothblatt said that if DAB receivers for terrestrial use of these systems are

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FCC Decides to Stop Advising on LMA Deals

by Lucia Cobo

WASHINGTON Radio operators looking to the FCC for guidance on structuring their local marketing agreements (LMAs) will have to look elsewhere from now on.

That seemed to be the prevailing attitude during a recent seminar sponsored by BIA Consulting in Washington.

According to Charles Kelly, chief of the FCC's Enforcement Division, radio broad-

casters by entering into those agreements.

From now on, the Enforcement division will be concentrating on studying complaints filed "against" LMA deals, Kelly said. He suggested that broadcasters seeking guidance on structuring their deals look at the 1989 rulemaking and the decisions the Enforcement division already has issued.

Operators also may have to deal with

Over the past year, the FCC's Enforcement Division also has issued a number of rulings on LMA proposals.

casters will no longer be able to obtain a ruling from the FCC as to whether an existing or proposed LMA is acceptable.

To date, the only FCC rulings on LMAs have been made at the Mass Media Bureau's Enforcement division, based on that division's interpretation of the Commission's 1989 rulemaking on time brokerage agreements.

Over the past year, the division also has issued a number of rulings on LMA proposals that were submitted voluntarily

regulation from Congress in the near future. Reps. John Dingell (D-Mich.) and Ed Markey (D-Mass.) have introduced legislation that would limit LMAs as we know them today to instances where a station's survival as a business was at stake. The price tag would be renewal expectancy at license renewal time.

According to BIA Consulting figures, there are currently at least 40 LMAs in place across the U.S.

But operators need to worry about more

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Anti-Trust Action Settled

by John Gatski

LA FOX, III. The U.S. Justice Dept. has approved an agreement with Richardson Electronics and Varian Associates that ends anti-trust action against the power grid tube industry companies.

The action stems from a business arrangement between Varian Associates, the world's largest tube manufacturer, and Richardson, a tube distributor. The Justice Department accused them of "conspiring to monopolize" certain segments of the power grid tube industry through their joint company, VASCO.

The Justice Department said that Richardson acquired Amperex, a major tube competitor, in 1988 on "behalf of itself and Varian in order to eliminate competition from Amperex and enable Varian and Richardson to increase prices of Varian power grid tubes." Through VASCO, the companies recycled old tube carcasses for commercial refurbishing.

The actions by the two companies violated the Sherman Anti-Trust Act, according to the Justice Department.

Under terms of the settlement, which had not been approved by the court at presstime, Richardson would pay a \$500,000 fine. In turn, the Justice Department would drop criminal indictments against two Richardson officials.

Varian and Richardson also agreed to a "consent decree" stemming from a two-count related civil suit filed by the Justice Department. The consent decree, also waiting approval at presstime, would bar Richardson from collecting tube carcasses in order to monopolize the tube rebuilding market.

Richardson and Varian also must pay \$1.5 million each in damages "to various agencies and departments of the U.S. at allegedly anti-competitive prices," according to the Justice Department.

Civil suit settlement also requires the two companies to dissolve VASCO and comply with restrictions on future tube ventures.

The two companies already have entered into a new agreement making Richardson the exclusive worldwide distributor of Varian's tubes except in the U.S. and certain Eastern Bloc countries.

than the regulatory issues when considering local marketing agreements. There are a number of economic and business questions that need to be answered before operators should feel comfortable with LMAs, according to consultants.

LMAs are a form of market consolidation. Although in the short run LMAs may be the key to survival for some stations, in the long run, will those stations lose asset value and/or the ability to ever function as stand-alones again?

Markets that have one or more LMAs in place also have fewer salespeople trying to sell the medium to local retailers and advertisers. If there are fewer salespeople, then the trend is less time on the development of new business and more time on just keeping up with the advertisers already using the medium.

LMAs that involve taking over another station's sales operations means fewer operators controlling a bigger percentage of the revenue and inventory in a market. If enough arrangements like that crop up, the Department of Justice could potentially be displeased and accuse broadcasters of "restraint of trade," a speaker noted.

And in an era of depressed station values, will skittish lenders be willing to put a price tag on a station involved in an LMA? So far, brokers and lenders, including BIA seminar speakers, Dick Blackburn of Blackburn & Co, and Matthew Breynne, of Greyhound Financial Corp., believe the deals are too new to help in station transfer situations. To date, Blackburn said, deals made involving LMAs add zero value to the deal.

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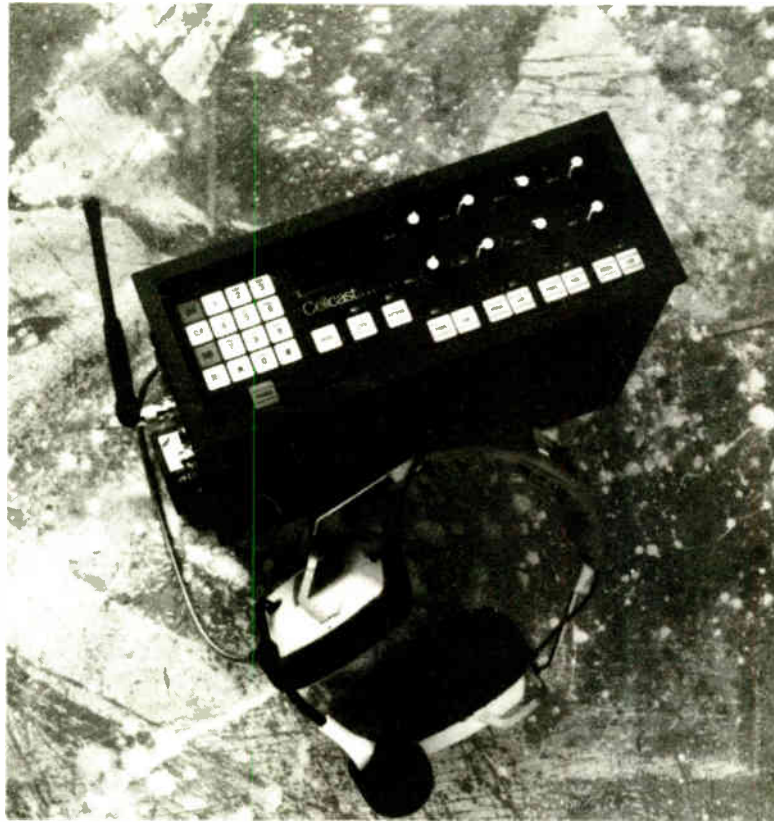
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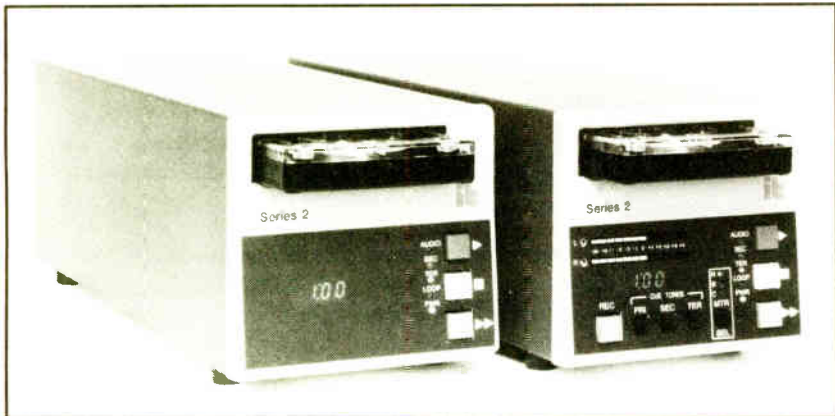
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BOOK REVIEW

“Heroes, Villains and Fools” Highlight Early Radio Book

Empire of the Air
By Tom Lewis
HarperCollins Publishers

by Judith Gross

WASHINGTON “This is the story of a fool, a knave and a hero,” Tom Lewis recently told his audience of radio enthusiasts.

The event was a premiere screening of the PBS documentary “Empire of the Air,” based on his book of the same title. The documentary is scheduled to air this month.

Lewis’ descriptions could have referred any of the three radio pioneers in his book: Lee de Forest, Edwin Howard Armstrong and David Sarnoff. But anyone familiar with the technical history of the early days of radio will probably easily identify de Forest as the fool, Sarnoff as the knave and Armstrong as the hero.

“I was amazed at my own ignorance,” said Lewis, a professor of English at Skidmore College who researched the subject for several years.

“Empire of the Air” tells the tale of radio’s beginnings and early successes through the personal histories of each of the three early inventors.

By necessity, Lewis focuses heavily on the technical innovations each man produced. But along the way, the more than adequate descriptions of de Forest’s audion and Armstrong’s regenerative circuits are supplemented by some very human insights into the personal motivations of each.

The era of radio

The story begins with the U.S. poised on the threshold of a new century. There is excitement over new technology, and science has caused a fever of national pride.

Details from each man’s early life provide valuable insight into their later dramas. de Forest’s quest for recognition seems less ludicrous and more sympathetic when his stern treatment by his father is taken into account.

It also is helpful to know that Sarnoff, the eldest son of a family of impoverished Russian immigrants, became his family’s sole support at age 15, explaining his early ambition and entrepreneurial aspirations.

There are also marvelous anecdotal tidbits. For example, Sarnoff first decided to look for a newspaper job, but became involved in radio’s infancy by accident when he entered the New York Herald Tribune’s telegraphy division instead of the newspaper office.

Other trivial but prophetic bits of information concern Armstrong. He became ill with St. Vitus’ Dance during his childhood, leaving him with a permanent twitch. He became very shy and secretive. His guarded secrecy prompted him not to file patents on some of his inventions, a source of misery later in his life.

The climb to success

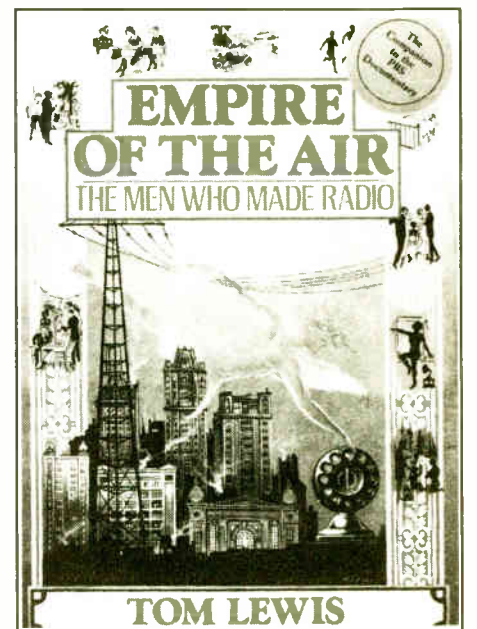
But Armstrong was a daredevil about heights, boldly building and climbing his own towers. Once he climbed atop RCA’s radio tower and globe—400 feet above Manhattan’s 42nd Street—and balanced on one foot. The stunt caused Sarnoff to ban him from RCA’s offices for a while.

The book becomes even more fascinating as the three stories merge. de Forest is generally credited with inventing the “audion,” the vacuum tube that laid the foundation of mod-

ern radio broadcasts.

In fact, de Forest tinkered with Fleming’s tube designs by adding a grid and plate. de Forest’s design added amplification to the weak radio signals of the time.

Armstrong experimented with the audion and added the principle of regeneration—taking the signal from the oscillating tube and



feeding it back into the circuit. He also was able to document and explain why it worked. “Feedback,” Lewis notes in the book, “unshackled the potential of the vacuum tube.”

Armstrong’s work also laid the groundwork for a lengthy and bitter patent dispute between de Forest and Armstrong.

Sarnoff enters the story later, as an employee of the Marconi Wireless Co., which evolved into the Radio Corporation of America (RCA).

Corporate concept

As de Forest began to “play” with his new inventions by sending music and culture over the airwaves, Sarnoff had an idea of radio transmission of music to the masses—a radio “music box.”

Sarnoff can be given credit for the concept of mass commercial broadcasting, which spawned RCA’s National Broadcasting Corp. and the other networks.

But the story does not end happily. While the concept of commercial radio flourished, Lewis reminds us that radio was one of the first technical advances where the large corporation supplanted the lone genius inventor.

AT&T, Marconi Wireless Corp. and later RCA eagerly gobbled up radio’s newest technologies for their own advancement. Sometimes they only paid the inventor small sums for ongoing rights—if payment were made at all.

de Forest lost some of his patent fights and won others, but was denied the recognition and fortune he so desperately sought.

Armstrong, worn down by numerous court battles, thwarts from his one-time friend Sarnoff over FM and TV technology, and failing health, committed suicide. The fact that his widow persevered and finally won many of the disputes only adds to his story’s sorrow.

And Sarnoff, who built an empire from the inventions of the other two, became a dark figure in his ruthless ambition. He later was forced to reinvent himself through a rewriting of history in his press releases, according to Lewis.

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World Radio History

Group Updating Tuner Standards

by John Gatski

NEW YORK Because radio tuner measurement standards have not kept pace with technology over the last 30 years, an industry advisory group is contemplating changes in AM and FM tuner specification measurement procedures.

The Electronic Industries Association's (EIA) AM/FM Tuner Measurement Subcommittee met in the summer and last fall to identify areas that need change and to assign each area to subcommittee members to work on.

According to subcommittee chairman

Len Feldman, many of the measurement standards date back to the 1950s and the FM standard has not been updated at all since 1974.

No timetable has been set for adopting a new set of standards, and international standards work (IEC 315-4-FM Measurements/IEC 315-3 AM Measurements, and international AM stereo standards) would also be kept in mind when writing the new ones, Feldman added.

Among the possible changes discussed were new measurements for AM noise susceptibility, FM multipath susceptibility, and tuner error (in light of digital

quartz tuners that often receive better off-channel than on). The subcommittee also agreed that new test parameters should include measurements for AM mono and AM stereo tuners.

In discussion of external noise measurements for AM, the subcommittee came away with the consensus that "tests are needed to quantify an AM set's susceptibility to power supply line noise (for AC-operated sets) and other noise generated from radiating sources (computers, fluorescent, lights, etc.), according to a subcommittee summary.

"In case of DC-operated car radios,

tests are needed to quantify and report upon such susceptibility," the summary said.

With regard to the myriad of existing test procedures and guidelines for tuner performance measurements, several suggestions were made to expand and modernize them. Some guidelines also may be dropped because they no longer are applicable or are redundant with other measurements, according to subcommittee members.

Existing measurement guidelines that merit changes include:

- **Frequency response.** Should the current 30 Hz-15 kHz limits be extended for measurement purposes (even though 19 kHz stereo pilot precludes broadcasting much beyond 17-18 kHz)?

- **Capture ratio.** The subcommittee consensus was that the existing measurement of this "important parameter" is not reliable and hard to accomplish. The group wants to explore development of a new test procedure that gives a "greater numerical range of reporting values." The current procedures give most tuner capture ratios between 1.0 dB and 2.5 dB, the subcommittee summary said.

- **Stereo separation.** Talk centered around measuring stereo separation at two or more signal levels or measuring separation in a continuous plot at one or more frequencies versus the RF input signal. Such a measurement would reveal relevant information when looking at car tuners, which often "blend" or reduce separation as the signal decreases to reduce noise.

- **AM useable sensitivity.** Is the current 20 dB S/N really a useable signal? Should it be dropped or changed to 30 dB S/N or greater?

- **Selectivity.** With the increasing use of wide/narrow bandwidth switches, it was suggested that adjacent and alternate channel tests and frequency response measurement be conducted on both bandwidth modes where applicable.

- **Subcarrier product ratio** (or subcarrier product rejection). Most subcommittee members agreed that the standard should be updated to separately list residual content at 19 kHz and 38 kHz instead of listing the result as a single number.

- **SCA rejection ratio.** In light of the increased use of the SCA baseband, some subcommittee members suggested that additional tests other than the one at 67 kHz be conducted to determine effects on FM mono and FM stereo. This test could be vitally important with the RBDS (Radio Broadcast Data System) subcarrier being proposed for the U.S., subcommittee members noted.

- **Distortion at 50 dB quieting and at 65 dB.** Should these parameters be simplified to one measurement—perhaps the distortion at the 50 dB quieting parameter at a given frequency, (such as 1 kHz)?

Several measurement parameters are likely to remain unchanged, based on comments by subcommittee members, including the S/N at 65 dB, muting threshold, adjacent and alternate channel selectivity, AM suppression ratio, frequency drift, AFC correction factor and AFC offset error.

According to the subcommittee summary, some measurements could be dropped because of marginal information value or lack of applicability. They include usable sensitivity, minimum hum and noise, and intermodulation distortion (today's receiver IM distortion values don't come close to exceeding total harmonic distortion).

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- Front panel headphone jack.
- Timer record/playback capability.



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- Amorphous 3-Head System.
- Linear Magne-Field Class AA Record Amplifier.

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- Real-time electronic counter with memory stop/repeat.
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- Full-logic feather-touch transport.
- Auto tape/source monitor select.
- TPS (tape program search), auto tape select and auto rec-mute.
- Large master rec level control and independent balance control.
- Headphone output level control.
- Timer record/playback capability.



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RS-BX606

QUARTZ DIRECT DRIVE 3-HEAD CASSETTE DECK

- Digital-Servo Quartz DD, 2-Motor Tape Transport.
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- Dolby HX Pro plus Double Dolby B & C NR Systems.

MORE VALUABLE FEATURES:

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- Dual-range FL peak-hold meters.
- Full-logic feather-touch transport.
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- TPS (tape program search), auto tape select and auto rec-mute.
- Large master rec level control and independent balance control.
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- Timer record/playback capability.



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- Output level control
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122MKII STEREO CASSETTE



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- Switchable VU meters with peak level indicators.

M106 COMPACT MIXER



The M106 is perfect for the small recording studio because of its alternative inputs and outputs, monitoring and cue capabilities. The ability to mix 3-6 source machines and combine that with other audio is invaluable in video post production and audio sweetening. 4 phone inputs and 4 program outputs are ideal for disco and multi-image work.

