

Radio World®

NAB Closes NRSC Meetings



NAB has drawn the blinds on future NRSC meetings.

FCC, FAA Sit Down To Solve Differences

By Alan Carter

Washington DC The FCC and the Federal Aviation Administration (FAA) are at the bargaining table to try to settle their differences over who has the final word regulating broadcast tower interference near airports.

While the two agencies have been sparring over the effects of broadcast transmission interference to aviation radio receivers for several years, tower applications have been denied and delayed.

Broadcasters have also, in some cases, had the added expense of submitting applications for alternative sites—if they are available.

An interagency meeting 5 December set the stage for substantive talks, according to William Hassinger, Mass Media Bureau assistant chief for engineering. Additional meetings were planned.

Short term vs. long term

While a long-term solution will most likely require extensive negotiations, Hassinger said the FCC will recommend an interim approach to accommodate broadcast applications. He declined to reveal the specifics.

FAA Systems Maintenance Service Director Peter Kochis said the two agencies have made a commitment to settle the differences. "If we don't do it, it's going to get settled at higher levels and may not come out to anyone's satisfaction," he said.

Hassinger said the main difference between the FCC and FAA is the perception of seriousness of the interference problem and how to remedy it. "We think the FAA feels it is more serious than we do," he said.

From the FCC point of view, the inter-

ference is not the fault of broadcast transmitters but caused by aircraft receiver inadequacies. Commercial aircrafts have not reported problems, only general aviation crafts, Hassinger said.

"We're not coming at this as novices," Hassinger said. "We do have people (on staff) who are pilots."

One point of contention is the FAA computer program for judging interference (continued on page 8)

Executive Committee Votes To Bar Press After Four Years

By Judith Gross

Washington DC After a four-year policy permitting and at times encouraging reporters' presence at National Radio Systems Committee meetings, the NAB Executive Committee has voted to close all NRSC meetings to the press.

The decision comes on the heels of an attempt to prevent tape recording of the NRSC's most recent composite working group meeting.

The composite group met in the midst of controversy surrounding its acceptance of a paper critical of composite clipping. One firm, Modulation Sciences

Inc., is still contemplating legal recourse as a result of the committee's actions.

After protest by RW, the tape recording was allowed to resume at the composite working group meeting.

Lumped with other committees

In a letter to RW the NAB legal department stated that the decision to close the meetings was a reaffirmation of NAB policy which restricts press presence at meetings of NAB committees "convened solely or partly under NAB auspices."

Unlike other NAB committees the NRSC is jointly convened by the NAB and Electronic Industries Association.

NAB Radio Board Chairman William Sanders called the sudden decision to close the meetings "a somewhat overdue housekeeping chore." He said the policy of not allowing press was a "long-

(continued on page 3)

MD Class A Wins Big

By Charles Taylor

Salisbury MD J.P. Connor is one broadcaster who can tell you how important it is to keep an eye on FCC policy.

When he decided in 1986 to apply for the license of a new channel the FCC created under docket 80-90—which

opened approximately 700 new FMs nationwide—Connor anticipated serving the market as a Class A station at 3 kW.

But when he powered up for the first time last month, it was at 6 kW that Connor was able to project the airwaves of his WSBY-FM here in the Salisbury-Ocean City, MD, market.

Luck, timing and prompt action

The station's increased wattage came as a result of luck, timing and prompt action on the Commission's recent Class A upgrade, which selectively allowed about 500 low power FMs to hike their power from 3 kW to 6 kW.

As a result, Connor's FM is one of the first stations in the nation to benefit from the power upgrade, a fact whose origins are so irony-laden that the station operator still is shaking his head.

"This business is usually one of timing where the timing is off. This was just a stroke of luck," Connor said.

The tale has its beginnings three years ago when Connor, VP of the family-operated Connor Broadcasting, decided to expand its radio holdings. J.P.'s father, J. Parker, in 1974, had put on the air the first FM stereo station in the market, WWTR.

Buying and selling

In 1980 he sold WWTR, after having purchased WJDY-AM in Salisbury, in 1978. A 5000 W urban contemporary outlet, WJDY is today consistently top 10 in market ratings ("not one of those awful AM stories you hear so much of," Connor said).

When docket 80-90 opened a channel at 98.9 in 1986, Connor Broadcasting bid (continued on page 10)

Q.

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NEWS BRIEFS

US Delegation in Cuba

Havana CUBA The jamming of US AM radio stations was one of the subjects a delegation of US government officials, broadcasters and selected academics were discussing with the Cuban government during a trip here 18-21 December.

Rep. Al Swift (D-WA) headed the group trip to Cuba, which was based on a recent invitation by the Fidel Castro government. The visit was organized by the

House Energy and Commerce Committee.

Although the group could freely discuss proposals to remedy interference and take proposals back to Washington, the delegation had no negotiating power to enter into official agreements.

Subjects to be discussed included Radio Marti (broadcasting since 1985) and TV Marti (not yet broadcasting), which are US government-operated stations that can beam US news

and information to the communist island country.

Radio Marti has led to Cuba's retaliatory jamming of American stations, according to the US government.

Many broadcasting insiders believe the timing of the trip couldn't be better because of the recent congressional go-ahead to begin broadcasting TV Marti this year, a move that US government officials believe will bring about more retaliatory action by the Cuban government.

Other issues also to be discussed included prospects for a new regional broadcasting accord and interpretations of existing regulations governing cross-national broadcasting.

WGMS-AM Granted Tower Site

Germantown MD WGMS-AM was granted permission to build a new AM tower farm by the board of zoning here, despite opposition from citizens who did not welcome such a structure in their community.