FEATURES:

- Six 1/4" mic and RCA line inputs, four RCA phono inputs
- One 1/4" and two RCA jacks per four main PGM outputs
- Insert and Direct Out jacks on each channel
- 2-band shelving type EQ on each channel
- 6 position Monitor Select switch
- Aux can be used as an independent line monitor
- True 4-buss operation from four Program Buss outputs plus outputs and master controls for Aux and Effects
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FEATURES:

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- Fader-start capability via Accessory 1 port
- Internal monitor speaker
- Headphone monitoring
- Quick cue with auto repeat

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FEATURES:

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- Serial & Parallel ports for ext. synchronizer control
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- Real time taper counter
- Pitch Control (+/- 12%)
- Dump and manual edit capability

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22-2/22-4 OPEN REEL RECORDER



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CBS, NBC Radio Ready for Olympics

By Mary C. Gruszka

ALBERTVILLE, France Athletics will not be the only ones setting new records at the 1992 Winter and Summer Olympics. Radio broadcasters will set some new milestones.

Radio coverage of the Games offers new challenges for engineers with the increasing use of digital technology.

Both CBS and NBC Radio, respectively, plan extensive use of digital audio gear in coverage of the Winter Games in Albertville, France, February 8-23, and the Summer Games in Barcelona, Spain, July 25-August 9, for listeners in the U.S.

Programming outline

Winter programming from CBS will include 20 two-minute Winter Olympics Previews, 250 two-minute special reports, updates within regularly scheduled sports features, 16 commentaries—one for each day of the Olympics, and some live coverage.

For the Summer Games, NBC Radio will feed both long-form and short-form programming blocks back to the U.S.

Three-minute, short-form reports will air at 15 minutes after the hour from 5:15 a.m. to 7:15 p.m., for a total of 15 reports each day.

Long-form broadcast will be magazine-type shows including live coverage of the various events, on-site interviews, studio interviews and telephone hookups.

Andy Vallon, manager of technical operations for CBS Radio, is planning the technical facilities to handle the Winter coverage. "This will be the first time that digital audio editing will be used at CBS radio," Vallon said.

CBS: Technical operations

The technical facilities will be located in the International Broadcast Center (IBC) in Moutiers, France. Four studios, for production and program coordination, each will be equipped with an audio console, cart machine, cassette machine and a digital audio workstation.

A digital audio editor will be used for editing small segments, not as a mass-storage playback device. Feeds from the venues will be recorded on cassette, and either played back directly from cassette, dubbed from cassette to cart, or dubbed to the digital audio workstation for editing and then dubbed to cart for playback. All production will be in mono.

CBS Radio's facilities at the IBC will receive all international sound feeds, TV audio feeds, and feeds from all the press centers provided by TV. These will be sent to their Sierra Automation Systems audio routing switcher. This switcher is the same one CBS Radio uses for major events such as the U.S. political conventions.

The router will be located in Radio TX along with an Image Video video routing switcher and a McCurdy 30x30 intercom system. Radio's McCurdy will be used for radio's intercom, IFB feeds, ties to CBS television's McCurdy Olympics intercom system and ties to CBS Radio's New York intercom.

In each of the venues, the talent will be located in a booth next to TV's facilities. "CBS is the rights holder," Vallon said. "So we have our broadcast booth at the finish line or where

the main area is."

The talent will operate all of the equipment including a headset/mic, a Shure M267 mixer with a cassette input for interviews. The output of the mixer will feed a limiter that then will feed the voice identifier which will ultimately feed the IBC.

7.5 kHz transmit loop

"We'll be getting the circuits from the French," Vallon said. These will include a 7.5 kHz transmit loop, a 3.5 kHz line for return cue and a four-wire "coord" line. The four-wire line is tied into Radio's intercom system.



The voice identifier is a device that will output a voice identifier (stored digitally), in French and English, along with tone, when program audio is not present for around 10 minutes.

"The activation of the voice identifier doesn't require action on anyone's part," Vallon said. "This will allow us to monitor all incoming lines with the minimum number of people," Vallon said.

While Radio will have its own anchor in its broadcast booth at all of these venues, they do not plan to have additional announcers outside to conduct interviews. For these, they plan to pick up the audio from the TV interviews.

CBS Radio will use five DSO data lines from France to New York, according to Vallon. Each of these lines is 56 kbit, full duplex.

"Technically, these are not switched 56k lines," Vallon said. "These will be dedicated circuits that will be on 24 hours a day, seven days a week."

These lines will be leased from CBS Corporate and are part of the full T1 service that CBS will be using for the Olympics, with MCI and French Telecom as the main carriers, according to Vallon.

Four out of the five lines that radio will be using will be for digital audio program feeds and returns, and the fifth for true data, containing multiplexed signals to and from a number of ports of the Newstar newsroom computer in New York, and for other computer and data feeds, such as CBS Network's Infolink.

NBC: Operations set

Much like CBS Radio's ambitious efforts, NBC Radio's Barcelona coverage of the Summer games is presenting a welcome technical challenge.

"These Olympics are made for radio," said Larry Michael, director of sports for Westwood One, which owns NBC Radio.

And that is not the only observation Michael will tell you about NBC Radio's coverage. Much like CBS' Winter coverage, the NBC Radio Summer coverage is providing an interesting mix of TV and radio facilities and technical innovations.

The NBC Radio studio hub will be in the IBC in Barcelona.

NBC Radio's technical facilities at the IBC will include two full control rooms and a studio, according to George

the router will include feeds from the venues, host broadcaster feeds, and feeds from NBC Television. All of the control rooms and edit rooms each will have a routing switcher output so that they can access any of its inputs.

Traveling package

Most of the equipment will come from Westwood One's travel package. The total package contains equipment for up to 10 edit stations and 2½ control rooms, all packed in sturdy road cases. This package will be augmented by equipment from NBC Radio's headquarters in Arlington, Virginia.

"The fly-away package is modular in design and is quite easy to set up," Thomas said. After doing all of the wiring hookup, the studios are ready to go into operation.

Equipment will include Pacific Recorders consoles, ITC cart machines, Otari MX5050 1¼" reel-to-reel tape machines, and cassette decks, RTS intercom and IFB system. All editing will be on ¼" tape with razor blades.

The systems design was done by Mutual/NBC's Broadcast Operations department. Staffing will include studio engineers operating equipment for the more complex programs and maintenance technicians, according to Thomas.

In addition to the IBC facilities, NBC Radio will set up its own broadcast booths at about nine different venues. According to Michael, each booth will be equipped with a small mic mixer with an input for a cassette deck, microphones, and IFB feeds.

NBC Radio also will broadcast live from an exclusive interview area at each of the venues. "Since we are the radio rights holder, we have exclusive access to the interview area," Thomas said.

NBC Radio is exploring different options for getting the feeds from the venues to the IBC, and also from the IBC to its Arlington, Virginia, headquarters in the U.S.

Two program origination circuits and two return cue lines will be used for feeds to and from the U.S. The Arlington studios will handle commercial integration, telephone calls, and some program coordination.

As in previous Olympics, plans for the upcoming 1992 Games once again show that U.S. broadcasters use the high profile events to experiment with the latest radio technology.

Thomas, director of broadcast operations for Mutual/NBC which also is owned by Westwood One. All of the rooms will be mono.

One control room will be set up for combo operation. On-air talent will operate their own console in this room for the simpler shows. The other control room will be used mainly with the separate studio that will be able to hold four or five people. The more complex programs will originate from here and have a separate operator to handle the board.

Three edit rooms will have full mixing capability with announce mics. They will mainly be used to record feeds from the venues, edit them, and dub to cart. Sports department producers will handle the editing chores.

All of the control rooms and edit rooms will be fed into the Datatek audio-only central routing switcher. Other inputs to

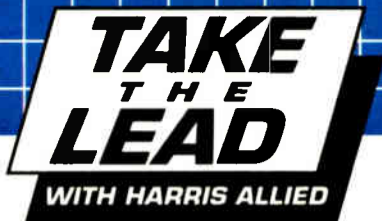
Gammon Denounces FCC

WASHINGTON Tom Gammon, whose well-publicized plan to change the city of license for Crown Broadcasting's WHMA-FM in Anniston, Ala., was struck down by the FCC, has raised his dukes with an appeal that accuses the FCC of a "patently ludicrous" decision.

In his 24-page appeal, Gammon said the Mass Media Bureau sided with the status quo and Emerald's opponents: "To get there, however, the Bureau has twisted and turned, misapplying the law, ignoring the facts and creating unprecedented doctrine. It is a strained and unsustainable staff decision."

Among specific accusations, the document pointed out that the Commission ignored its own precedents by giving loss of service a weight "far greater than it has ever before received"; ignored Atlanta's need for service; and ignored its recent decisions on changes of community of license.

The Commission, in making its October decision, said that the change in Crown Broadcasting's city of license would not serve the public interest because it would remove service from Anniston, while adding service to the already "well-served" Atlanta market.



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'Proms' Broadcast Trans-Atlantic

By Frank Beacham

LONDON A new chapter in broadcast history was written with the international debut of a new CD-quality stereo codec technology for the first live trans-Atlantic broadcast of the rollicking British concert tradition, "The Last Night of the Proms."

Shedding the 7.5 kHz G722 technology, two leased fiberoptic 64 kbps lines, linking the British Broadcasting Corp. (BBC) in London with National Public Radio (NPR) in Washington were transformed into a single in-phase, 20 kHz, high fidel-

ity transmission path.

The key to the change was a the Model CDQ-2000 codec from CCS Audio products, a division of Corporate Computer Systems (CCI) of Holmdel, N.J. The codec uses 12:1 MUSICAM compression technology and allows CD-quality stereo remotes with as little as 112 kbps of digital bandwidth.

First live transmission

The nearly three-hour concert originated live from London's Royal Albert Hall last fall. The "Proms," short for "Promenades," are a beloved English musical tradition,

dating back almost 100 years. The final concert is a tumultuous event, with the audience joining in with whistles, noisemakers and cheers and singing with the BBC Symphony Orchestra and Chorus. It was the first live broadcast of the Proms to America.

Executives at the BBC and PBS were impressed by the new CCS codec and have placed orders for units to permanently convert their two 64 kbps circuits to the 20 kHz stereo system.

"It was very effective," said David Gooding, project engineer for the BBC World

Service Projects and Planning Dept. "We had it in service for 10 days and we have ordered the equipment for permanent installation. MUSICAM opens the possibility of doing music-based pieces (remotes) economically."

At NPR, the reaction was equally positive. "In the future, when ISDN circuits are readily available, I could do a concert from Berlin on dial-up lines and it would cost about two bucks a minute," NPR Director of Communications John Keator said.

Although Keator said the MUSICAM compression technology "sounds great" to the casual listener, he admitted there are some imperfections in the audio that can be heard by the critical ear. "If you are really listening carefully on certain things under certain circumstances you might hear some artifacts," Keator said. "But this is the first unit, the first practical realization of MUSICAM."

Parameters outlined

The new CCS codec is capable of operating at eight switch-selectable data rates from 128 to 384 kbps, and can be used between satellite services or terrestrial digital telephone networks including Integrated Services Digital Network (ISDN), Switched 56 or fractional T1. It also offers a two-line interface which combines two 64 or two 56 kbps data circuits into one data path and automatically corrects phase.

continued on page 16 ▶

Metropolitan Opera Radio Goes Worldwide

▶continued from page 1

stand ready in case of primary system failure during an opera broadcast. If all else fails, the broadcast is available to stations on a dial-up 900 telephone number. Throughout the years, however, gremlins have occasionally interrupted performances. Cows have bumped satellite dishes out of alignment, and snow or beer bottles in a dish have been blamed for bad reception.

On one occasion a total failure of the transmission system and all of the backups necessitated a broadcast being routed to an uplink via a local radio station in New York to a national television network to their Washington office and then across the street to the National Public Radio uplink.

Technical director Bill King and performance mixer Jay David Saks oversee the audio production from the Met's newly-designed facility. Saks controls 22 live microphones in the hall on a Studer console and monitors them on a pair of decade-old Infinity 1.5 consumer speakers.

High quality

"These are speakers I know and trust," he said. "The most critical thing about speakers is having a frame of reference. When I take tapes out of here and listen

somewhere else, I have no surprises."

Quality control and constant network testing have given the Met broadcasts a reputation for the highest sonic quality. In advance of the 1991-92 season, which began the first week in December, Engineer Mark Schubin spent more than 40 hours testing every link on the global network.

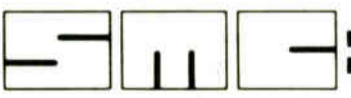
"You find some amazing things," Schubin said. "This test I just did with Europe—I was on with Paris and London—in Paris everything was fine, but in London there was a tremendous anomaly in frequency response between British Telecom and the BBC. It turns out that it was a local problem due to an impedance mismatch at British Telecom. But no one ever found it because they don't test like we test."

Schubin keeps a log book of tests and compares previous network specs with new ones. "First we check RF level on the satellite, we look at the audio level to make sure that it's in spec. We check for crosstalk between channels, signal-to-noise and the quality of the noise."

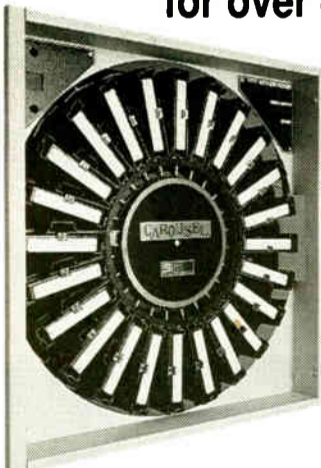
Examining his log, Schubin noted an entry. "You may see this channel was clean, which means the noise was just hissy, but this one had low level static. Here's one test

where we heard faint music in the noise ... definite crosstalk. The meter said, 'it's in your spec, don't worry about it,' but that's not good enough for us. It may be numerically OK, but if during a quiet point in the opera somebody hears a ball game coming through, that's no good," Schubin said.

"Then we test for distortion and noise at our normal operating levels," Schubin continued. "We go 10 dB above that to our peak levels and then we go beyond that to see when we hit one percent distortion or clipping. Then we do frequency response testing. We check phase between channels, and then the final thing we do is play some music and voice and listen to it."



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California Enacts Workplace Safety Plan

by Pamela Watkins

LOS ANGELES Maintaining its reputation as a state with strict workplace health and safety standards, California adopted legislation last summer requiring all managers to create a written safety plan for their workers.

As of July 1, 1991, Senate Bill 198 (SB 198) gave the California Occupational Safety and Health Administration (Cal-OSHA) power to require every state business to have a safety and health plan for its workers, based on the agency's Injury and Illness Prevention Program (IIPP).

This plan spells out every conceivable workplace injury, from wrist fatigue because of improper computer usage to high voltage safety procedures at the radio transmitter.

"What SB 198 requires Cal-OSHA to do is that, upon every inspection, our enforcement personnel have to look at the employer's Injury and Illness Prevention Program. The law requires that," Cal-OSHA's Rick Rice said. "And if the investigator doesn't see a written plan, and the company doesn't have one, the investigator can write it up."

No plan means big fines

The Cal-OSHA plan is employee-complaint driven, except when the agency targets an entire industry. When an employee makes a complaint or files for workman's compensation because of a workplace injury, Cal-OSHA will visit that employer and request to see the plan.

If there is no plan and no implementation

of that plan, Cal-OSHA has the authority to slap as much as a \$2,000 per infraction fine on the employer plus a jail sentence. Another piece of legislation is pending that would increase that fine to \$7,000 per violation.

Dick Rudman, CE at KFWB in Los Angeles, recently put together a seminar for the area Society of Broadcast Engineers (SBE) to get radio station's started on their IIPP plans. Rudman used the 44-page plan he wrote for KFWB as an example, noting that it covered areas specific to radio stations.

"I distributed some new information to engineers in our shop regarding small tools and how to use them. In the engineering world a lot of injuries occur because of misuse of small tools," he said.

Rudman noted that engineers often work in high voltage situations where safety is vitally important. He explained: "there's a procedure called 'walk-out, tag-out,' where if you're going to work on a hot circuit, you have two or three people involved in that. Everybody puts a padlock on a special hasp that goes on the breaker to make sure that if one person is still working on that circuit, somebody else can't energize it accidentally. They all have to unlock their own padlock."

Other suggestions in KFWB's safety plan include hearing protectors or "clam shells," along with instructions on how to use them.

Rudman stressed that engineers have to look at everything in a new light because every situation carries a potential hazard. Even housekeeping can compromise safety, Rudman noted. "A frayed rug can trip somebody

and cause them to hurt themselves or even get killed."

Positive employee relations

Bob Kanner, CE for KRTH, gives SB 198 high marks because it creates a positive dialogue between the employees and management. "KRTH's employees are happy about the program and the training sessions because they see that management is very concerned with their safety," Kanner said.

KRTH has implemented its safety plan through showing films and conducting training sessions on CPR, as well as labeling areas as dangerous or hazardous.

Even though most employers throughout

California are enthusiastic about the program and are taking it seriously, some have grumbled and complained that SB 198 is just another administrative burden.

Cal-OSHA's Rice said that safety is too important an issue to be considered a burden. "The bottom line is that it's going to end up reducing the number of workplace injuries and illnesses," which benefits employers through reduced workmen's compensation claims, he said.

Any California radio station still preparing its safety plan can seek assistance by calling the state Department of Industrial Relations consultation at 415-737-2843. The department will refer the company to the nearest consultation office. That office then will prepare and write the station's IIPP plan. Funding also is available for an employer that cannot afford to create a plan.

'Proms' Goes Trans-Atlantic

►continued from page 15

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"ISDN is readily available in Europe," Keator said. "But the transmission we get in the United States is 56 kbits, called Switched 56. We are the only country in the world that uses it.

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The Early Days of FM Radio: What to Program; How to Sell

by George Riggins

LONG BEACH, Calif. A look at the early history of FM radio reveals that the first listings of FM stations appeared in the Radio Station Treasury, 1900-1946 edition, by Tom Kneitell, published by CRB Research of Commack, N.Y. and the Broadcasting Yearbook for 1941.