Construction of four antennas is expected to begin pending an appeal deadline 31 December and appropriate weather to build, according to John VerStandig, president of VerStandig Broadcasting, which owns the classical WGMS-AM and FM.

The relocation of the station's antennas became an item of interest when VerStandig earned

an estimated \$14 million after selling to a real estate developer the 51-acre plot of land on which the AM's transmitter and antennas had been located in Potomac, MD.

Commercial Classical Back in LA

Three months after Los Angeles' KFAC switched from a classical music format to contemporary hits, leaving the nation's top market with no venue for commercial Mozart, another station in the market has come to the rescue of classical music fans.

KKGO announced that as of 1 January, it will begin broadcasting a classical commercial format 24 hours a day. The station's previous jazz format will move to KKJZ-AM 540 in stereo.

The city commanded the station at a ceremony in the City Council chambers at City Hall in December.

Deal Forms Radio Non-Network Megagroup

A deal valued at more than \$700 million has made merged Legacy Broadcasting, Metropolitan Broadcasting and Group W Radio, making the group the nation's largest non-network owned radio group.

The agreement includes Metropolitan and Legacy stations WNEW-FM in New York; KTWW-FM in Los Angeles; WMMR-FM in Philadelphia; WCPT-AM/WCXR-FM in Washington; WLZ-FM in Detroit; and KILT-AM and FM in Houston.

Group W stations are WBZ-AM in Boston; KYW-AM in Philadelphia; KDKA-AM in Pittsburgh; WINS-AM in New York; KFBK-AM and KAER-FM in Sacramento; KFWB-AM in Los Angeles; KQZY-FM in Dallas; KQXT-FM in San Antonio; KMEO-AM and FM in Phoenix; and WMAQ-AM in Chicago.

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NRSC Meetings Closed To Press

(continued from page 1)
standing one."

In the four years the NRSC has been meeting since its reactivation, however, the policy has not been stated in notices announcing meetings of the NRSC and its subgroups nor verbally announced to the press.

In a December meeting of an NRSC subgroup, NAB attorney Valerie Schulte said the policy of not allowing press at meetings was a "long standing, unwritten one."

NAB VP of Communications Walter Wurfel, when asked why press had not been previously informed of the policy either in writing or verbally, said "It had not come to my attention; I did not notice that (press) was going to the meetings."

Eyewitness press reports of NRSC meetings have appeared over the years in RW, on prominent pages, however.

Sensitive areas

Despite assurances that the closed-door policy is merely a reaffirmation of earlier NAB unwritten policy, both Wurfel and Sanders mentioned the legal threat surrounding the composite working group in commenting on the decision.

"As we're getting more and more into sensitive areas, we become more aware of what the committees are doing," noted Sanders. He added that "with threatened lawsuits of various commit-

tees and so forth, we felt we needed to protect ourselves."

The decision also stated that participants to NRSC meetings "can engage best in full and robust debate when they are free from the inhibition of potentially being quoted in the media."

That viewpoint has been expressed in the past by EIA, which, although it had no members present at the time of the Executive Committee's decision, was consulted on the decision, according to Sanders.

NRSC participants, including the committee chairman, had not been informed of the decision however, until contacted by RW. Wurfel noted that "the association (NAB) makes policies that are not put to a vote by participants."

Several previous NRSC participants who declined to be named said they would need to reexamine their company's policy of continued involvement in light of possible anti-trust implications of conducting the meetings behind closed doors.

Wurfel and Sanders both maintained that there are "clear and studied opinions from our lawyers that no anti-trust issues have been violated."

Press' role acknowledged

NAB staff as well as NRSC participants each acknowledged the beneficial role the trade press has played in enlightening the industry and helping generate

support for the NRSC AM standard.

"It's been my feeling that in the past the press has really helped out as far as getting the word out to engineers and

"I wouldn't argue that press coverage has been helpful," Wurfel said. "But the press is still free to talk to members after the meetings and report on them."



NRSC: They don't want us at the party.

stations," noted John Marino of NewCity Communications, chairman of the AM technical subgroup.

Glynn Walden of Group W noted that reporters covering the meetings "had done a tremendous job on NRSC, and I hope they will continue to disseminate information."

"I agree that press coverage has helped the process and I have every hope this will continue," said Michael Rau, NAB VP of Science & Technology. "We will do everything possible to maintain the lines of communication with the press."

For more information, contact NAB at 202-429-5350.

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Where Service and Engineering Make the Difference

Left Out in the Cold For 1990

by Judith Gross

Falls Church VA Let me be one of the last to wish you a terrific New Year. The '90s are here: are you ready for them?

Well, it finally happened.

After more than four years of covering National Radio Systems Committee meetings, telling ya all about the NRSC standard and how it was going to help AM compete in a high tech world and watching well-meaning participants fumble their way through the start of FM issues—we've been shut out.



That's right. I guess the lawyers had their way. The NAB has closed all NRSC meetings to press coverage.

This comes, maybe not so coincidentally, at a time when the NRSC FM groups are plagued by conflict on two fronts. There's the threat of legal action hanging over the composite working group from the brouhaha over clipping.

Then there's a fumble on the field of the multipath group as a power play shapes up and the defensive line doesn't seem to know which way the end zone is. Or maybe even who has the ball.

Then the AM subgroup manages to give away concession after concession on the specs for improved AM radios to a large, faceless mass of overseas receiver manufacturers who can't be bothered to show up at the meetings.

So I guess it's not too surprising that they don't want us around, poking into the issues, asking embarrassing questions and generally making them all accountable not just to us—no—but to you, the folks who stand to lose or gain the most.

The justification was that participants would feel more free about exchanging ideas if there were no worries about be-

ing quoted by you-know-who.

But do any of them realize that it shuts most of the industry out of the entire process? You can't afford to fly to Washington, DC? You can't take eight hours out of your business to sit in a room and chew on half-baked ideas? You mean you can't afford an overnight hotel bill in the nation's capital, won't get reimbursed for that over-priced dinner?

OK, then you can't be a part of the decisions which will affect your stations for years and decades to come. RW has been your eyes and ears at these meetings, but tough luck, NAB doesn't want you to know what's really going on there any more. They want to issue press releases and gloss everything over with the company PR line.

☆☆☆

Let me put on my best squeaky Andy Rooney voice here and ask "Didja ever wonder . . . "

Didja ever wonder why the country's founding fathers decided freedom of the press was important enough to include it in the Bill of Rights?

Maybe they had this quaint little notion that if a country is going to be fair and just, in other words democratic, it would have to be accountable to the folks it serves. And in order to do that, those folks would have to have a way of finding out what was going on even if they couldn't actually witness it themselves.

It's worked pretty well, if imperfectly for over 200 years. But then along the way certain bureaucratic bodies took a hint from the world's dictatorships and discovered that if you can control the flow of information, you can decrease your opposition and further your own agenda.

What's ironic about the whole thing is that the decision to shut out the press was made by broadcasters—who are the first to yell and scream the loudest when their First Amendment rights are stepped on.

Second irony is that it was the good efforts of the press which got support and enthusiasm for the NRSC AM standard in the first place.

But all that's over, now. Maybe one day

in the not-too-distant-future we'll all wake up and discover that they've chomped away at more of our occupied bandwidth, or put a clamp on the type of processing we can use, or given our competitor some technical or marketing advantage. But by the time we discover this it's gonna be too late.

You'll read about it after the fact. Sorry, but Big Brother NAB knows what's best for us all.

Disagree? Let's see some action here.

How about letting the Executive Committee know if you think they goofed? Let NAB Radio Board Chairman Bill Sanders know by faxing him at 712-262-2076. He's at KICD AM-FM out of Spencer, IA. Address: Box 7248; ZIP: 51301; regular phone: 712-262-1240—but fax is quicker.

And Joint Board Chairman L. Lowry

and learning a heckuva lot.

Hey, maybe you could meet somewhere else besides NAB and reverse the decision to shut the doors. I'm sure we could find somebody else to foot the bill for lunch.

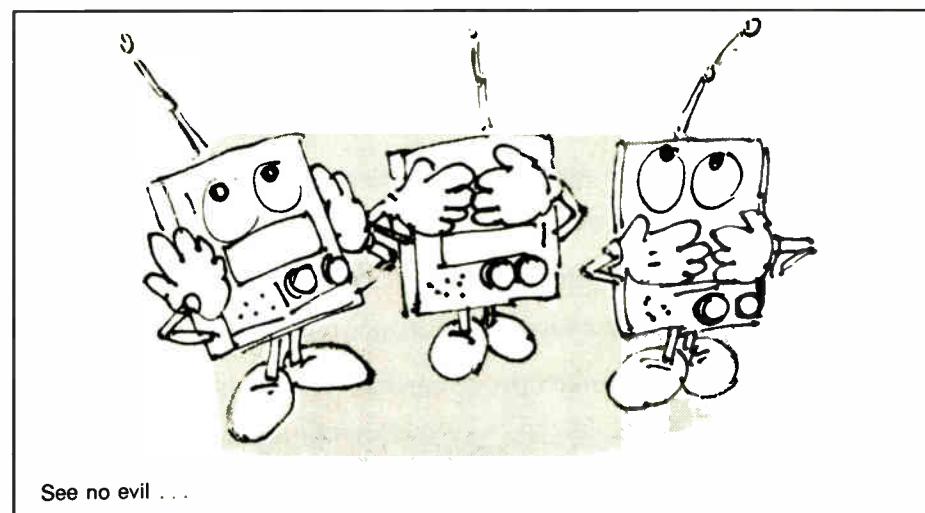
☆☆☆

Speaking of that which is, as my Irish grandmother used to say "A dirty shame" the FCC continues to try to clean up the airwaves.

Commissioner Jim Quello, speaking at a brown bag lunch on "Communications in the Year 2000" told folks that he's a First Amendment man himself, generally relaxed on double entendres and the like.

But he thinks the stuff they've taken action on is something few could argue about.

Said Quello, "The F-word. I've heard it, I've said it, I've done it. But I don't think



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Tell 'em. Tell 'em all that you want to continue to know what's going on. Tell 'em especially if you're a member, but tell 'em even if you're not.

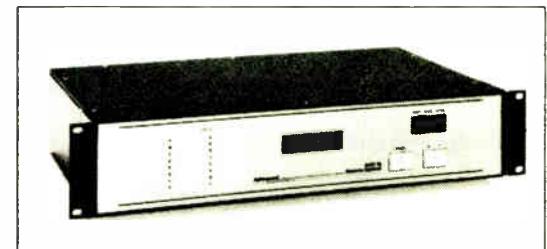
And to you patient, well-intentioned guys who have been and will continue to be at the meetings doing the hard work, well, it's been fun. It was nice getting to chat with you all like regular folks

it belongs on the nation's airwaves."

Oh, and you've heard of the fears about "AMization of the FM band?" Well duFreil, Lundin & Rackley took some inspiration from the phrase in submitting comments on technical criteria for AM.

The firm said it would like to encourage "FMization of the AM band." If it means better times for AM, I'm all for it.

Heard something interesting? Spill your guts to Earwaves. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted 1990 edition Radio World mug.



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Lee's ARC-16 might save him a few trips.

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READERS FORUM

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Z-100 speaks

Dear RW:

I keep reading letters in **Radio World** from concerned broadcast engineers, expressing (mostly negative) feelings about the wisdom of using "excessive" amounts of audio processing. There's ill-will toward the stations that are heavily processed, and animosity toward their own PDs when they want "that" sound.