The FCC authorized commercial FM broadcasting on May 22, 1940, with the allotment of 40 channels in the 42-50 MHz band. NTSC also chose FM for the audio portion of the new TV service that was then being considered. TV was authorized by the FCC on July 1, 1941.



The Radio Technical Board favored the 40-50 MHz band for FM, but with some outside urging, the FCC became concerned with possible skywave interference and recommended that the FM service be moved to the 92-106 MHz band.

A band is born

The final decision on FM, made in 1946 and still in effect today, was to put the new service on the 88-108 MHz band. Stations could continue to broadcast on the lower frequencies until 1947 when all operation in the 42-50 MHz band would cease.

Stations were allowed to simulcast on both bands during the transition period. As for the pressure to move the FM band, industry chroniclers have written that the pressure from the TV industry to move FM to its current band position came mostly from RCA. Sarnoff, then head of RCA, was intent on seeing television develop, and protecting the AM band.

In 1938, after Major Edwin Armstrong established his "new" FM station at Alpine, N.Y. using his own money, a few additional FM stations went on the air. The Radio Station Treasury lists 47 stations as "on the air" in 1941.

The Broadcasting Yearbook lists 29 FM stations as of Jan. 15, 1941. The discrepancy between the lists can be partially accounted for by the absence of experimental station listings and calls in the Broadcasting Yearbook.

What's in a name?

The first calls issued for commercial broadcast were a combination of the "K" or "W" prefix, the channel number—without the first digit dropped—and one or two letters designating the city. As an example, the call issued to Radio Service Corp. of Utah was K47SL. The "K" stood for west of the Mississippi, the 47 was the frequency or channel, 44700 kHz and the SL for Salt Lake City.

The power designation of a facility was not listed, but the size of the service area was given in square miles. The largest service area, 69,400 square miles, belonged to W4IMM (CP), Winston Salem, N.C., owned by Gordon Gray. The second largest service area, of 38,000 square miles, was assigned

to K37LA (CP), Earle C. Anthony, Los Angeles.

The 1942 station list compiled by the Radio Station Treasury lists 78 FM stations. This total includes 39 CPs—four of which were stations that had not as yet been assigned calls. Four of the stations were educational assignments.

The educational stations were WYNE, Board of Education, New York, N.Y. 42,100 kHz; Unified School System, San Diego, Calif. 42,300 kHz; WBEZ, Board of Education, Chicago, Ill., 42,500 kHz; and WIUC, University of Illinois, 42,900 kHz.

By 1946, 48 FM stations were listed in the Broadcasting Yearbook as being on the air, and four construction permits had been granted. Radio Station Treasury gives a list of 54 commercial stations and 17—including three CPs—for non-commercial stations. The call signs were all of the conventional variety, as experimental calls were no longer being used by that date.

One element of the early years of FM broadcasting that is usually overlooked is the lack of receivers. There were very few readily available receivers that "John Q Public" could purchase for home use. There was a lack of knowledge as to what the service could do, or what the future would or could bring to the broadcasting industry.

But what does it do?

Most of the early stations wound up simulcasting the co-owned AM program and were unable to sell the time on the FM. Broadcasters ended up selling the programing as music services for stores and offices. The commercials were silenced by recording a tone at the start of each commercial. The tone muted the receiver furnished to the purchaser of the background music service.

It has been reported that the FCC ignored this short-lived part of FM history. Dick Burden, of Burden Associates, reports that some stations made more from this early background music than from the few commercials that were being sold on FM. Dick should know because he was part owner of one of those early FM stations that did not have a tie to an AM station.

As for me, my first FM tuner was an Arkay kit. I used the tuner for several years until the second generation Sherwood AM/FM tuners became available in the early 1960s. Both were mono with no stereo capability.

Other receivers or kits of the era were the Meisner, Pilot, H H Scott, Fisher and Heathkit. Fisher began selling a stereo decoder when stations started stereo service. There were probably more receivers sold on a regional basis, but those are the ones I remember best as being available in Southern California.

Another factor limiting the band was the lack of technical knowledge at the local level. On a personal note, I once asked the engineer at one of the first local stations to go stereo, what his subcarrier frequency was. He dismissed me rather abruptly and told not to try to steal the service.

No one was supposed to know that the station was transmitting in stereo or that a 19 kHz pilot tone was being used. My, how times have changed.

George Riggins has experience in radio and electronics dating back to the 1930s. He can be reached at 213-598-7007.

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Deterring Tower Vandals and Thieves

by Barry Mishkind

TUCSON, Ariz. There are few experiences worse than driving up to a deserted transmitter building and finding the door wide open. Ouch—You've been robbed.

For the moment, you have to set the anger aside and start arranging your calls. The general manager has to be called. The police. The insurance agency. And the frantic calls to find something with which you can get back on the air.

Sometimes the situation is similar to that which recently greeted an engineer in Kentucky. Upon arrival at the transmitter, all he found was the building and the tower. Everything else had been trucked away. One Michigan FM station had its exciter stolen *three times in six weeks*.

AM sites are especially prone to copper loss. Sometimes tower crews hardly get the copper in before the thieves remove it. Just to maintain its signal, one station in Phoenix figures it needs to replace its ground system every year—not from deterioration, but from theft.

Such horror stories are distressingly frequent. Often the first indication a station has of intruders is the moment the thieves disconnect part of the air chain equipment. Gerold Shepherd of KXEO in Mexico, Mo., told a familiar story of moving studio operations from the transmitter into the city. He described the result at the now un-

manned transmitter site as "aggressive vandalism."

Trying to prevent, or at least reduce, the loss of station equipment has taken on a greater urgency in recent years as more and more stations report being hit. How sure are you that your facility is secure?

An ounce of prevention

True, a determined vandal can knock you off the air and get away before being found. But, just as simple precautions can reduce the likelihood that a thief will go after your car, some basic steps can reduce your exposure to theft.

No one will argue that the quickest way to secure a site is to call one of the security companies that will come out and wire up the place. Those that share a site with other stations can sometimes work out a cooperative agreement where the costs of security are shared.

Nevertheless, be careful of whom and how you choose to protect your site. For example, some of the alarm systems use telephone lines. By cutting the phone line, a thief can prevent the system from calling the security company.

On the other hand, the system could end up catching you or your stand-by. Suppose you forget the right code to phone into the security company. Right. The cops come out, loaded for bear.

Lights are important in discouraging theft. Use your remote control to turn the

lights on periodically, and check to see if the bulbs are working, just as with your tower lights.

Another way lights can help is to make the site more visible to the police. Some stations, not required to light the tower by the FCC, put a small light up anyway for the police helicopter to identify the site. It's good for pilot safety as well as quick response to calls.

Since there are relatively few audio processors or FM exciters being fenced at the local swap meet each weekend, don't forget to mark each unit in your facility with the station name, etc. This could result in a quick return in case the bad guys do get inside.

Copper signs in their eyes

AM stations have an additional complexity to their security needs, since there's a whole lot of copper out there. Thieves have discovered it's easy to pull some of it out and drop on down to the local scrap yard for a quick buck.

One Ypsilanti, Mich., station lost its ground system twice in short order. The day the insurance was paid and a new system was installed, *that* one was stolen, too.

At a Tucson, Ariz., station, thieves were so persistent in stealing the ground system nearly as fast as it was installed that the insurance company found it cheaper to fence the entire perimeter of the five tower array than to continue to pay for ground systems

that lasted only a few days.

Sometimes the thieves get greedy and get caught. Harold Hallikainen recalled a case where thieves ripped out all the copper they could carry in their truck, only to get stuck in the mud on the site. Eventually the sheriff came and took them to a drier place.

One solution was suggested by Paul Reynolds of KCCY, San Antonio. He used one of those motion sensor units coupled with an automatic dialer. By combining them with a microphone he could

Sometimes tower crews hardly get the copper in before the thieves remove it.

check on suspicious activity at the transmitter site quickly and without alerting intruders.

Another solution comes from the Missouri station mentioned earlier. The solution was to fence the site, and start a small herd of buffalo as caretakers and guards. The original four head of buffalo have now become 25. Unauthorized entry to the site has stopped. And the grass never gets too long, either.

□ □ □

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson. He can be reached at 602-296-3797, or 325-9883 on MCI Mail, or 'barry@coyote.data-log.com' on Internet.

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The Differences Between Primary and Secondary Cells

This is the sixth in a 10-part series called DC Fundamentals. Northern Virginia Community College will offer 1.2 CEUs (Continuing Education Units) to registered students who successfully complete the course and an examination mailed at its conclusion.

To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, Va. 22003, or call 703-323-3159. The fee for the course is \$30.

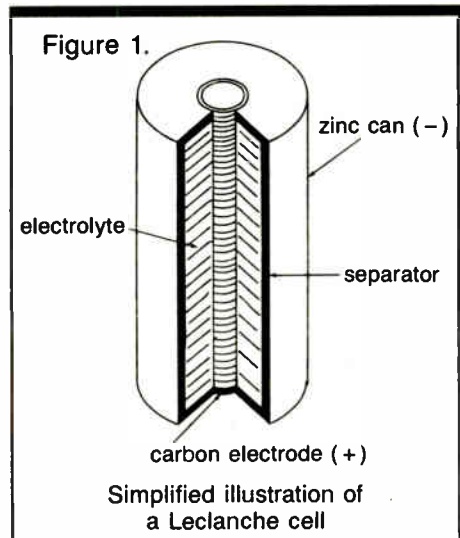
by Ed Montgomery

Part VI

ANNANDALE, Va. As previously mentioned, batteries are classified into two families—primary cells which consist of material that cannot be recharged and secondary cells which are made of material that can have their chemical reaction reversed. A secondary cell can store electric energy for future use and, when discharged, can be charged again for future use.

Most cells produce about 1.5 volts of potential. When searching the shelves for batteries, you will find numerous sizes: A, AA, B, C, etc. The different size cells are all producing the same potential. The difference is in the amount of chemicals in each cell.

Cells are rated in ampere hours (Ah). This is a measurement of how much current a particular cell can produce in an hour's time before the cell is discharged.



Thus, there are many cells in various sizes all producing the same amount of voltage to devices requiring different current demands.

Primary cells

The original dry cell was developed in 1866 by Georges Leclanche. This is the carbon-zinc cell that has been used for years in flashlights, radios, etc. This battery consists of a carbon cathode in the center surrounded by a cathode mix (electrolyte) of manganese dioxide and a separator made of paper or paste. An example of this type of cell is illustrated in Figure 1.

Another type of battery that has the external appearance of a carbon-zinc cell is the alkaline battery. Internally it is much different with a caustic electrolyte, potassium hydroxide. The anode is powdered zinc and the cathode is

manganese-dioxide.

An alkaline cell works well under heavy current demands. It can provide up to seven times the energy of a Leclanche cell when powering portable radios and tape machines.

The Leclanche cell is excellent in applications where current drain is light and constant. This cell is excellent for powering toys and clocks. The Leclanche cell has a very short shelf life; its chemicals will break down whether the cell is used or not. Alkaline cells can be stored for much longer time periods.

More primary cells

Other types of primary cells include the mercury and silver-oxide batteries. These are usually small button-shaped devices with long lives when small current demands are required. These cells are often used to power watches, hearing aids, and calculators.

Lithium cells have the capacity to produce a relatively high output voltage (2.9-3.7 volts) for a very long time. This type of battery is often used to "refresh" RAM (Random Access Memory) chips in remote locations.

A lithium cell will often be soldered directly onto the circuit board and will often outlive the usefulness of the circuit it is energizing. Its shelf life can exceed 10 years. An example of a lithium cell is illustrated in Figure 2.

The zinc air cell is also used in these devices. This cell uses powdered zinc with a potassium-hydroxide electrolyte anode. Oxygen becomes the cathode material. These cells are usually sealed and the chemical process of producing electricity does not begin until a tab is pulled, exposing the chemicals to air.

Secondary cells

Secondary cells can store electrical energy by reversing the action of the chemicals in it. This cell is often termed a storage battery because it can be used over and over.

Rechargeable cells fall into two types: nickel cadmium (Nicaid) and lead acid. The Nicaid is the smaller of the two and comes in sizes to replace most Leclanche cells.

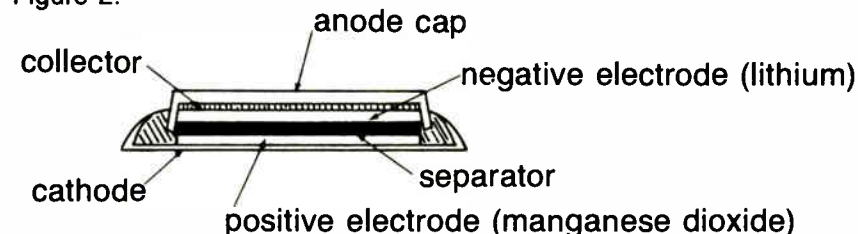
This cell consists of an anode made of nickel oxide and a cathode made of cadmium. Nicaid batteries work well under heavy current demands. They are often used in electronic flash equipment in photography, portable power tools and alarm systems.

The most famous storage battery is the lead acid cell. This battery produces high amounts of current. Often the starting motor on an automobile requires a current in excess of 200 amperes.

The battery consists of positive plates made of lead peroxide and negative plates made of spongy lead. The electrolyte is a diluted solution of water and sulfuric acid. Cells are connected in series to increase voltage and then in parallel to increase current capacity.

Lead acid cells have a life span in excess of three years. Their biggest drawback is their weight. When used to power a conventional automobile, rather than using an internal combustion engine, it is often necessary to take the space for-

Figure 2.



merly occupied by the engine and trunk, and fill it with batteries.

Review

- A secondary cell can be _____.
- Carbon-zinc, alkaline, and silver-oxide are all cells _____.
- Cells are rated in _____.

Ed Montgomery is a communications teacher at Thomas Jefferson High School for Science and Technology. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations. He can be reached at 703-750-5090.

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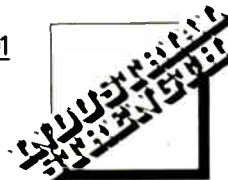
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For more information, call or write TASCAM, the company whose Industrial Strength product line also includes cassette decks and mixers.



TASCAM



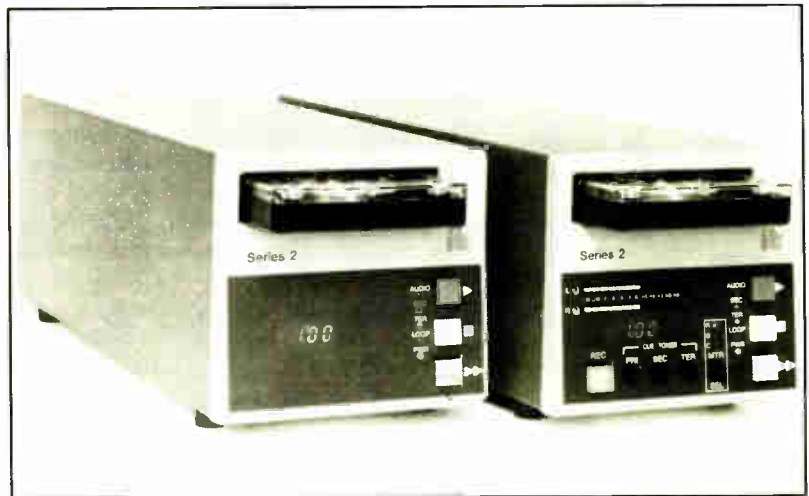
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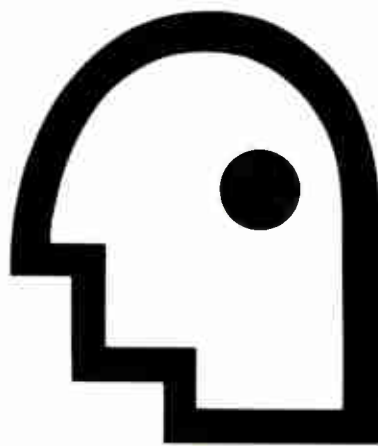
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INSIGHT ON RULES

Limiting the RF Exposure for Climbers of Hot AM Towers

by Harold Hallikainen

SAN LUIS OBISPO, Calif. This month, we'll take a little detour from our discussion of the FCC Self-Inspection Report. Instead, I'll review a study prepared by Richard Tell Associates Inc.

This study looks into the possibility of violating FCC regulations and American National Standards Institute (ANSI) guidelines on RF exposure by climbing hot AM towers. Copies of this report are available from NTIS (phone 800-336-4700). As of this writing, NTIS has not assigned a publication number or price.

The FCC requires stations to comply with the current ANSI guidelines on RF radiation exposure. These guidelines specify maximum electric (E) and magnetic (H) fields based on the heating effect of the RF. The E and H field limits are based on the far field relationship, where $E/H=377$ ohms, the intrinsic impedance of free space.

Near a radiator, however, the E and H field do not have this relationship—making it possible to have a lower power density (watts per square meter) than the E or

tower heights: the feet and the hands. The feet are generally separated from the tower by a small capacitor formed by the tower member being stood on, the dielectric of the shoes, and the "capacitor plate" of the foot.

The hands often directly contact the tower or may be capacitively coupled to the tower through tower paint and gloves. Since the hands generally wrap around the tower while the feet do not, a higher capacitance would be expected between the hands and the tower.

The climber and the tower form a loop in which current can be induced by magnetic fields from the tower. These currents pass through the legs, the body and the arms, then back to the tower.

If a fixed current goes through this loop, power dissipation at any point can be determined using I^2R . If we assume a relatively constant specific conductance for the various body cross-sections, the maximum resistance (and maximum power dissipation) will occur in the portion of the body with the minimal cross-sectional area.

It's all in the wrist

This area is the wrist. Based on a 1965 study of the wrist sizes of 3,859 male U.S. Air Force personnel, and using anatomical diagrams of wrist cross-sections made in 1911, as well as studies of the specific conductance of wrist tissues done in 1986 and 1988, wrist currents were calculated for the current ANSI SAR limits (RF heating of the wrist tissue).

The current SAR limit allows 0.4 watts per kilogram (W/kg) averaged over the whole body. To allow for fields that vary substantially over space (such as those generated by a hand held radio), the standard allows for a peak SAR of 8 W/kg measured in any one gram of tissue.

Since it appears the SAR is going to be much higher in the wrist than the remainder of the body of a tower climber, wrist currents for the 8 W/kg and a proposed 20 W/kg limit were calculated. These are shown in Table 1, based on wrist size. The 99 percentile indicates 99 percent of the population has a wrist size of that or smaller.

IEEE has revised its RFR exposure standards to allow up to 20 W/kg over any 100 grams in the extremities. The peak allowed exposure for the remainder of the body would remain at 8 W/kg over any gram, and the whole body average remains at 0.4 W/kg.

In addition, the new IEEE standard, which has not yet been adopted by ANSI or the FCC, limits contact current to 100 mA, to limit the possibility of RF burns (see Figure 1). A wrist current of 100 mA would be expected to cause an SAR of greater than 20 W/kg in the wrist of more than 50 percent of the male population. We might expect this current to cause excessive SAR in a larger percentage of the female population, based on observations of wrist size.

New kind of wrist watch?

In my discussion with Mr. Tell, I came up with the idea of a wrist watch type device. This device would consist of a magnetic wrist band—suitable for operation at

continued on page 27 ▶

Table 1—Projected wrist currents to produce 8 and 20 watts-per-kilogram wrist SARs.

Wrist Size Percentile	Wrist current for SAR to	
	8 W/kg	20 W/kg
1	45mA	72mA
50	56 mA	89 mA
99	72 mA	114 mA

Table 2—Projected wrist currents from climber-tower loop (magnetic field)

Frequency	Power	
	1.0 kw	50.0 kw
540 kHz	21.1 mA	149 mA
1,000 kHz	38.9 mA	275 mA
1,600 kHz	62.2 mA	440 mA

Table 3—Rough estimates of power that will cause current (8 W/kg) and proposed (20 W/kg for extremities) ANSI SAR limits to be exceeded.

Frequency	SAR=8	SAR=20
	W/kg	W/kg
540 kHz	1.55 kW	3.88 kW
1.0 MHz	452 W	1.13 kW
1.6 MHz	177 W	441 W

H field alone would suggest. Based on E or H field strengths, OST 65 suggests staying at least three meters away from an AM tower radiating one kilowatt. If the power is 500 watts or less, the suggested distance is 0.2 meters. It is difficult to climb a tower while staying this distance from it.

The Tell study does further analysis on the actual SAR (Specific Absorption Rate) due to currents in a body which is in close proximity to and in contact with the tower.

Climber as capacitor

A climber on a tower can be thought of as a loop in a magnetic field and as a capacitive voltage divider. A climber generally has contact with the tower at two



Vincent Marchese

The cart room at WLTW-FM, New York, a Viacom station

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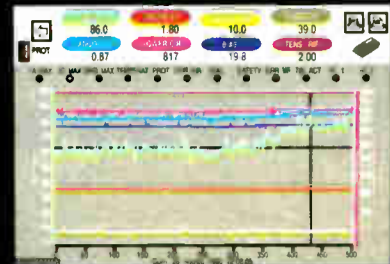
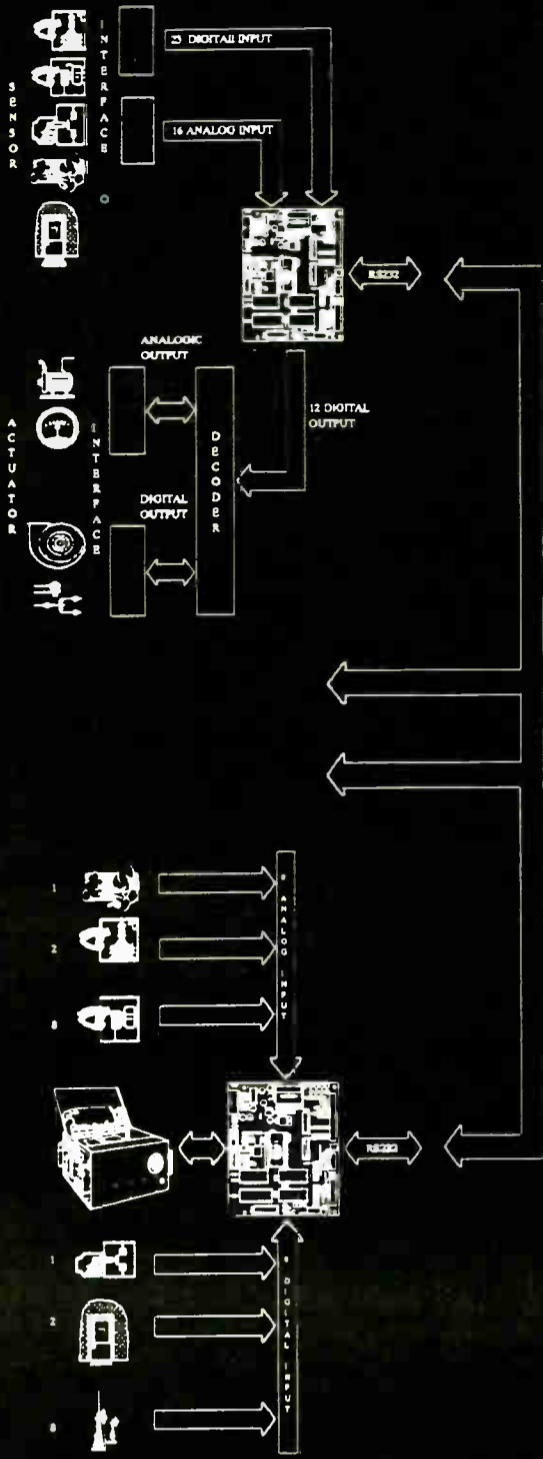
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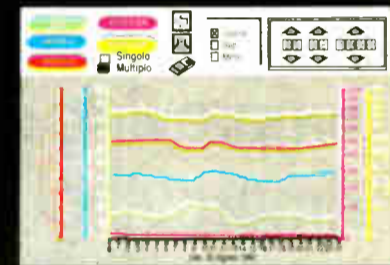


COMPROT: features a screen that displays a protection event triggered by the grid power. The cursor on one point of the graph displays the pertinent values of the plotted parameters.

RF DIAGNOSTIC is a new telemetry and remote control system for tube-type power amplifiers. All the useful parameters needed to prevent malfunctioning or to intervene in the operation of malfunctioning equipment are transferred by either radio link or telephone to a personal computer (IBM or compatible with an MS-DOS operating system). A unique software system created by ELENOS, available in various languages, enables the user to obtain:

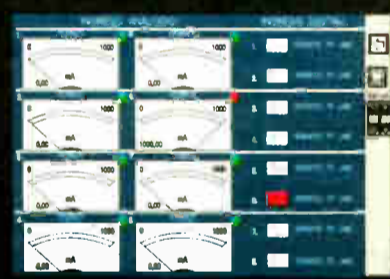
- CURRENT DATA
- PAST DATA
- GRAPHIC DATA

MULTI: features a plotted graph displaying the daily parameter readings. You also have the options of selecting weekly, monthly, for a single parameter or for every parameter simultaneously. It is also possible to have this in bar graph form and to print the data.



Moreover, if the amplifier in question is manufactured by ELENOS, the computer screen will produce a picture of its front panel (with high graphic resolution) including all current meter readings. Of particular interest to the engineer are:

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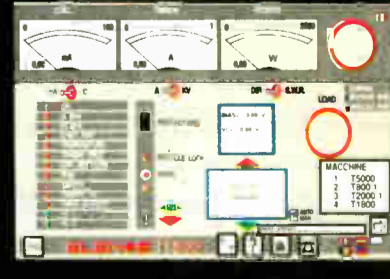
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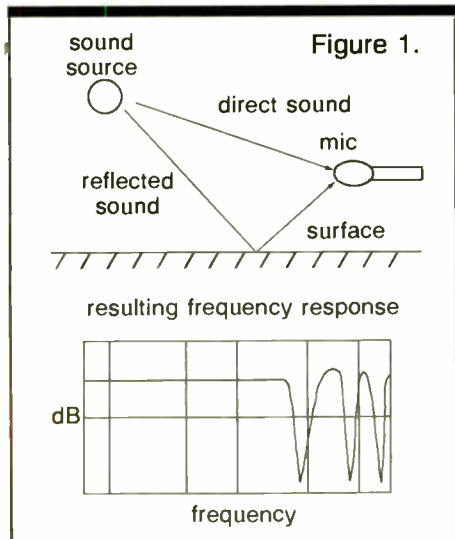
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LINE OUT

Boundary Mics: Picking up from All Sides

Editor's note: Although the author works for Crown International, a company prominently mentioned in this article, boundary microphones represent a useful miking option in radio applications. A number of companies manufacture such microphones; consult distributors in your area for more information.



by Bruce Bartlett with Jenny Bartlett

ELKHART, Ind. What are those funny looking "plate" microphones, and how do you use them? They are boundary microphones, designed to be used on surfaces such as floors, walls, tables, piano lids, baffles, or panels.

How can a microphone sound good on the floor? Read on.

Suppose you're picking up a sound source with a microphone placed close to a hard, sound-reflecting surface. Instances like this occur when you are picking up drama with the mics near the stage floor, or recording an interview with the mic on a desk stand near a table top, or recording a piano with the mic near the open lid.

In these situations, sound waves reach the microphone from two paths: directly from the sound source, and reflected off the nearby surface. Because the reflected sound travels a longer path than the direct sound, the reflected sound

is delayed relative to the direct sound (see Figure 1).

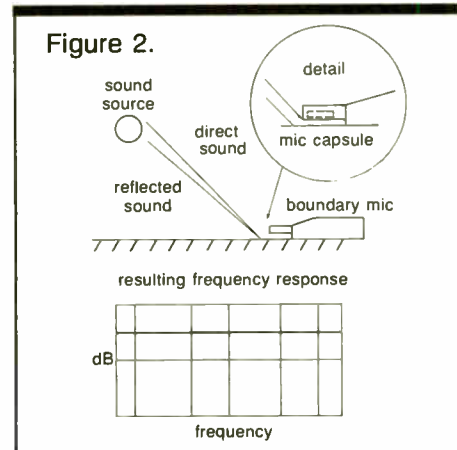
The direct and delayed sounds combine at the microphone, causing phase cancellations at various frequencies. The result is a series of peaks and dips in the frequency response called a comb-filter effect. It yields a filtered, colored tone quality.

Reflection and direction

But in a boundary microphone, the mic capsule is a few thousandths of an inch from the surface. Direct and reflected waves travel virtually the same distance to the mic capsule, so they are in-phase at all frequencies. This eliminates phase cancellations for a more natural-sounding reproduction (see Figure 2).

What's more, the coherent addition of direct and reflected sound boosts the mic's sensitivity by 6 dB. This is free acoustic gain. And it increases the signal-to-noise ratio 6 dB, which improves clarity and "reach."

Another benefit of the boundary mic is that it has no off-axis coloration; the frequency response is the same anywhere around the microphone. The



term *off-axis* means "not in front of the microphone." All stick-type omnidirectional mics roll off their high-frequency response off-axis, but not boundary mics. Everyone seated around a boundary mic is picked up with equal fidelity.

Invented in 1978 by Ed Long and Ron

Wickersham, the Pressure Zone Microphone (PZM) was the first boundary microphone with a full-range frequency response. Ken Wahrenbrock built the first prototypes, then Crown International took over production in 1979.

Background noise

Each of Crown's PZMs include a miniature electret-condenser capsule mounted face-down next to a sound-reflecting plate or boundary. The polar pattern is omnidirectional, or more correctly, hemispherical. Note that the plate is not a pickup; it does not pick up mechanical

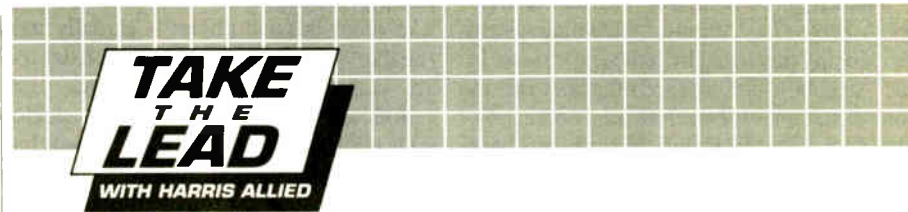
vibrations. It merely serves as a predictable hard surface to reflect sound into the microphone capsule.

Another type of omnidirectional design uses a flush-mounted mic capsule aiming up in a shallow housing. Two examples are the beyerdynamic MPC 50 N and the Neumann GFM 132.

Boundary microphones are also available with a unidirectional polar pattern. They have the benefits of both boundary mounting and the unidirectional pattern: improved gain-before-feedback, and better rejection of room acoustics and background noise. Some examples are the Crown PCC-160, Audio Technica AT-871, and Shure SM-91.

There's even a gated version out now, the Crown PCC-200. Thanks to gating

continued on page 28 ▶



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Q-TIPS

Lightning Can Take Paths Less Traveled

by John "Q" Shepler

Part VII

ROCKFORD, III. This final column on lightning protection takes a look at some of the less obvious paths through which lightning can sneak into a station.

Every wire that enters and leaves the station is susceptible to lightning transients. Next to the AC power and RF transmission lines, the most vulnerable wires are your phone lines.

Protecting the phone

The telephone company does an excellent job of protecting the public telephone system from being destroyed by lightning strikes. In fact, telephone failures are relatively rare as long as the lines themselves aren't damaged. Part of the reason is that most phones have built-in surge protection. The rest of the protection comes from lightning arresters and surge protection at the central office.

If you have one of the older telephones built with a carbon mic and a passive coupling network, you're probably OK. Newer phones are all solid-state—meaning that they have silicon or MOV voltage clamps to protect them from transients on the phone line. A direct hit would probably fry them just like other solid state gear. Fortunately, direct hits to the phone lines just outside the station are relatively rare.

I can honestly say that I've never seen

a telephone destroyed by lightning. But, I have seen the switching equipment for multi-line phones damaged rather severely. Once again, it wasn't the phone lines that took the strike, it was the power lines.

The switching boxes are run off AC supplies and are vulnerable to the same surges as other equipment. Years ago, the local telco rep gave us boxes of fuses so we wouldn't have to pester them every time there was a flash in the sky. Nowadays, surge protection is a better answer. A small unit protecting the outlet might be all you need.

Many of the newer phones, especially ones equipped with speaker phones, have AC transformer supplies to run the electronics. The older passive phone is actually more reliable because it gets powered from a 48 volt battery at the phone company.

Today, if you lose AC power you can lose your phones. Worse, a hit to the power lines can leave you without two-way communications. Be sure to protect all line powered equipment with surge protectors. It's also a good idea to have at least one telephone that doesn't depend on AC power.

Can we talk?

Phone lines are used for much more than just telephones. Computer modems and fax machines talk on the network as much as people do. This equipment may or may not have voltage limiting and is very expensive to replace.

If you are in a remote area or have any

notion that your equipment is vulnerable, it is cheap insurance to install a special surge protector at the telephone socket. These are silicon diodes or MOV devices and need a ground wire to operate fully.

What about your remote control? That dedicated line for meter readings and transmitter control can easily take a hit. The overvoltage spike will back up into the transmitter or studio unit and destroy unprotected semi-conductors.

One solution that worked for me is shown in Figure 1. This remote control worked on 10V DC. I stopped it from blowing transistors by connecting back Zener diodes across phone line terminals. Note that voltage rating of Zeners must be higher than normal voltages put out by the unit or you'll simply short out the unit.

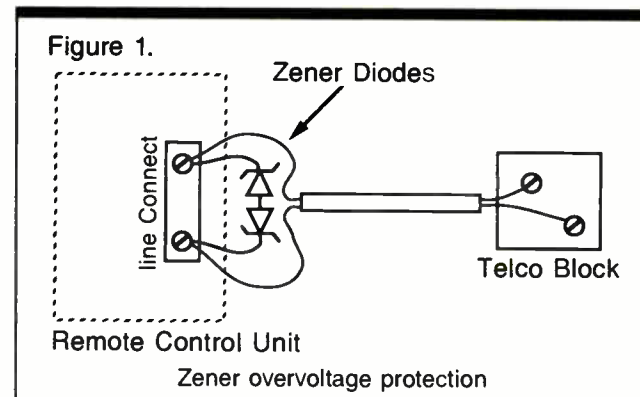
Zeners make good protection diodes because they stay off until their threshold voltage is reached and then conduct very quickly to limit the peak. The transients are so short that no real power is dissipated in the Zener.

Note that this arrangement clips both negative and positive surges. In either polarity, one Zener is forward biased like a normal diode and one is reversed biased.

This circuit will limit surges to about 15.7 volts, positive or negative polarity. Use larger or smaller diode voltages as required by your application.