Let's try to put aside this growing antagonism. Aggressive audio processing is only for those stations that feel it is required for the success of their product. Others who do not want it simply should not use it. But there is no reason for name-calling or trying to make the louder stations feel guilty about their hard-won decibels.

My personal philosophy is to make my station as *spectacular* and *exhilarating* to listen to as possible, and that means *processed*. If the processing is done correctly, it will yield a *very* loud signal, but it does not necessarily mean the loudest in the market, if indeed the loudest station only got that way with pure distortion.

It means creating a signal that captures the listeners' interest and imagination, a "larger than life" sound which, incidentally, probably won't sound a whole lot like "program." It does take some work to get there without resorting to running all controls at "11."

The original reason for limiting/compression was to increase SNR of the system. With roughly equivalent RF signals, the louder station will cover more territory. And those stations with a disproportionately small amount of RF are driven to be more processed in a simple effort to become or remain competitive with the "big boys." I know, having several Class A versus Class B and C battles under my belt. But keep in mind, you're after the best SNR, not nausea.

As long as you and I are producing a sound for our stations that is legal and gets the results desired by the creative forces (programming) we can, and should, feel free to do anything we want.

But we as engineers should not feel territorial about audio processing. It is no place for elitism. It is our job to deliver what is best for the *station* and that means giving the PD what he/she wants. If the PD's wrong, he'll lose his job, you won't. If you're not collaborative, it'll be *you* on the streets. Be creative with what you have to work with, but more than that be a team player. If you don't like your situation, you should change it.

Reserve your contempt for those who deserve it: light-bulb salesmen.

David P. Reaves III, CE

Z-100

New York, NY

Consumers' choice?

Dear RW:

I'm going to start manufacturing stereo radios. Of course, they'll have only one speaker, because offering two speakers limits consumers' choices. Naturally, it will receive FM stations only up to 99.9 and AM stations up to only 990, because adding another "1" to the frequency readout will increase the price of the radio receivers ...

Gimme a break. It seems to me that, in the 1990s, a "stereo radio" should be a stereo radio—AM and FM, no questions asked. Radio is radio; the fact that the service happens to be supplied on two different bands is hardly a reason to leave out parts, hoping the buyer won't notice. Truth in advertising and all that.

(No, wait a minute ... I think I'll make color TVs. I'll use only blue and green phosphors, 'cause they're colors, so I can still call it "Color TV," but I'll leave out red, 'cause red phosphors are expensive, and, besides, I want to offer consumers a choice ...)

Ted Eiselgroth, Sales Rep
American Radio Networks
St. Paul, MN

Inspection blues

Dear RW:

As I went through an FCC inspection recently (September), I read with interest Mr. Hallikainen's article concerning the recent inspection of KYLO-FM. The situation was very similar here, but with very different results.

Back in 1982, one of my contract stations was inspected and fined heavily for over-power operation, based on the efficiency factor in the manufacturer's man-

The NAB Executive Committee's decision to close NRSC meetings to the press after four years of an open door policy is as damaging to the industry as it is a disappointment to reporters who have dedicated themselves to bringing the committee's work into the light.

In case after case, especially when the subject is technical, it has always proven more beneficial to have issues discussed in an open forum, encouraging the free participation of all, than to conduct meetings in secret.

The NRSC AM standard has received overwhelming industry support and has been a success in part because its benefits to AM stations were made widely known—largely through the efforts of the trade press.

Secrecy is Industry's Obstacle

knowledge that the trade press has served the association's goals with the NRSC so well to date.

Understandably there are cases where the industry's purposes are best served through exchanges held in confidence. And there is confidential information involving stations, manufacturers and organizations that the press would be loath to publish even if told.

For those few cases, there is ample opportunity for one-on-one phone calls, letters or personal discussions far removed from the eyes and ears of reporters.

In the majority of cases, however, an informed industry is always the best vehicle for decisions and actions which hold the greatest benefit for the largest number of people.

And if those entrusted with the decision-making are afraid to talk in front of the press and therefore the industry—then perhaps in the long run those discussions shouldn't take place.

—RW

ual and the plate voltage and plate amperage readings.

When I was hired in 1984, one of the first things I did was install a Bird in-line wattmeter and posted the calibration certificate on the wall along with the license documents. When the Bird was installed, it was discovered that the (transmitter) manufacturer's efficiency factor was not even close to the actual (49% instead of 67%).

Lo and behold, when our recent inspection proceeded to the transmitter, the inspector logged the various readings and came up with the same over-power readings as did the inspector in 1982. However, when confronted with the Bird (and the calibration certificate) he conceded that perhaps the manufacturer may have been mistaken in factoring in the efficiency of its transmitter.

The \$500 wattmeter saved this station some \$5000 or more in liabilities and seems to have paid for itself in our ability to keep the station within our legal operating parameters.

Interestingly, our inspector never questioned the staff (other than the manager and myself) about the "efficiency" of the transmitter or how we get the reading on the remote control. I think this may be yet another case of FCC inconsistency.

I have heard of this before, with one inspector finding fault with a method of doing things and assessing a liability and another inspector finding nothing wrong with the same method.

It would seem to me that the efficiency of the transmitter is an obscure thing to almost anyone except the engineer and the FCC inspector, and that this particular inspector had a bone to pick with this station. Unfortunately, you never know what to expect from the regional offices, as they all seem to have their own interpretation of the Rules and Regs, depending on their mood at the time.

The fact that the efficiency factor was posted at the transmitter should have satisfied the inspector. If the remote control reading matches the transmitter reading, that should satisfy the inspection process as well. So much for our perfect world.

Don Mussell, Consulting Engineer
Mouth of Wilson, VA

More bottomline

Dear RW:

Many thanks for your fine publication! I especially like the *Bottomline Broadcaster* column and would love to see it in every issue.

We are greatly in need of low cost tips to do up a station on the cheap and the series on phone patches has been especially helpful.

I also like seeing what must be true reviews of equipment since not all of them are glowing. Realism counts more with me than fluff.

Robert Bendheim, Asst. Engineer
KMUD
Redway, CA

Low power not the solution

Dear RW:

Low power FM for struggling daytime AM substitutes handicap for disability.

Three things hamper daytime AM. First, lack of adequate fulltime service. Second, multiple upgrades now placing aggressive fulltime signals into communities who previously remained loyal to daytimers. Third, the changing "complexion" of community. My licensed city is a town of 4700. My immediate market (the "Canton Folks") no longer live, work or play within the confines of this licensed community and regularly out-drive their local station even when they

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Next Issue RW
Jan. 24, 1990



NRSC

**THE STANDARD
IS COMING!
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World Radio History

Congress Approves Fee Hike

Some Fines Also Upped As Hill Launches \$12.9 Billion Budget Cutback

by John Gatski

Washington DC Higher FCC fees are about to become a fact of life for broadcasters as a result of House and Senate approval of a \$12.9 billion budget reduction package designed to help shrink the federal deficit.

The House and Senate reached a compromise on slightly different versions of increased FCC fee proposals before the fall recess. The increases will add about \$50 million in revenue to the federal government for fiscal 1990.

Bush to ink plan

President Bush is expected to sign the legislation now that the Fairness Doctrine was dropped from the package, according to legislative sources.

The compromise keeps intact the fine and forfeiture limits that the NAB voiced concern about last fall.

Under the new fee schedule, the max-

imum forfeiture penalty for broadcasters and common carriers will increase from \$2000 to \$25,000 for each violation and continuous violation limits will increase from \$20,000 to \$250,000.

The NAB said the fine limits are being raised too quickly, but the fee increases are long overdue. Many have not been raised in 50 years—since the Radio Act of 1934.

FCC Bar Association President Richard Zaragoza said a huge fine increase could result in more litigation for the Commission by those who want to appeal the significantly stiffer penalty. Under the lesser fines, those who were cited usually just paid the fine, he added.

A partial listing of the increased fees includes construction permit AM, \$2000 to \$2250; construction permit FM, \$1800

to \$2030; hearing (major, minor change or comparative new or renewal), \$6000 to \$6760; AM license, \$325 to \$370, and FM license, \$100 to \$115.

Other fees

Other increased fees include assignment or transfer (long form) \$500 to \$565 and short form, \$70 to \$80.

Higher fees also will affect cable operators, direct broadcast satellite and international shortwave broadcasters.

For information from the FCC about the higher fines and fees, contact the fee office at 202-632-0241.

Type of Filing	New	Old
New or Major Change CP: AM	\$2255	\$2000
FM	\$2030	\$1800
Minor Change:		
AM	\$565	\$500
FM	\$565	\$500
Hearing (Major/Minor Change, Comparative New or Renewal)	\$6760	\$6000
License:		
AM	\$370	\$325
FM	\$115	\$100
AM (DA)	\$425	\$375
FM (DA)	\$355	**
AM (Remote control)	\$35	
Assignment or Transfer: Long Form (314/315)	\$565	\$500
Short Form (316)	\$80	\$70
Renewal	\$100	\$30

Class Cs Plan Combiner Sharing

Shoreview MN A group of eight Class C FM stations here in the Minneapolis area are joining together to share a new combiner and antenna that should be in operation by June.

LDL Communications of Baltimore will supply and install an Alan Dick combiner and 12-bay circularly polarized FM antenna for the Shoreview FM Antenna Group. Stations participating are KEEY, KDWB, KQRS, KTIS, KLXK, WLOL, WLTE and KTCZ. The antenna system has a 10-station capacity. The antenna will be mounted on the KMSP-TV

Channel 9 tower owned by United Television.

LDL Sales and Marketing VP Ray Tattershall said antenna combiner systems are an opportunity for stations to have a state-of-the-art system they might not be able to afford individually. "You end up with a better bang for your buck," he said.

The trend took off in the mid-1980s when the FCC changed the rules that for a station to have guaranteed protection, Class C FM stations had to be at 984' minimum for an ERP of 100 kW.

Until that point, there was very little incentive for stations to spend the money to upgrade their operations or change antenna sites, Tattershall maintained.

"It's really an increasing trend," he said. LDL has similar systems in Jacksonville, FL, Atlanta, New Orleans and in various Canadian cities.

For information from LDL contact Ray Tattershall at 301-498-2200. For information from Shoreview FM Antenna Group, contact Gary Swartz at KDWB, 612-340-9000.

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Injunction Lifted from WNZ

by Paul Rebmann

Orlando FL Tower construction has resumed at the future WNZ-AM transmitter site following the lifting of a temporary injunction that had halted construction in November.

The injunction had been obtained at the request of the Greater Orlando Aviation Authority (GOAA) to prevent the radio station from building a tower ar-

Dave Murray said one of the array's 360' communications tower was erected on the foundation, which had been poured before the injunction.

Zoning affects existing airports

In its findings of fact, the Board of Adjustments found the zoning restrictions applied only to the three existing airports and that the proposed WNZ towers did not violate these restrictions.

In making its decision, the board said the airport remains a proposal, noting that no property has been purchased . . .

ray 1.5 miles from a proposed airport site.

The tower site is in Lake County, just across the county line from the proposed general aviation airport in Orange County.