Satellite dishes

Satellite receivers are also vulnerable to nearby strikes. The LNA and receiver are sensitive instruments straining to pick up microvolts of microwave energy. True, lightning doesn't have much energy left in the gigahertz range, but a nearby hit can send large surge currents at lower frequencies back into the receiver section. One item that can be destroyed is the power sup-

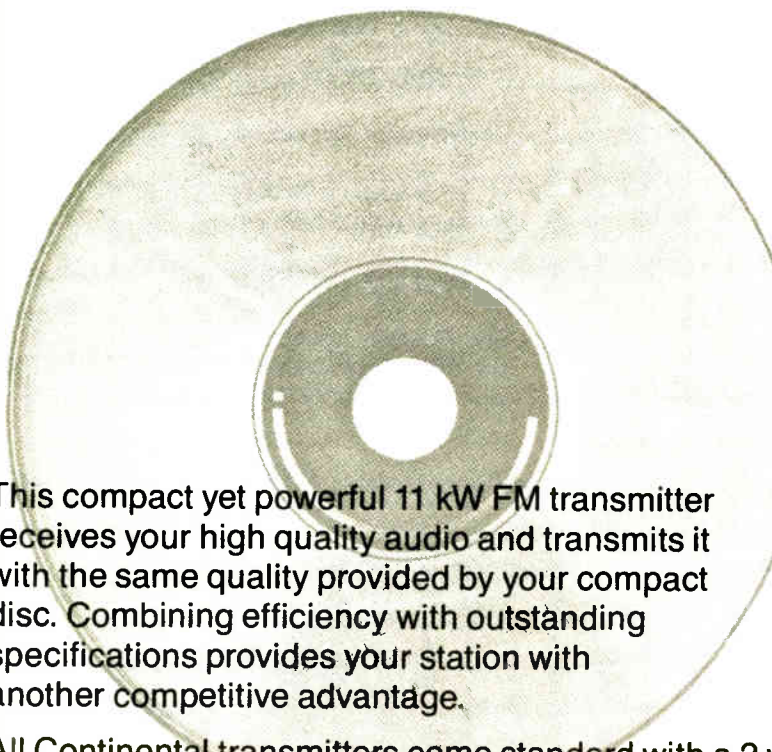


ply for the LNA. This DC supply uses the same feedline as the signal. Transients at low frequencies will get through its decoupling network and perhaps destroy the regulation chips and even some of the cards that are powered by the same supply.

Make sure your installation is properly grounded for lightning. These dishes will often operate normally even though a good low frequency ground is missing. You only

continued on page 28 ▶

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RF Exposure Ranges for AM Radio Tower Climbers

►continued from page 21

1 MHz. The wrist would form a single turn transformer primary winding.

A secondary winding would drive an indicator and alarm based on wrist current (as detected by this current transformer). Since SAR varies with wrist size as well as wrist current, adjustment of the wrist strap length could change the alarm setting, or several different instruments could be made for different wrist sizes.

Such a device would allow a climber to actually measure wrist current and calculated SAR. Mr. Tell's report, however, attempts to establish suggested operating powers that will keep the wrist current (and SAR) below the established limits.

Magnetically induced current

Since the tower radiates an AC magnetic field, Faraday's law was used to establish an expected loop voltage, based on frequency, the permeability of the tissue—and air in the loop—the magnetic field strength (maximum field anywhere on the tower for various tower heights) and the area of the loop formed by the climber and the tower.

This voltage was divided by the "impedance of the body" (371 Ohms with a standard deviation of ± 39 Ohms) from studies in 1985 and 1986. This resulted in the loop current. Again, the area of concern for this current is the area of least cross-section, the wrists. Shoes and gloves worn by the climber add resistance or reactance in series with the body impedance, reducing the possible wrist current.

Table 2 lists the expected wrist currents based on these calculations. Generally, it appears that the wrist current due to the magnetic field is below the ANSI limit for operation under 1 kW at any frequency, but above it at 50 kW.

Capacitive voltage divider

The climber and the tower, separated by air, form a capacitor. The climber and the ground, again separated by air, form another capacitor. These two capacitors are in series, forming a voltage divider driven by the voltage on the tower at the height of the climber.

The arms and feet form resistors across the "top" capacitor of this divider, causing current to flow through the arms and feet. Again, the area of interest is the wrist, since it has the minimum cross-sectional area. Measurements of wrist current and predictions of radial electric field at various tower heights showed a correlation.

Further, wrist current seemed to be much more greatly influenced by the radial electric field than the magnetic field. Very definite peaks in the measurements are appar-

ent at points where a high electric field would be expected.

Putting together all the calculations and measurements, Table 3 lists the suggested maximum power a station may operate at while not exceeding a wrist SAR of 8 W/kg and 8 W/kg—the proposed ANSI limit for extremities. These limits assume a tower height between 0.25 and 0.625 wavelength.

Theory and practice

Below 0.25 wavelength, electric fields become quite high, and additional study is required. Further, these estimates assume the climber is wearing work gloves, which may reduce wrist currents up to 50 percent. The table is based on extremely limited data and, consequently, should not be relied upon for determining acceptable power levels.

The table illustrates the degree of power reduction that may be necessary to meet the ANSI SAR guidelines. Some tower companies are "playing it safe" by doing all work at night, with the station off the air.

Some stations may be tempted to work on "floating" towers of a directional array during non-directional operation. However, these floating towers also generate substantial local fields, so power to the driven tower should again be limited. In any case, operating above the powers listed in Table 3 may call into question the station's compliance with the SAR limits of the ANSI guidelines and the FCC rules.

□ □ □

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. He can also be reached on internet at ap621@cleveland.freenet.edu or hhallika@pan.calpoly.edu or through CompuServe at INTERNET: ap621@cleveland.freenet.edu.

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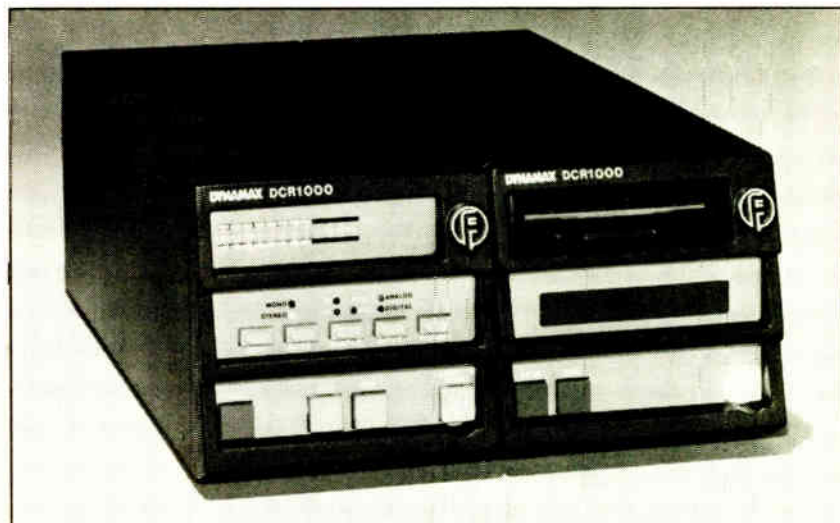
Talk with Howard Enstrom, veteran broadcast consultant who, in the 70s switched to FM translators as a specialty.



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Boundary Mics Picking up Center Stage

►continued from page 25

circuitry built into the microphone, the mic turns on when you talk into it, then shuts off during pauses in speech to reduce leakage and feedback.

Using the mic

An omni boundary mic can be placed in the center of a table to pick up a group discussion. You'll appreciate the convenience—there's only one mic to connect. Yet it sounds the same as eight cardioid mics spread around the table.

The sound can be made clearer or less hollow by adding acoustic absorption to the room surfaces, such as carpeting, an

acoustic-tile ceiling, drapes, and panels of muslin-covered thick fiberglass insulation.

Boundary mics can be taped to the underside of a piano lid. According to many users, the sound quality is excellent.

When taped to the walls or ceiling near an audience, boundary mics provide realistic pickup of audience reaction.

A boundary mic can be attached to a 2'x2' clear plexiglass panel ("boundary") and suspended over an orchestra or choir.

A stereo arrangement with excellent imaging uses two sheets of clear plexiglass, each 2'x2'. You mount these with one

edge touching to form a "V," with a 60 degree angle between panels. A boundary mic goes on each panel. You suspend this array above and in front of a musical ensemble, with the point of the V aiming at the ensemble.

Easy to use

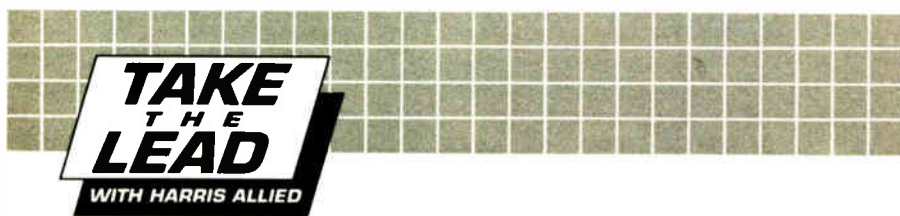
If the wedge stereo array is too unwieldy, consider the Crown SASS-P Mk. II, which is a stereo boundary microphone. It can be handheld for ENG work in the field, or stand-mounted for recording classical music or sound effects.

Unidirectional boundary microphones are well suited for stage-floor pickup of drama or musicals. Shure notes that their SM-91 uni mic can even be used in a kick drum.

For users who want to understand boundary theory and create boundary arrays for PZMs, Crown International offers a free pamphlet, *The PZM Boundary Booklet*. The address is 1718 W. Mishawaka Rd., Elkhart, IN 46517.

□ □ □

Bruce Bartlett is a microphone engineer and technical writer for Crown International, and the author of Stereo Microphone Techniques published by Focal Press. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

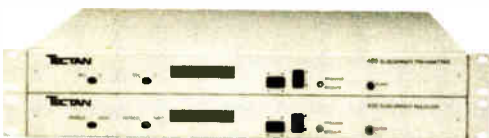


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World Radio History

Protecting Against Lightning

►continued from page 26

find out when the worst happens.

Once again, don't forget the AC lines to the receiver. A few dollars for line protection can save you the big bucks that a new receiver costs.

Miscellaneous considerations

How do you know when you have enough protection? It may take a lot of trial and error to finally eliminate all strike damage.

Not all storms are equally powerful. The worst ones seem to hit in the spring, but not every year. You can think you're finally safe, only to be hit next year by an especially powerful strike.

Follow the manufacturer's recommendations on all equipment you buy. Then go

further with the techniques described in these articles until your equipment will keep running undamaged through several seasons. Check periodically that the grounds are solid and connections are not corroded. This will keep the protection working for you until it is suddenly needed.

This concludes our series on lightning protection. If, like myself, you're surrounded by cold and ice right now, you might want to clip these last seven columns and keep them handy for early spring when the clouds start to rumble again. Write and let me know about your experiences in protecting your station from lightning.

□ □ □

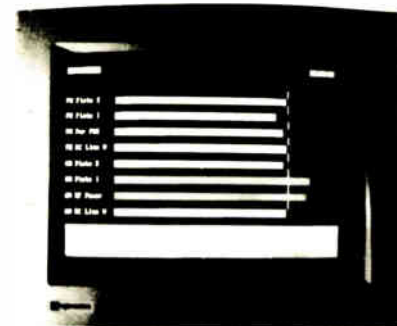
John Shepler is an engineering manager, writer, and longtime RW columnist.

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DIGITAL DOMAIN

Standardizing Digital I/O Interfaces

by Mel Lambert

STUDIO CITY, Calif. I make few apologies for picking up the thread of a topic that's been covered before within these pages: digital interfacing.

As most of you should know, most of the systems used in the production and air studio feature a variety of non-compatible digital I/Os.

Despite the fact that standardized connections and protocol definitions have existed for several years, it is perhaps unfortunate that, because of several factors, reliable and trouble-free exchange of digital data is not always possible.

But this need not be the case. With a little additional cooperation from the hardware manufacturers—who need to tell us more about the way they have implemented various I/O formats—I'm convinced that life for digital-conscious broadcasters will become far less complicated and less frustrating.

Many firms have moved from the wide variety of formats offered and used in the mid-to-late 1980s—including PCM-F1, SDIF-2 ("PCM-1610/1630"), ProDigital A/B/C-Dub and Yamaha Cascade—toward a couple of well-documented connections.

Setting standards

As I've said on several previous occasions, the AES3-1985 Recommended Practice has come to represent an almost universally accepted, reliable format for passing two channels of 16/20/24-bit audio between recorders, processors, mixers, workstations and other components in the all-digital studio.

With the recent publication of AES3-199X, which contains some very useful, application-specific enhancements to the original standard, there should be no reason why every system we plan to use shouldn't feature the familiar three-pin "AES/EBU" digital I/Os.

The confusion arises, however, when we attempt to interface such hardware with systems that are derived from consumer-style hardware—including some CD players, signal processors and DAT recorders.

Quite often, using a correctly wired RCA phono-to-XLR cable we can often connect an AES-format output on a workstation to a consumer-grade IEC-958 (also often referred to, incorrectly, as "S/P DIF") input on a domestic DAT recorder. Due to the level and impedance differences, the reverse connection is usually not possible.

Mixing apples and oranges

The problems arise, however, when such connections work satisfactorily for certain, but not all, DAT recorders. These and other "operational funnies" that we face in the studio can, I would suggest, be attributed to just one cause: We are not using these interfaces for the purpose for which they were designed.

The IEC-format I/Os are intended to carry information appropriate to consumer use, and hardware constructed to lower operational tolerances than those needed for day-to-day in a professional environment.

AES/EBU I/Os take all of these factors into account, including connector choice, balanced operation, clock stability, channel status labels and a myriad of other well-documented operational details.

My advice to users and manufacturers alike is very simple—choose and correctly implement an I/O that has been evaluated in a variety of situations, and for which a wealth of hands-on experience now exists.

While I realize that such advice might not be what you want to hear, we should also refrain from mixing and matching consumer-grade I/Os with professional formats.

An electronic Babel

Not only are such interconnects "dubious," but information is carried within their respective bitstreams—that are designed to be non-compatible.

Aside from the almost totally incompatible channel status information carried by both IEC-958 and AES3-199X ports—including sample-rate flags, time-of-day count, alphanumeric labels and other useful data—synchronizing transmitters and receivers via these I/Os is often achieved differently.

AES/EBU and IEC 958 "consumer-use" interfaces should be considered totally different I/Os, with any electrical compatibility being purely incidental.

An example might help to clarify the situation. During my consulting activities for a leading manufacturer, I'm often asked why "Unit X" talks to "Device Y," but won't talk to "System Z," the assumption being that there is something wrong with "Z."

What might be not so obvious, however, is the simple fact that Unit X's interface was being used in a way for which it wasn't originally designed, but which "agrees" with Device Y's input ports. Along comes System Z's correctly-implemented but incompatible I/O,

and you have the inevitable result.

What about this one: A short while ago, I encountered a group of broadcast users that were experiencing problems while transferring two-channel mixes from a popular workstation into a DAT recorder equipped with both AES3-1985 and consumer-grade digital I/Os.

Responding to sage advice that AES/EBU connections were usually more reliable, several users were not unsurprisingly dismayed that the connection either failed to work at all, or was intermittent in operation. Sometimes, the DAT would enter record-

ready mode—indicating the presence of a digital bitstream—but would then drop into stop mode after a few seconds. Conversely, the IEC-958 input proved 100 percent reliable.

Rather than attributing the blame to a faulty AES/EBU input circuit, the solution turned out to be rather interesting. The digital audio workstation in question comes complete with a programmable digital I/O that can generate several different formats.

The AES/EBU setting produced a totally correct bitstream, apart from two important channel status data bits. Rather than set a sampling rate flag (bits six and seven) to correspond to 48.0, 44.1 or 32.0 kHz, the programmable I/O simply expects the DAT recorder to determine this information from the subframe clock pulses.

continued on page 35 ▶

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WORKBENCH

Organizing Tips for This Year

by John Bisset

FALLS CHURCH, Va. As we kick off a new year, let's begin with some paperwork chores around the workbench. We'll start with EBS, the often neglected (yet heavily fined) section of the rules.

You can make your life a lot easier by developing an EBS log. Drawn by hand or on

a PC, the log is basically a calendar sheet with 31 blocks in it. The blocks are filled with the date and time EBS tests are sent and received. One quick glance will tell you whether you are in compliance or not.

The log will help you spot problems quickly, and in the case of sending EBS tests, if you get to Friday and nothing is logged, you still have some time to check with your traffic manager and get a test scheduled.

The first month of the year is a good time to get that quarterly tower inspection completed as well. With the paperwork out of the way, it's time to move on to some projects.

First on the agenda is taking a look at the remote gear. If you have a group of cables which are used at each remote as a set, an easy solution exists to keeping the cables together. Take a trip to your local hardware store and pick up some PVC couplings.

Couplings come in various diameters. You select the diameter that corresponds to the number of cables in your bundle. All cables should pass freely through the coupling—but with the cables installed, no connector should pass through. Thread the cables through the coupling before installing the connectors.

After the connectors are in place, the cable set is now inseparably joined into a "borrow resistant" harness—and for just pennies. Larry Albert from Murray State University in Murray, Ky., sent in this tip.

Larry's reasons for using couplings instead of wire ties or tape go beyond the inexpensive cost. They are easily painted to ID the cable set, they never dry out, work loose, or snag. Larry Albert can be reached at 502-762-4664.

Bob Clinton, the engineering manager at WKYS/FM in Washington, D.C., had a problem with an overshooting transmitter power adjustment. In addition to the transmitter screen adjustment moving way too fast, the slow response of the remote control made setting power a tedious task. Bob developed the circuit shown in Figure 1.

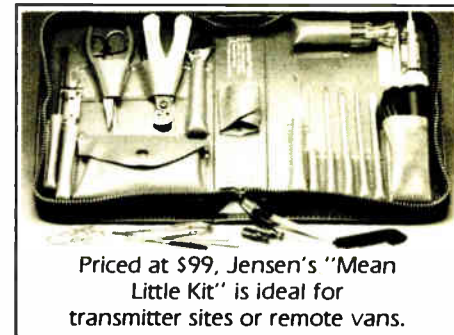
The circuit allows you to alter the duty cycle and give control over how fast the adjustment takes place. By setting the duty cycle just right, you can make your adjustment move at an easily predictable rate—such as a one percent power adjustment per second.

Bob's circuit uses a 10 percent duty cycle. By adjusting the values, just about any range is possible. Operation is straightforward, but if you require dry contacts and use a relay, the response time of the relay becomes a major factor. Short duty cycles may not be long enough for the relay to make contact, so experiment.

The circuit uses a 74LS123 and a handful of Radio Shack-type parts. The relay is the

and place two switches in front of the separate relays after pin 13.