Three Lake County commissioners, sitting as a Board of Adjustment, issued the 5 December order declaring that WNZ's building permits shall continue in effect. The injunction was to be in effect only until the Board of Adjustment made a decision on the matter.

During the week following the Board of Adjustment decision, WNZ CE

The board also concluded that "GOAA failed to request an interlocal agreement or a joint zoning board to create areas in Lake County, which would affect the proposed airport . . ."

In making its decision, the board said the airport remains a proposal, noting that no property has been purchased and no land use proposals have been filed with either Orange County or East Central Florida Regional Planning Council officials.

The board's decision clears the way for the radio station to continue with its planned upgrade, pending the grant of

a construction permit from the FCC.

Murray said the FCC CP should be approved by early this year. Federal Aviation Administration (FAA) approval was granted in September 1989.

The proposed airport site that precipitated the injunction is one of three locations selected for a possible general aviation airport in Orange County.

Studying options

The airport is needed to handle the increased traffic caused by the rapid growth of the Orlando-Disney World area, according to a Florida Department

of Transportation Study.

GOAA Community Relations Director Carolyn Fennell said the authority "is currently studying the options available following the ruling."

Fennell said the site affected by the ruling was GOAA's first choice and the authority has not yet fully evaluated the two other options.

For information from WNZ call 407-299-7400. Call the aviation authority at 407-826-2001.

• • •

Paul Rebmann is CE for WLKF-AM/WEZY-FM in Lakeland, Fl.

FCC, FAA Negotiate

(continued from page 1)

ence. Broadcasters question what statistics the FAA feeds the program and how the program calculates its results.

The FAA will explain the program to FCC officials during meetings 11-12 January, Kochis said.

The FCC also questions the FAA's unwillingness to reveal details of the administrative review for applications, specifically its findings that justify a rejection. "Our view is everything has to be out in the open," Hassinger commented.

The FAA ruled the proposed tower site could cause harmful electromagnetic interference (EMI) to aircraft receivers in the Baton Rouge Metropolitan/Ryan Field instrument landing system frequency-protected service volume.

The FAA suggested an alternative site, but the filing noted the first choice is owned by the applicant. A move would require the applicant to pay rent and also require re-engineering of the proposal.

Reading the FCC

Carr argued a site change on EMI basis alone should not be required in view of objections to the FAA interference computer modeling program.

"All I'm trying to get from the FCC is some indication (of the agency's position in the dispute)," Carr said. "I'm trying to get the FCC to tell us what they are going to do."

Hassinger said if the interim agreement is reached it could become the FCC's answer to the petition.

For information from the FCC, contact William Hassinger at 202-632-6460.

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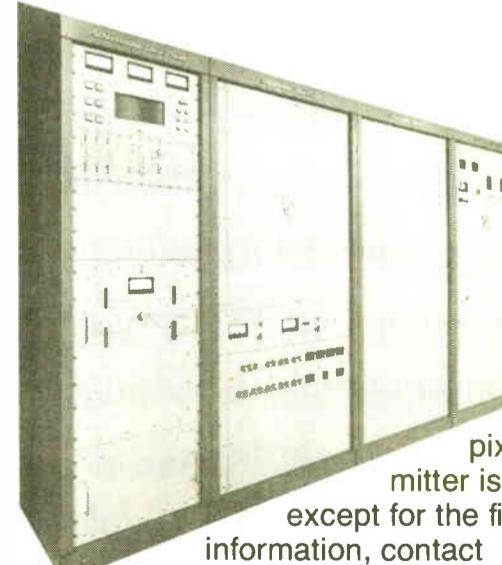
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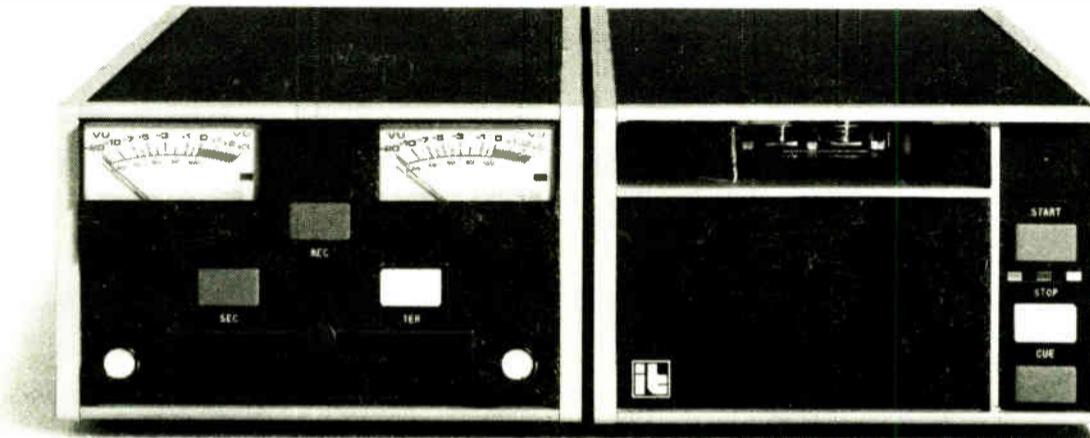
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Class A Benefits from Boost

(continued from page 1)
for the license.

Delays at the Commission, however, held up a construction permit for nearly three years and it wasn't until November 1989 that the FCC gave the nod for the family to operate a 3 kW Class A station.

Meanwhile, a month earlier, WHFS-FM, a 50,000 W station in neighboring Annapolis, MD,—and the new station's adjacent channel at 99.1—secured permission from the FCC to move its antenna 14 miles closer to the nearby Washington, DC market and thus away from Salisbury.

At the same time, the Commission passed its ruling on Class A upgrades, allowing stations that met distance requirements to double their power from 3 kW to 6 kW.