If you've been looking for a small tool kit for your transmitter site, Jensen Tools sug-



Priced at \$99, Jensen's "Mean Little Kit" is ideal for transmitter sites or remote vans.

gests the JTK-6. Shown in Figure 2, the compact collection of 24 tools also includes a soldering iron. It can be purchased with a Beckman Probe Meter as well. For more information on this kit, or to receive a complete Jensen Tool Catalog, circle Reader Service Number 70.

I'll close out this column with an interesting tidbit from the "Strange But True" category. According to a news release from Best Power Technology, makers of Uninterruptible Power Supplies (UPS), the company is being sued by its competitor, American Power Conversion, for copyright infringement.

APC claims a copyright to the symbols " " and "#." The symbols were used in some experimental software that Best included in its new Fortress no-break UPS. Best has since removed the experimental software, though its copyright lawyer said that the lawsuit was unfounded and that no one can copyright functionality. For information on Best Power Products, circle Reader Service Number 39.

□ □ □

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



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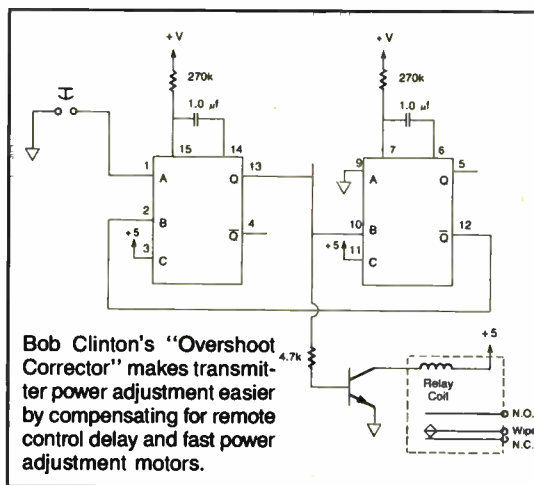
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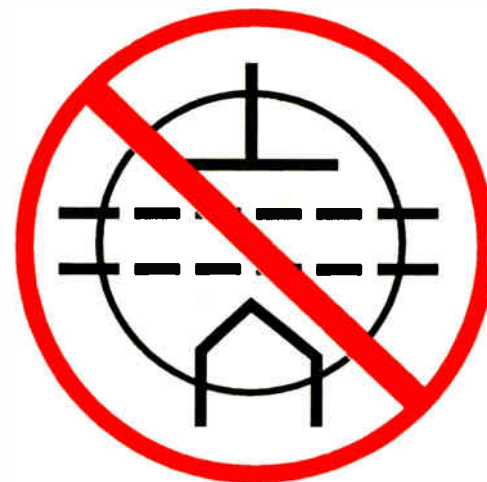
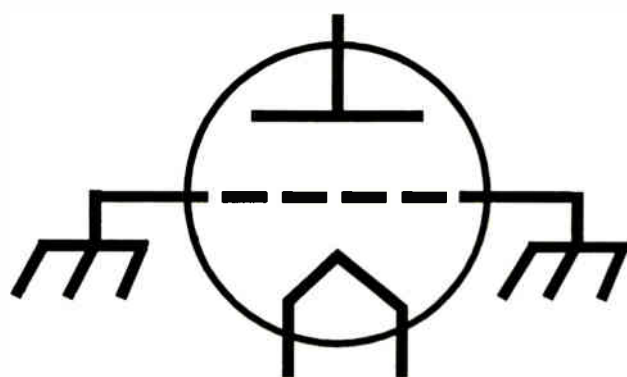
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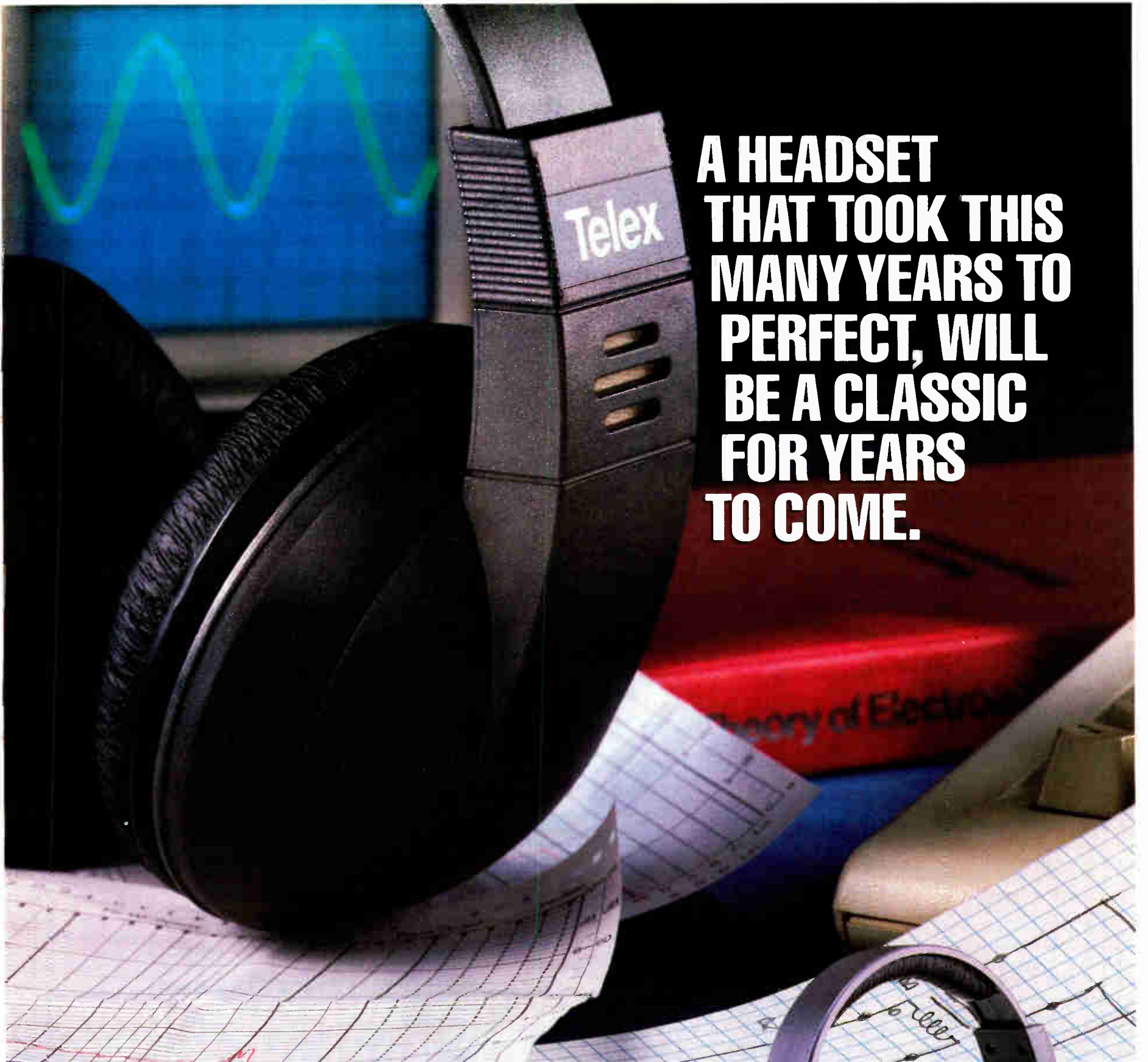
Bob Clinton's "Overshoot Corrector" makes transmitter power adjustment easier by compensating for remote control delay and fast power adjustment motors.

only moderately esoteric device, but it is available from Digi-Key. If you want one circuit to run two functions (such as raise/lower) you can permanently ground pin number one



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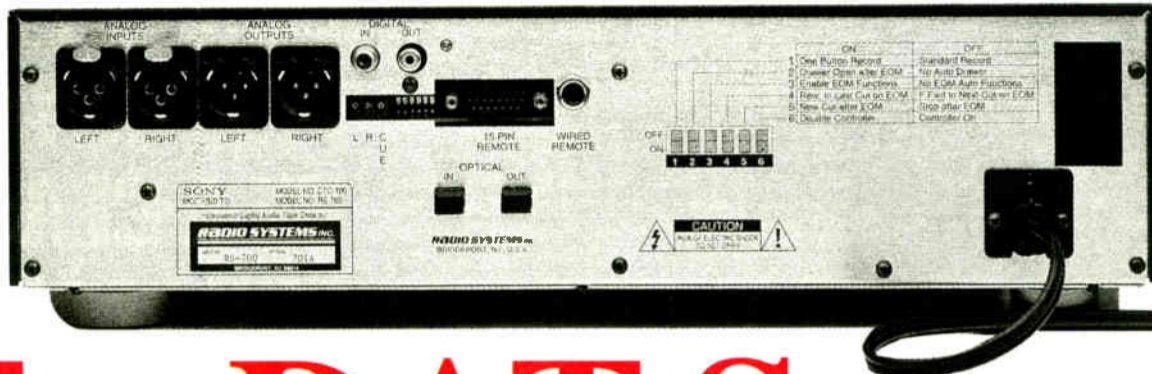
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FEED LINE

Varmints Love Your Transmitter

by W.C. Alexander

DALLAS It's my guess that any engineer that has been in the business for a while has a "critter in the works" story to tell. I have several. The most recent occurred in early August at a directional AM site in Dallas.

It started when the operator reported that the station went off the air when switching from the night to the day pattern. Switching back to the night pattern kept the station on, although at a fraction of its normal daytime power.

At the transmitter site, a check of the control circuits showed that the number one tower antenna tuning unit RF contactor was not moving. Opening the ATU cabinet door, the problem was apparent—fire ants.

Mountains out of anthills

Anyone living in the southern U.S. is probably familiar with fire ants. These tiny little insects pack a powerful sting, eliciting dangerous allergic reactions from many people. Small children are especially susceptible to their bites, and I've heard of cases where children have died as a result of multiple stings.

As if the stings weren't bad enough, fire ants are a real problem where outdoor electrical devices are concerned. Ask any air conditioner/heating contractor in the South.

There is something about 60 Hz AC that attracts fire ants. A typical failure will find thousands of fire ant carcasses packed into the air gap between the contacts of a relay. When the relay is energized, nothing happens.

This was almost what happened at the Dallas AM station. The ants got into the contactor in such a way as to prevent the opening of a particular microswitch.

With the microswitch stuck closed, the contactor was paralyzed by its interlock circuits. The directional antenna control circuits will not allow the transmitter to come back on until all switches have closed, so when switching to the day pattern, the station went off and stayed off.

Burying the dead

I cleaned the dead ants out of the works in the number one tower ATU using a vacuum cleaner and a paintbrush. I laid down a thick application of Diazinon liquid all around the ATU cabinet supports, transmission line, sampling line, control cable, and AC power cables. I also squirted a generous amount around the cabinet seams.

The weatherproof cabinets are really good at keeping out the elements and all other insects, but tiny fire ants can get through the mesh of the vent screens. The contactor worked OK, and the station returned to its daytime pattern and power a couple of hours late.

As I was packing up to leave, a

little birdie told me to take a peek at the other ATUs to be sure there weren't any ants in them. I had checked all the towers the previous week, but as the incident at tower number one demonstrated, fire ants work fast.

Checking the ATUs going counter-clockwise from the number one tower, I found number five to be clean, number three to have a couple of ants inside the cabinet, and number four to have a wasp nest beneath it—yes, I got stung on the elbow, but the wasp paid the ul-

imate price.

I treated all those ATUs and the ground around their supports and feedlines with the Diazinon, getting rid of the wasp nest in the process.

When I got to tower number two, my worst nightmare came true. When I opened the cabinet door, I found the entire floor of the ATU cabinet covered with a quarter-inch of fire ants. I felt like Indiana Jones looking down into the pit of asps.

Amazingly, number two wasn't the ATU that caused the failure that morning. It took a lot of work to

clean that cabinet out, including some down time.

When all was said and done, the worst damage was to the enamel in the cabinet. Fire ants secrete some sort of acid that caused a spotty discoloration of the paint. I'm not happy about it, but the damage could have been much worse.

Fire ants are slowly migrating north. I don't know how far north they have traveled, but they haven't been in north Texas all that long. Sooner or later, they will probably invade the entire continent.

For those of you in the south, a word to the wise. Treat for fire ants regularly, whether you have them or not. For the rest of you, your day will come.

A few years ago, I was working

in southern California on an STL diversity receiving system installed on a tower in a directional array.

The system is housed in a weatherproof cabinet inside a doghouse at the base of tower number two. There was trouble with one of the receivers, so I removed the cabinet and carried it up the hill to the transmitter building.

After removing the many screws securing the chassis top, the unit was opened. Inside were the fragrant remains of a baby mouse.

How did it get in, you ask? There were some slots cut into the side of the receiver chassis for ventilation—each slot being about an inch long and about 3/16" wide. There was also a rectangular hole

continued on page 35▶

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World Radio History

Varmints at the Tower Site

►continued from page 33) in the rear panel for a connector that had about 3/16" clearance all the way around.

The mouse must have squeezed into one of those tiny openings and become trapped inside as it grew after nibbling insulation off the wires.

Cats

I'll relate one other "critter" story that comes to mind. Some years ago, I was chief engineer of a television station in west Texas. It was deep winter, and the snow was a couple of feet high.

It seems that a cat had found a way to get into the power supply vault of the transmitter building, although he hadn't found a way into the building itself.

The cat, ever seeking shelter and warmth, somehow found a way into the top of the vault—the area where the AC and high voltage terminals are located.

He went to sleep in there one night, and had a rude awakening the next morning.

The sign-on transmitter operator hit the switch, and *bang*. The transmitter overloaded and popped a breaker.

The operator found the poor cat in the HV vault. It was still breathing, so he rushed it to a veterinarian. The cat recovered, minus a couple of toes and some large patches of fur. He returned to the site to live. The crew named it "Toes," and though it still loved to lie against the HV vault, it never tried to get inside again.

The transmitter fared at least as well as the cat. The mess was cleaned out (mostly fur), the reset was pressed, and the station was on the air.

With cooler weather coming on, creatures great and small will be looking for a winter home. The prudent engineer will try to anticipate most of the likely points of entry and plug them, before something nasty happens.

□ □ □

Cris Alexander is the director of engineering for Crawford Broadcasting Co. in Dallas.

Digital I/O Data Interfacing

►continued from page 29

This configuration worked reliably with early-generation recorders. But then we encounter a new DAT machine that correctly uses Channel Status bits six and seven to set its internal timing clocks.

For sampling rates of 48.0 kHz (bits 6/7=00), the interface might be expected to function correctly—because the workstation also set undefined bits to zero. At a sampling rate of 44.1 kHz, however, (bits 6/7=10), the DAT was unable to match sync rates and wouldn't enter record mode. An I/O port firmware upgrade that generates the correct channel status flags for all sampling rates cured the problem.

The bottom line:

• Try to use nothing but correctly implemented AES/EBU I/Os—preferably ones that follow the new AES3-199X Recommended Practice.

• Determine from the equipment manufacturer which channel status bits are included, and, for new AES3-199X-compatible I/Os, what level of implementation has been included.

• Don't assume that any particular manufacturer is better than another at correctly implementing AES/EBU-format I/Os. To perform quantitative assessments of a suspect interface, you'll need reliable test equipment for analyzing timing accuracies of sync clocks, for example, and channel status information.

□ □ □

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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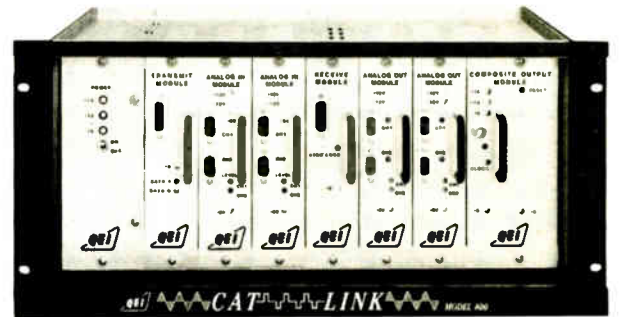
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McIntosh MC2500, black, factory sealed, \$3975; (2) MC240, \$1175 ea; (3) MC40, (2) MC-225, \$575 ea; (2) Krell Altair w/outboard pwr supply, \$3150 ea; Spectral DMA100 Mk III, \$2975; Sony Espirit TAN900, \$750 ea/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

RCA BTE-15A w/2 SCA generators, extender board & book. NationWide Talk Radio, PO Box 68088. 503-774-0459.

Auditronics 1100DAGLC dist amp (20), in (2) Auditronics 1100MF 10-input mainframes, w/Auditronics PS60 RM external pwr supply, used 6 mnths, \$1290/all. B Lord, Lord Brcdstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

RCA BA-21A mic tube pre amps (9) w/connectors & racks; (2) RCA BX-21A tube pwr supply's w/connectors & racks; (6) RCA tube program amp BA-23A; (2) RCA tube pwr amp SA-354; (3) RCA tube pwr amp SA-751; Altec A-326; (6) Altec 1564A; (3) Altec 1567A; (8) Altec 1561A; Altec tone pre amp 1562A; Altec 1520A; Dynaco stereo 70, mint. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

Want to Buy

Denon POA8000 (2); Sansui B2301, BA5000, C2301; Marantz 1-10; Crown DL2 phono module; Burwen TNE7000; Hartfields; Sony CDPR1, DASR1. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

ANTENNAS & TOWERS

Want to Sell

Miter elbow, 3", flanged, new, \$280 + shipping & COD. R Krob, KMUS, 1513 Carey, Cheyenne WY 82001. 307-484-2704.

Gray Research antenna heater control. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Radio Systems CP-15 coupler (12), for use in carrier current brdct applications, wired w/6" 3-phase cable & 3-phase disconnect plug, excel cond, \$100 ea. R Rossman Jr, 814-865-9568.

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Elec Research EH05 antenna heater, 150 W/110 V, brand new, still in crate, \$1080. K Conner, KAMQ, 2001 W Walnut, Rogers AR 72756. 501-636-4611.