Suddenly, thanks to WHFS's antenna relocation, Connor's channel was eligible under those rules for an upgrade—before it even hit the air.

"We filed a letter with the Commission immediately saying that we would meet the new spacings and to let us go up to 6 kW," said Rachel Cramer, an attorney at Washington's Mullin, Rhyne Emmons and Topel who handled the station's legal affairs. "A week later, they reissued the construction permit with 6 kW."

"It all happened just one thing after another within 40 days," explained Mat-

thew Connor, J.P.'s brother and a broadcast engineer who oversaw WSBY's equipment package. "WHFS moved, we applied for an amendment and got the hike, all before sign on."

"It was really the icing on the cake," J.P. said.

Stretch two or three miles

The power hike will allow the station to stretch its coverage area about two to

three miles, an improvement of about 30%, J.P. said. In principle, "what we're really doing is besting the other 3 kW stations in the market."

The station airs an all-compact disc oldies format using a new CCA 500 W transmitter and Continental exciter. It also employs a 30-year-old, gutted Gates Executive console.

"I kept the pots and switchers and put state-of-the-art electronics in it," Mat-

thew said. "Those big pots and big meters make an awesome board. It's the way radio should be."

"I was trying to make something good out of nothing and it turned out to be something very good. It really sounds excellent," he said.

Now, with the drama cleared and the station on the air, Connor said he looks forward to the challenges of multiple station ownership.

"I think we've cleared away most of the Murphy's Law stuff," Connor said. "We're ready to fly."

For information, contact Connor Broadcasting at 301-742-5191.

Ice Storm Toppled Towers in NC

by John Gatski

Raleigh NC In the space of one hour on 10 December, one radio and two TV stations were knocked off the air because of ice storm conditions that toppled two towers and a transmitter building.

WRAL-FM, WRAL-TV and WPTF-TV, all located near Raleigh, lost their signals as a late fall ice storm brought the towers to the ground.

At 8:35 AM WPTF's 2000' tower fell to the ground first and was followed by WRAL's 1800' tower that collapsed at 9:20 AM, destroying the 24-bay antenna. The towers are located in a cluster of antennas, nicknamed Clayton Towers, a few miles outside of town.

WRAL-FM CE Keith Harrison was not sure how the ice storm caused his tower

to collapse, but he conjectured that a rapid warming and subsequent ice melting immediately after the storm caused guy wires to oscillate and then break.

A towering mess

The demise of WRAL's tower affected not only the FM and TV stations, but also a multitude of two-way communications and paging antennas that were on the antenna, Harrison said. Fortunately, the tower missed the transmitter building, he added.

The 100 kW radio station was back on the air 22 hours later with 10 kW using a remote truck, a TFT 450 EPU and a four-bay antenna perched 260' in the air via a crane next to the twisted skeleton of the old tower, Harrison said.

WQDR-FM, WPTF-TV's sister radio station, was lucky, according to CE Gary Leibisch. Its antenna was scheduled to be moved to the TV tower weeks before the storm struck, but the FCC has not approved the move. WQDR-FM's tower is located outside of Raleigh in Cary, NC.

At presstime, WRAL-FM and WQDR-FM were negotiating a temporary ar-

rangement so WRAL could install an antenna on WQDR's tower.

That arrangement was to be temporary for WRAL until management made a decision to again combine the FM and TV antenna on the same tower, Harrison said.

The toll

WPTF-AM was not affected because it was located at another site, according to Leibisch.

WRAL-TV and WPTF-TV, however, did not fare well. WPTF-TV's antenna was destroyed and the transmitter was heavily damaged because the tower fell on the building.

In order to get back on the air, WRAL-TV and WPTF-TV signals were temporarily beamed from ENG trucks to a satellite and broadcast on the local cable system.

A UHF station also agreed to carry some of the WRAL-TV's programming over-the-air, according to the station.

For information, contact Keith Harrison at WRAL, 919-890-6101 or Gary Leibisch at WQDR, 919-876-0674.

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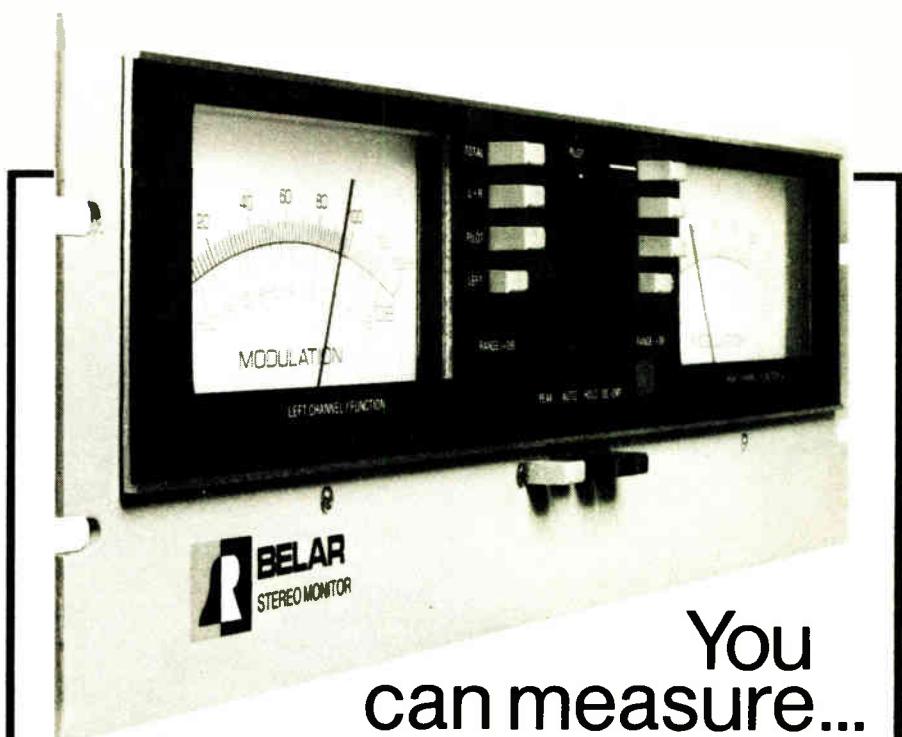
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Telex MC-PR III RP audio, excel cond, \$995. L Chatman, IVA, 424 Commerce Ln Ste 1, Berlin NJ 08009. 609-768-5006.