Interconnector bullets w/teflon disc (2), 3-1/8", new; (2) 90° 1-5/8" elbows; (2) 1-5/8" to 7/8" taper reducers. R Plummer, CTC-TV, 10071 Bayhaven, Fairhope AL 38532. 205-928-5770.

Set of guy wires (8), approx 1/4" diameter including insulators, can be used for AM/FM 300s tower, like new, \$500. R Chambers, 916-257-2121.

American 20' free standing sections (2), triangular, 24" per side, \$800. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

CSP phasor built for 5 kW day/1 kW night; DA-2 5 twr array on 1410 kHz; Polomac Instruments AM-19D phase monitor for 5 twr array, BO. L Fuss, WDTL, PO Box 159, Fayetteville GA 30214. 404-460-6259.

Locke/Lapp 78463 & 91349H (3) AM twr base insulators, BO. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

Scala 8' STL dish, \$800; 6' STL dish, \$500. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Want to Buy

Rohn 80/equiv 20' section, need (4), will pick up & pay cash w/in 200 miles. Z Smith, Airwaves, 4801 Lamar, Paris TX 75460. 903-785-8881.

Bogner UHF bdct/xlator, B-series, chnls 25-40, 41-52, 53-83, any cond. J Powley, WIIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Andrew 16 bay tuned to 36 UHF, donation/price negotiable. R St. John, Robert St. John Productions, 7123 I-30 #31, Little Rock AR 72209. 501-562-7829.

AUDIO PRODUCTION

Want to Sell

Howe 2100 Phase Chaser w/all connectors & manual, \$500. S Schweiger, WXLO FM/AM, 146 Worcester Cir, Worcester MA 01608. 508-752-1045.

Studio Sound S305 vintage passive filter sets, matched pair, consec #, rack mount, rare, \$275 ea. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Eventide BD955 3.5 second digital delay, \$1700; Gentner SPH-4 telephone system, \$450; both used 1 yr, excel cond. J Carl, KCOB/KLVN, 611 1st Ave E, Newton IA 50208.

Orban 111B Parasound dual reverb, gd cond, \$225 + s/h. Ken, Rainbow Music, 614-877-0585.

Orban 622B parametric EQ, \$600/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Mod Sciences SCA-186 Sidekick clean, like new, \$2000; Johnson SCA ST-449 rcvr, \$100. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Orban 672A (2) trade towards Harris SP-90 FM Intr/BO. E Mitchell, KCDU, 5956 Sherry Ln #2000, Dallas TX 75238. 214-343-1760.

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Orban 245E (4) stereo synthesizers, unused w/manuals, \$200/ea. J Cunningham Jr, KNOX, 720 Front St, Natchitoches LA 71457. 318-352-9596.

Delta DL-4 acoustic computer, gd cond, \$175 + s/h. Ken, Rainbow Music, 614-877-0585.

Orban 424A gated compressor/limiter de-esser, \$475. R Haggard, Haggard Audio Prod, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

Eventide H949 Harmonizer w/de-glitch card, \$1250. R Haggard, Haggard Audio Prod, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

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Fairchild tube reverbs gd cond. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Gentner CRM combo remote mixer. A Kenyon, WLW, 1111 St. Gregory, Cincinnati OH 45202. 513-241-9597.

Orban 111B-1 spring reverb, gd cond. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

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

AUTOMATION EQUIP

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Microprobe Electronics 24 station/8 source automation controller, needs repair/gd for spare parts, w/remote control switch pad, \$300. R Chambers, 916-257-2121.

IGM Instacart (2), stereo w/Maxtrax heads, gd cond, \$6000 both. D Swatman, WMGF/WPRD, 2001 N Mercy Dr, Orlando FL 32808. 407-298-5510.

Conex CS25A dual 25 Hz tone sensor (2), \$200 ea. J Bremer, KARZ, POB 492890, Redding CA 96049. 916-243-2222.

BE 16 w/newest software. (3) BE sngl P, Carousel, 48-tray Instacart, 42-tray Go Cart which needs work, (3) Scully R-R PB, vry clean, satellite interface, \$15,000/BO; also, Sono Mag DP-1, complete remotely controlled desk unit, vry cln, not modified, well cared for, BO. E Delahunt, KPRM, Hwy 34 E, Park Rapid MN 56470. 218-732-3306.

Sentry Format FS-12B: 12-chnl switcher, Opto card, brdct auto control w/3 operating modes, 50,000 event walk away memory w/360K diskette, traffic software integration, special music rotation, interface for 12 stereo random access sources, (4) SMC mono Carousels, bi-directional, SMC dual P cart machines, Otari R-R, racks, etc. BO. G Gilbert, CSRG Inc, Box 50539, Denton TX 76206. 817-380-0229.

IBM EC, complete system less SAT receiver, config'd for Unistar, w/custom switcher to allow 4-jock walkaway & (3) Instacarts, BO. 601-693-2661.

BE 16 complete system for tape/satellite, 3000 events software, pwr supply, audio processor, main processor, remote, CRT, printer, customer interface, satellite interface, (10) audio cards, (6) interface cables, 78-tray IGM Go Cart II, (2) 42-tray Go Carts, much more, gd wrking order, BO. D Brown, KVLV-FM, POB 832, Gunnison CO 81230. 602-645-8181.

SMC-24 (2) Carousel auto system w/controls, switcher, each w/metal cabinet, w/ABC decoder, \$2500. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

BA 25 25 Hz tone sensor, rack mount, \$200/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Instacart (2) 48-hole w/Sentry firing systems & IBM PC software. NationWide Talk Radio, PO Box 68088. 503-774-0459.

SMC 350RS Carousels (3) in gd cond, \$650. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Conex 25 Hz tone generator, \$200/BO. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

MW Persons 25 Hz stereo decoder, like new, \$250. P Wolf, WKZY, 329 S Main St, Labelle FL 33907. 813-574-5548.

Conex CG-25 25 Hz encoder. P Wolf, WKZY, 329 S Main St, Labelle FL 33907. 813-574-5548.

Otari ARS-1000 (2) w/tone sensors mounted in McCurdy 2077 equip rack, excel cond, \$2000 w/manuals. J Cunningham Jr, KNOX, 720 Front St, Natchitoches LA 71457. 318-352-9596.

SMC w/3060 60-event programmer, AS-10 switcher, programmable digital clock, RSC-100 random selector for Carousel, (1) 350 Series Carousel, LA-246 AGC amp, 2 ARS-1000 half trk stereo R-R reproducers, inside 2 rolling racks, \$4000/BO, you pick up. R Miller, WRVI, 815 West Dean, Virden IL 62690. 217-965-3388.

MW Persons Prgmr like new w/manuals & cables, sets up w/any reel decks, \$700. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Want to Buy

CD Juke Box, multiple CD players, J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811.

CAMERAS (VIDEO)

Want to Sell

Norelco PC-70 (2), 3-tube Plumbicon studio camera systems w/10:1 zoom lens, cables, racks & spares, \$500/both. J Krepol, RNDL, 7 Dustin Dr, Claymont DE 19703. 302-798-4076.

Hitachi FP 15 color camera (2), 3-tube Saticon, 1.5" & 4.5" VFs, rear servo zoom & manual focus, remote control unit w/camera cable, external pwr supply, case, manual & extenders, 10:1 Hitachi lens, \$4000 + shipping. JVC KY1900 3-tube Saticon, pwr supply, 10:1 Tamron lens, case, \$500 + shipping. D Hurd, Harding U, 805 Park St, Searcy AR 72143. 501-279-4658.

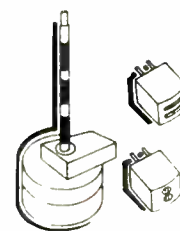
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Broadcast Museum wants Ampex, Norelco, GE, Marconi, Harris, Visual & Dumont, H Henson, American Brdct Museum, 4549 Havensrest Rd, Winston-Salem NC 27106. 919-924-0621.

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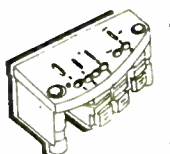
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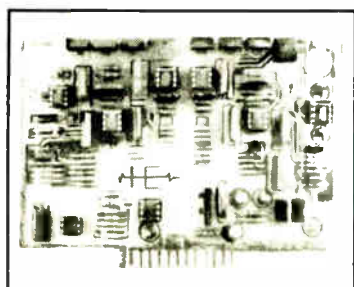


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Audi-Cord DL series stereo cart R/P, \$700; Audi-Cord E series stereo PB, \$500; BE 3-stack stereo PB, \$800; all equip in service. M Huffman, KYRX-FM, Cape Girardeau MO. 800-455-9105.

SMC T90 R/P, \$200; Telex Magnecord R/P, \$250; (2) Revox B77, need some knobs, \$250 ea/\$450 both. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

SMC 510 mono (3), very gd cond w/manuals, \$150/ea. J Cunningham, KNOX, 720 Front St, Natchitoches LA 71457. 318-352-9596.

ITC premium triple deck (mono), one w/mono record amp, excel cond. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

SMC 721 dual PB rack mount, \$350. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Pacific Recorders Micromax (2) stereo (NAB) w/all options w/rack mount kit, \$2000. Henry Engr, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

ITC mono record/PB deck, \$350. T Wetzal, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Audi-Cord A31SR mono cart PB (2), excel cond, \$150/ea. J Cunningham, KNOX, 720 Front St, Natchitoches LA 71457. 318-352-9596.

ITC RP stereo w/3 tones, new hds, perfect cond w/rack mount, \$1200. Henry Engr, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Want to Buy

Good working stereo PB decks, prefer triple, w/all tones, consider trade for advertised surplus equip. T Wetzal, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

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Otari ARS 1000 DC R-R, 2-chnl reproducer, 1/4" 1/2-trk w/25 Hz tone sensor & cuttone relays w/adjustable delay, excel cond, \$1700 ea. R Chambers, 916-257-2121.

Ampex AG-440C stereo (2), PB only, excel cond, \$1500 ea. D Swatman, WMGF/WPRD, 2001 N Mercy Dr, Orlando FL 32808. 407-298-5510.

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Studer/Revox HS77 Mk IV FT mono, 10 hrs use, as new, \$875/BO/trade; portable case for A77 w/mon spkrs & pwr amps, excel cond, \$375. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Revox C-278 current 1/2" 8-trk, vry lw hrs, excel cond, w/manual & parallel adapter, \$3500. J Rose, Digital Attic, 20 Marion St, Brookline MA 02146. 617-277-0041.

Ampex AG440 1" 8-trk rcrdr, 10 hrs on relapped heads, excel cond, \$3000; Fostex 4030/4035 synchronizer system, version 3.2 software, w/manuals & cables, \$900; Fostex 4010 SMPTE reader/generator, excel cond, \$425. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Magnecord 1021 7" R/P reel deck, \$75. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

ITC 850 FT, 3.75/7.5, split gate, works well, \$500; Ampex 602 FT, 7.5, gd cond, \$200. D Ibel, Valley Sound, RR 1, Spencer IA 51031. 712-262-6231.

Ampex ATR 700 R-R; (2) Correctone R-R; Revox R-R, KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Revox A-77 1/4-trk in walnut case, excel cond, original wired remote control incl, \$600. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

750 PB only, reel deck & 1 new Otari ARS-1000, \$500. C Springer, KSEC, PO Box 890, Lamar CO 81052. 719-336-2206.

Studer Revox PR99 MK 2 like new, few hrs, w/roll-around pedestal & stereo cue amp-speakers built-in, \$1995/BO. D Bisbee, 685 S Roys Ave, Columbus OH 43204. 614-279-6163.

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Ampex AG-440B 8-trk in roll around console, gd cond, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Magnecord 1021 (2), mono, \$75/BO. T Wetzal, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Tascam 32 remote control, like new, controls 22 & 32 reel decks, \$50. P Wolf, WSEB, 241 NE 10th Ave, Cape Coral FL 33904. 813-574-5548.

Telex 235 cassette duplicator, \$500. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

TEAC 3340 gd cond, 4-trk, 10 1/2" reels, recently srvcd, \$450. S Hahn, Precipice Prod, 103 E 2nd St, Tucson AZ 85705. 602-882-7154.

Tascam 122 (8) 2-spd rackmount cassette decks, all need some tweaking, \$125 ea or \$800 for all, FOB Austin. J Block, Prod Block, 906 E 5th, Austin TX 78702. 512-472-8975.

Scully 284B-8 8 trk 1" deck, 3/4 to 30 ips, console mdl w/V5-76 variable spd module, manuals. T Sherry, Recording Consultants, 1412 Clarita Ave, San Jose CA 95130, \$4000. 408-244-3848.

Pioneer RT-909 4-trk stereo, 10 1/2" reels, mint cond, low hrs, \$450. S Hahn, Precipice Prod, 103 E 2nd St, Tucson AZ 85705. 602-882-7154.

Ampex 3000/Protracs 1/4" duplicating system, mint cond, \$5900/BO. J Quinn, The Mix Place, 663 5th Ave, NY NY 10022. 212-759-8311.

Viking 88 working, gd cond, \$200. B Lee, WEEI, 25 Mystic St, Boston MA 02129. 617-242-4184.

Otari ARS-1000 deck, stereo, \$1000. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Scully 280B 1/4" 4 trk w/Ruslang cabinet & remote, needs minor transport elec repair, \$300 + s/h. Ken, Rainbow Music, 614-877-0585.

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Otari 5050 MX stereo R-R, excel cond, new heads, tilt back brackets, \$1200. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

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Want to Buy

Ampex 300 8-trk recorder. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Ampex 351 for parts. D Ibel, Valley Sound, RR 1, Spencer IA 51031. 712-262-6231.

Tapesonic for parts. J Garvey, Radio Yesterday, Box C, Sandy Hook CT 06482. 203-744-2476.

Craig 2405 schematics to make repairs, will pay postage. J Benjamin, 3923 E Thunder Bird Rd, Box 139 Ste 26, Phoenix AZ 85032.

Old multi-chnl R-R decks, mixing consoles, mics, pwr amps. S LeRoy Sailors. 308-882-4696.

MCI/Sony capstan & reel motors, any cond., recdg heads, most migs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

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

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

CD's

Want to Sell

Denon 950FA working when removed from svc, \$700/BO. R Rogers, KSKG, 1217 S Santa Fe, Salina KS 67401. 913-825-4631.

COMPUTERS

Want to Sell

Extel 15 cps news printer, BO. F Anderson, 3801 5 Ave S, Great Falls MT 59405. 406-452-2810.

CONSOLES

Want to Sell

Radio Systems R-S18, mint/new cond, used in studio only, \$5500/BO. E Delahunt, KPRM, Hwy 34 E, Park Rapid MN 56470. 218-732-3306.

Mono console, 4-chnl, w/pwr supply. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Hellos 24/16/24, classic British circ 70s, many updates/models, w/documentation, discrete mic preamps, (9) sep pieces, w/wood rack cab, mahogany desk, \$9500/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Fender 4208 8-chnl mixer, phantom pwr, (2) mon sends/chnl, effects bus, 9-band EQ on ea chnl, excel cond. c/n sound, custom travel case avail, \$850. D Deuth, Audio Prod, 1801 Commerce Blvd, Mound MN 55364. 612-472-1619.

Custom 16 x 16 vacuum tube recording console, w/newistors, Westrex line amps, Pultec Type EQ, up & running, \$5000/BO. W Sear, Sear Sound, 353 W 48 St, NY NY 10036. 212-582-5360.

CCA-QRK Futura 6 stereo, gd cond, slide pots, \$300 + shipping. G Erway, KRRU, 6208 Momouth Ave, Goleta CA 93117.

Gates MO3388 4-chnl mixer console, as-is, \$300. K Hill, WONG, POB 1151, Madison MS 39110. 859-8218.

Harris Stereo 80 (2), now in service, \$1000 ea. M Huffman, KYRX-FM, Cape Girardeau MO. 800-455-9105.

Roland CompuEditor automated fader pkg, SMPTE based w/15 long throw ALPS faders & 15 chnls of voltage controlled gain elements, (2) avail, 30 chnls, \$900. R Seifried, Eclair Engrg Svcs, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Tascam M-520 20 x 8 x 2, w/pedestal, pwr supply & on air light/speaker muting system, low hrs, \$3200 + s/h. Ken, Rainbow Music, 614-877-0585.

Wheatstone A-500 like new, 11 input modules, 2 mic modules, \$8000. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myer FL 33931. 813-574-5548.

Spotmaster 838-0820 (2) 8 chnl stereo, bdct VU meter, \$1000. A Walker, KBAK, 40 1312 S.W. Croix, Topeka KS 66611. 913-266-5273.

Altec 10 chnl mixing board, \$300. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Kuston PX200 8 chnl mixing board, pwr in mains & monsters, 2 graphics in board, \$300. S Russell, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Tascam 32, like new, little use, \$1100. P Wolf, WSEB, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

BE 4 chnl mono, like new, clean, \$850. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Ward Beck M2484A 8-track, looks good, pots & switches need cleaning, 16 in/8 out/2 out st, \$7000. P Vandegrift, KING, 333 Dexter Ave N, Seattle WA 98019. 206-448-3435.

Continental 212R-1 10-ch, dual stereo air, excel cond, \$2800. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

Auditronics 110-A Grandson 4 mono & 4 stereo inputs 2/4-ch output, \$1100. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

Sony MX16 8 chnl, works fine, \$250. P Wolf, WSEB, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

Howe Series 9000 10 chnl, light use, 2 yrs old, \$5000. P Wolf, WCKT, 4048 Evans, Fort Myers FL 33907. 813-574-5548.

McMartin B-502 stereo 5 chnl in excel cond. Goodrich Enterprises, 11435 Manderson St, Omaha NE 68164. 402-493-1886 FAX 402-493-6821.

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Want to Buy

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CONSOLES . . . WTB

Used control board for production room of 5000 W station, slide/rotary dial. R Lightsey, KPBA AM, Pine Bluff AR. 501-536-0052.

Sparta Centurion II not working OK & manual. B Rathman, KRVM, 1574 Coburg Rd Ste 237, Eugene OR 97401. 503-687-3370.

Good working stereo w/current parts avail & support, consider trade for advertised surplus equip. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Gates Studioette or Yard I dead/part-gutted, need chassis & meters, prefer chassis w/out drilled holes, other brands considered, pickup w/in 150 miles & good price. F Vobbe, WLIO, 1424 Rice Ave, Lima OH 45805. 419-228-8835.

Sunn Coliseum 8 chnl. S Russell, 60410 Kleff Dr, Decatur MI 49045. 616-782-9258.

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

DISCO & SOUND EQUIPMENT

Want to Sell

Bullfrog 3-way stage monitors, pair, parallel jacks, hi freq control, excel cond, \$450/pair; Sunn SA-21 pwr amp, 300 W/chnl or 600 W bridged mono, floor display, rack mount, like new, \$395. D Deuth, Audio Prod, 1801 Commerce Blvd, Mound MN 55364. 612-472-1619.

dbx NX-40 (2), tape NR encoder/decoder, \$100 ea. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

EMT 140ST stereo tube plate reverb, \$3000; Eventide H3000, \$1700; Lexicon 200 digital reverb, \$1700; Orban 536A de-esser, \$200; Rane GE14 stereo graphic EQ, \$185; Eventide Instant Phasor, \$150; (2) KEPEX gates (modules), \$175/both. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Altec N-501-8A 2-way crossover network (2), in orig boxes, new, \$70/pair. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Snake 16 phantom-pwr inputs w/ext pwr sup, 250' Belden 19-pair cable w/mil connectors & stainless-steel strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, excel cond, \$750/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

AAL Super Jock spkrs; Peavey stereo booster amp, 130 W/chnl; Alus SM502 DJ mixer, new; BO, D Miller, KOOL, 1340 Richmond Rd, Detroit Lakes MN 56501. 218-847-5624.

Emulator II+ sampling keyboard. (2) disk drives, reads & writes SMPTE, built-in sequencer, w/sm library of sounds, used in studio only, vgc, \$900 + shipping. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

Community Long Throw mid-range cabinet (4) & (4) horns which take 1" drivers, all empty, \$600 all/trade for processing gear. B Wilson, 212 Southside Ave, C-ville KY 42718. 502-789-1505.

Master Room X2-121 reverb & Kenwood Basic C-2 stereo preamp, \$100 ea/BO; Ashley SC-88 4-way stereo crossover, \$300. B Wilson, 212 Southside Ave, C-ville KY 42718. 502-789-1505.

Orban 111B spring reverb w/limiter & parametric EQ, \$75. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

Altec 100A 92S9 dual TT port DJ setup, can run tape thru to amp, excel cond, \$800. A Walker, KBAK, 40 1312 S.W. Croix, Topeka KS 66611. 913-266-5273.

Klipsch La Scala spkrs, horns in road cases, will run 300 W/chnl, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Want to Buy

dbx 500 owner's and/or svc manual. J Butler, Motorola, 2 Phillippi Creek Dr, Elgin IL 60120. 708-576-5962.

Eventide H969 Harmonizer. S Russell, 60410 Kleff Dr, Decatur MI 49045. 616-782-9258.

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dbx 164 stereo over easy compressor/limiter w/LED meters, \$200. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

Audio Design Transdynamic stereo limiter, new, w/user & service manual, \$500. M Shea, Precision, POB 723, NY NY 10276. 212-989-2684.

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

Gates Solid Statesman (2), just removed from service, excel cond; also, BL-40 Modulimiter; BO, E Delahunt, KPRM, Hwy 34 E, Park Rapid MN 56470. 218-732-3306.

Harris ME1 modulation enhancer, \$100; Harris MSP90 AM tri-band AGC, \$600; Inovocines 230 AM multi-band processor, \$300. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

Aphex Dominator II stereo multiband peak, new w/manual, \$750/BO. D Kronquist, D&D Prods, 7028 W 70th Ave, Arrada CO 80003. 303-425-6851.

Orban 9000A Optimod AM stereo compatible. NationWide Talk Radio, PO Box 68088, 503-774-0459.

Want to Buy

Aphex Aural Exciter & studio Dominator. R Sweatte, KUBE/CIRP, 120 Lakeside Ave # 310, Seattle WA 98122. 206-322-1622.

Good unit, any proven make, will pay cash. D Magnum, WBOG-FM, 608-372-9600.

Orban 8100/8100-A/8000, fair-gd cond, will pay cash & UPS/insurance. F Vobbe, WLIO-TV, 1424 Rice Ave, Lima OH 45805. 419-228-8835.

Orban Optimod 8100A w/6-way EQ, gd to excel cond, needed yesterday. N Chavigny, 713-527-0034.

UREI/Teletronics LA-2As/LA-3As compressor/limiters. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Optimod 8100A will pay top dollar for gd cond. M Osborne, WKSQ, PO Box 9494, Ellsworth ME 04605. 207-667-7573.

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

MICROPHONES

Want to Sell

Electronic table mic. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Telefunken/Schoeps CM-61 tube mic, very rare, uses std 6AU6 plug-in tube, w/o cables/pwr supply, mint cond, \$975/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Sennheiser MKE-2002 stereo/binaural mdl w/dummy head, \$200. Henry Engrg, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

WE 633A (2) in gd cond, 1 in fair cond, \$200/both. R Habegger, WAWZ, Weston Canal Rd, Zarephath NJ 08890.

RCA 77 vintage ribbon mic in gd cond, BO. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Mics; desk mics (hi2), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer prin/sec. Mr. Oliver, 212-874-7660.

Want to Buy

RCA, Neumann, WE & all other vintage mics; also, parts, flags & stands. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

RCA 77DXs/44BXs ribbon mics, chrome/TV grey. R Kaufman, Pams Prods, PO Box 462247, Garland TX 75046. 214-271-7625.

Telefunken/Schoeps CM-61 tube mic pwr supply & cable, AKG C24. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Classic mic for display purposes, reasonable price, not a dealer. D Koehn, Central Sales, 609 S 15th, Quincy IL 62301. 217-228-2115.

AKG 451 preamp CK2 omni capsules (2); CE2 omni capsule for AKG SE5 preamp. N Pearsall, Synergy Sound, POB 832, Chima-cum WA 98325. 206-732-4198.

MISCELLANEOUS

Want to Sell

Gorman/Redlich CEB EBS encoder/decoder, looks bad but works, \$195 + freight & COD. R Krob, KMUS, 1513 Carey, Cheyenne WY 82001. 307-484-2704.

Phone couplers, pair, \$25; light modulator w/dimmer, #LM3300 (3 x 1000 W); Conalert II; VSWR Watchdog, KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Triad AC isolation xformers, 120 V I/O, 7A unit, \$70; 0.5A unit, \$15. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Gentner FBTRB prewire bay (8), \$195 ea; Gentner GEC-FB-100 Flexiblock (50), SIE-MF2250, \$8 ea; Gentner GEC-50DR pre-wired patch bay, 52DR w/TRS jacks #8 & approx 15' wire, \$90. B Lord, Lord Brdcstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Orban ACC11 1-3/4" security cover (6), \$15 ea. B Lord, Lord Brdcstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Rolling 19" cabinets (2), \$300. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Remote studio Marti xmtr, ant, standby generator, 5 chnl mixing board, wireless mic, FM/AM rcvr, large tinted window in back to see jock, custom flashing lights, intercom, ready to bdc, \$5000. R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

Rotron Blowers for Elcom, CCA, CSI, McMartin, Harris, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St., Omaha, NE 68164 402 493 1886 FAX 402 493 6821

Equip racks 6' (3) very gd cond, \$100/ea. T Wetzel, KEXO, Box 2450, Grand Junction CO 81502. 303-243-1230.

Want to Buy

ETA/Lepicon lighting equip; also, par cans & spots. B Wilson, 212 Southside Ave, C-ville KY 42718. 502-789-1505.

Vintage bdcst equip, TV studio cameras, literature, 16" transcriptions, theater amps & spkrs, blank recording discs. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

Full production facility needed in very near future, of recent vintage, must be vgc to excel cond. N Chavigny, 713-527-0034.

Jazz record collections, 10" LP/12" LP bebop, swing, dixie, highest prices paid. B Rose, Program Recds, 228 East 10th, NNYNY 10003. 212-674-3060.

MONITORS

Want to Sell

TFT 713 AM mod & freq mon, \$400. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

Belar FMM-2/FMS-2 mono & stereo mod RFA-1, amp clean, \$1800/all 3. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

FM mod monitor package for mono, stereo * SCA, used, tuned & calibrated to your freq & guaranteed, all or part. Goodrich Enterprises, 11435 Manderson St, Omaha NE 68164. 402-493-1886 FAX 402-493-6821.

Want to Buy

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

MOVIE PROD EQUIP

Want to Sell

Bolex MST motor for 16mm movie cameras, 24 fps, excel cond, \$175; Bolex sound Barney/blimp for 16mm movie cameras, 2-piece for use with/without 400' magazines, like new, \$225; B&H 2580 16mm sound proj, late model, excel cond, \$200; Eiki RT-0 16mm sound proj, excel cond, \$100; Siemens 2000 pro interlock (dbl board) optical/magnetic 16mm editing proj, vgc, \$350. G Ormrod, GFO Prod, 432 X St E, Tumwater WA 98501. 206-352-8028.

RECEIVERS & TRANSCEIVERS

Want to Sell

Magnum/Dynalab FT-101 rack-mounted FM tuner, 4 yrs old, factory refurbished, 67/92 kHz SCS outputs, selected from front panel, like-new cond, made in Canada, \$475 + \$11 shipping; Gran Prix TVP-5 5" B&W TV w/FM-AM radio, AC-DC, modified w/TV-SAP & FM-SCS adapter, tunable to 67/92 kHz SCS & TV-SAP & Pro chnl, \$124 incl shipping. B Eving, FM Atlas Publishing, 241 Anderson Rd, Esko MN 55733. 218-879-7676.

AM STEREO RECEIVERS Portable, Home/Studio, Auto RRADCO GROUP 708-513-1386

SCA decoder, high quality micro-miniature 67/92 kHz, prewired & ready to install, \$15. D Jackway, Backgrnd Music Eng, 5742 Fair-roak, Springfield MO 65810. 417-881-1846.

Maxon CP-0510 VHF port, 5 W, 4 chnl, 144-174 MHz, 2 batteries, charger, manual, leather swivel case, \$150/BO. C Stahnke, 1951 N Meridian Rd #84, Tallahassee FL 32303. 904-385-0718.

Fisher 800-C tuner, working & gd cond, \$300. B Lee, WEEI, 25 Mystic St, Boston MA 02129. 617-242-4184.

Sony SRF-A1 AM stereo, FM stereo walk-mans, new, quantities avail, \$100. C Fox, WOLF, 4653 Manor Hill Dr, Syracuse NY 13215. 315-468-0908.

REMOTE & MICROWAVE EQUIP

Want to Sell

Andrew solid 6' dish, 2 GHz feedhorn & mount bracket, \$900/BO. A Bowab, WDLT, 2402 Wolf Ridge, Mobile AL 36618. 205-344-3698.

COMREX RENTALS

1, 2 and 3-Line Systems Call Steve Kirsch for details Silver Lake Audio (516) 623-6114

Marti RMC-20, cosmetically lacking, functionally perfect, w/(4) RY5T relay panels & all manuals, \$500. S Schweiger, WXLO FM/AM, 146 Worcester Ctr, Worcester MA 01608. 508-752-1045.

TFT 7601 CR, just factory checked OK, w/manuals, \$1600. M Blakemore, WCVF-FM, Box 280, Murphy NC 28906. 704-837-2218.

TFT 7700B composite 2 wks use, works good, \$5000. P Wolf, WCKT, 4048 Evans, Ft Myers FL 33907. 813-574-5548.

Burk TC-8 new 8-chnl R/C set-up for telephone line, \$1300. J Salov, WHGR/WUPS, 3431 W Houghton Lk Dr, Houghton Lake MI 48629. 517-740-1165.

Burk TC 8 new, in orig boxes w/all manuals, \$1200/BO. D Durden, WWSF, 38 Miracle Stop Pkwy, Ft Walton FL 32548. 904-664-2400.

Marti 406-512 MHz single section cavity, never used, \$100. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Scientific Atlantic 7300/7325 wideband BPSK rcvr; digital proc unit; 15/7.5 kHz dual audio decoders; ABC/CBS/NBC/Transtar w/dish & some cable, \$6500. R Williamson, KWEI, PO Box 791, Weiser ID 83672. 208-549-2241.

Regency Transcom 0-15 W, mobile, traffic rpts, etc, 450 MHz band w/mic, dual freq, \$200. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers FL 33931. 813-574-5548.

Moseley PCL 303 2 sets; (2) ACL303 xmtr and rcvr sets on 947.5/945.5 MHz, \$2850. D Dodd, KKTX, 107 W 9th St, Mtn Home AR 72653. 501-425-5100.

Want to Buy

Any STLs. K Thompson, WWIC, 815 W Willow, Scottsboro AL 36768. 205-574-2198.

Marti UHF & VHF remote equip, used. K Thompson, WWIC, 815 W Willow, Scottsboro AL 36768. 205-574-2198.

Marti 26 MHz xmtr & receiver w/manuals, will consider 152/161 MHz w/right price. F Vobbe, WLIO-TV, 1424 Rice Ave, Lima OH 45805. 419-228-8835.

Marti 8/10 STL stereo package, will pay cash. D Magnum, WBOG-FM, 608-372-9600.

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

DJ, 18 yrs exper, seeks adult contemporary, will also consider country/oldies. Mike, 904-255-6950.

College grad w/major in audio prod/mass comm, 4 yrs internship/college radio exper. Tina, 508-745-1120.

Broadcast grad w/some on-air & prod exper seeks work anywhere in US, any format, FT only. Charles, 912-567-4715.

For sale: late model morning team, lw mileage, runs strong, AOR/CHR/CHR, serious inq only. Jeff, 813-624-2922.

Finally an antidote for Rush! Intuitive talk show host w/keen mind & quick wit will travel anywhere, exper in all size markets. 216-677-9113.

Blues/jazz radio DJ, producer, in-depth knowledge plus music library, PT OK, San Francisco/N Bay areas. 707-528-4055.

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20+ yrs experience extremely knowledgeable on oldies music, seeking air shift, music director & program director. D Evans. 818-905-9388.

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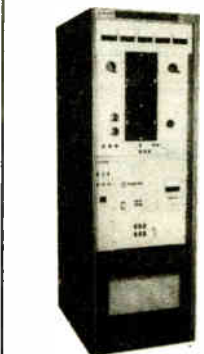
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414-482-2638

Adler manuals for UHF TV xlator UST-10/20 10 & 20 W, good copy OK. J Powley, WILM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

CCA FM-10DS exciter manual. P Anderson, 208-234-1290.

Jones/Tepeco single/dual 10 W translator. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811.

Collins 5 kW-AM 820/830 E1 w/tuning house; Collins 10 kW-FM 831G; Harris 5H 5 kW-FM 3 phase w/MX15 exciter; Harris HT-5 single phase 5 kW-FM w/THE-1 exciter. ALIUS, POB 661447, Miami Springs, FL 33166. FAX in Guatemala 502-2-352045.

Acrodyne 25 W, donation/small price. R St. John, Robert St. John Productions, 7123 I-30 #31, Little Rock AR 72209. 501-562-7829.

Harris 25 kW FM late mdl. M Garity, WYUU, 9421 Exec Center Dr • 200, St Pete FL 33702. 813-579-1925.

GE UHF TV TT-57, 58, 59, 62, any cond for parts; also new/used parts for GE UHF TV xmtrs, will handle removal. J Powley, WILM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

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61 YEARS AGO

Reprinted from **Radio World** January 1931. Editor's note: The **RW** of old, printed for a time in the 1920s and 1930s and today's **RW** are unrelated except in name.

400 KW PERMIT IS GRANTED TO WESTINGHOUSE

Pittsburgh. The Federal Radio Commission has licensed the highest power radio transmitter of the United States, if not of the world. This experimental transmitter, W8XAR, at Saxonburg, Pa., may use 400,000 watts, eight times the prevailing maximum. This station will operate on 980 kilocycles, the operative frequency assigned to KDKA, but the high power will only be used between the hours of 1 a.m. and 6 a.m.

The application for permission to use this high power was filed by with the Federal Radio Commission by H. P. Davis, vice-president of the Westinghouse Company, who has charge of radio transmitting development.

The purpose of this high power is determine its effect on reception throughout the country. To make this test the Westinghouse Company shortly will station engineers at listening posts at selected points. These men will make the necessary technical observations, recording the effect of the increased power, noting how it blankets the prevalent static, the fading, etc. The station will be located about 30 miles from Pittsburgh.

SNAG STRUCK ON EQUALIZATION

Washington. The Federal Radio Commission has been deliberating several plans with a view to attempting to redistribute the broadcasting facilities of the nation in accordance with the provisions of the Davis Equalization Act, which is an amendment to the Radio Law.

The Commission has finally decided that it will have to shelve the whole matter temporarily, as the plans now before it are incapable of application.

The original plans prepared by Chairman Charles McK. Saltzman and Commissioners W. D. L. Starbuck, Ira E. Robinson, are among the ones that were under consideration. The Robinson plan was later amended at the suggestion of Commissioner Sykes. It provided for a gradual increase of the facilities of under-quota States with a corresponding decrease of the facilities of the over-quota States. In all there were four separate proposals before the Commission.

Approximately one-half the States have more than their proportional share of broadcasting facilities. The law provides that there shall be an equal distribution of facilities among the five radio zones into which the nation is divided, and that there shall be an equitable distribution among the States, within each zone, according to population.

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This listing is provided solely for the convenience of our readers. Radio World assumes no liability for inaccuracy.

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