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ATC Criterion Series mono R/P, gd cond, \$300. B McKittrick, 331 Mulberry, Catashqua PA 18032. 215-264-5295.

SMC 510 single cart player (2), \$150 ea/BO. J McDonald, 303-689-3442.

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

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

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BE 5302B mono, triple decker, gd cond, \$1300. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348.

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

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Revox tape recorders, top-shape factory rebuilds. New heads, etc. Accessories. A77, \$850; B77 (1/4 trk 7.5 ips), \$1000; G36 (tube mdn) 1/4 trk 7.5 ips, \$500. Send phone number & address to: JM Technical Arts, POB 8156, Hermitage TN 37076.

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

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

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Autogram AC-8/I/C-10 spare parts, lamps, switches & bridging input transformers, BO. B Royster, KQM, 1019 Cordova, San Diego CA 92107. 619-223-3413.

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

Ariongram AC-8/I/C-10 spare parts, lamps, bridging input transformers, BO. M, 1019 Cordova, San Diego CA 92107.

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

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Ramko DC8M 8 chnl stereo, gd cond, all manuals & extras, \$5500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

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

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Sphere Eclipse A/B 20x16 w/(8) 9-band graphic EQ, full patch bay, producers desk, \$6000. H Alrich, Box 869, Greenville CA 95947. 916-284-6929.

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

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

RCA BC5A (2), modified to 7 inputs, complete w/spare parts & manuals, gd cond, BO; Kelvin KD20A remote broadcast console w/(2) TTs, (2) waterproof speakers, gd cond, BO. J Keller, WKOK, POB 1070, Sunbury PA 17801. 717-286-5838.

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

BE 4BEM 50 w/4 pots; (2) Ramko solid state; Collins 212 F-2 tube type w/6 pots; ATI 8 chnl stereo w/pwr supply, call for details. Adolph, 915-949-2112.

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

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

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

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

7500 stereo console parts, P&G in preamps, etc. J.C. Aegeerter, W

GAO Licensing Study Due Soon

Findings May Affect Legislation Proposed to Protect Engineers

by Charles Taylor

Washington DC A government study discussing state licensing requirements for broadcast engineers is expected to hit the streets later this month and some followers of the issue said it could heavily influence the chances of legislation being introduced to protect engineers.

The report, written by the General Accounting Office (GAO), was requested nearly a year ago by Rep. Matthew Rinaldo (R-NJ) and Rep. Edward Markey (D-MA), chairman of the House Telecommunications and Finance Subcommittee.

Rinaldo was approached about introducing legislation to protect engineers from state regulation and felt more research was needed to assess the issue.

State involvement

According to Thomas Heck, assignment manager with GAO's resources community and economic development division, the report, due in mid-January, shows "to what extent states are bringing charges against telecommunications engineers."

Heck added that the study will discuss the issue from a number of perspectives without proposing any solutions or mak-

ing specific recommendations.

"It'll be up to those who requested it to look at it and assess whether any legislative remedy would be appropriate," he said.

An official with Rinaldo's office said that based on preliminary studies of the report's rough drafts, it does not appear that the information contained would prompt legislation.

"I don't know that it will establish the basis of the necessity of federal legislation. That's my best guess," said Paul Schlegel, senior legislative assistant with Rinaldo.

Report could have influence

But followers of the issue appear more convinced that the report could have a direct influence on the state regulation of broadcast engineers and that with or without legislation, it will at least present evidence in favor of engineers' freedoms.

"We're hoping that the GAO study will bring order out of chaos," said Ray Thrower, president of the National Association of Radio and Telecommunications Engineers (NARTE), a strong opponent of state licensing.

"I feel like it will present all sides of the issue fairly." NARTE attorney Robert Thompson added that the report will verify claims the organization has made regarding individual engineers being harassed by unfair state regulations.

"From what I've heard of the report, it should question the belief of some

people that this was a very limited problem and not worth anyone's time," Thompson said.

He said the report also will propel the issue to the attention of FCC Chairman Alfred Sikes and his new commission,

will produce favorable evidence or have any influence on legislation.

However the National Society of Professional Engineers (NSPE), which believes that a state licensing standard would place broadcast engineers under

"It'll be up to those who requested it to look at it and assess whether any legislative remedy would be appropriate."

which he views as a point in the issue's favor.

"We're extremely encouraged by a couple of things Sikes has said publicly in the past couple months," Thompson said. "We're hoping that, plus the GAO report, will really take this and propel this issue more toward some legislation in the new year."

"Sikes seems to be fitting into the overall pattern of peacemaker," Thrower added.

Glimmer from the tunnel

"With him, I've seen the first nice glimmer at the end of the tunnel, and it's not a railroad train coming out. I think it's a cooperative attitude and with that kind of attitude on Capitol Hill, I think we can achieve something that we were unable to do with the prior administration," he said.

But not all are convinced the report

the same scrutiny as their counterparts in other engineering disciplines while setting a necessary minimum standard, was guarded in its expectations of the study.

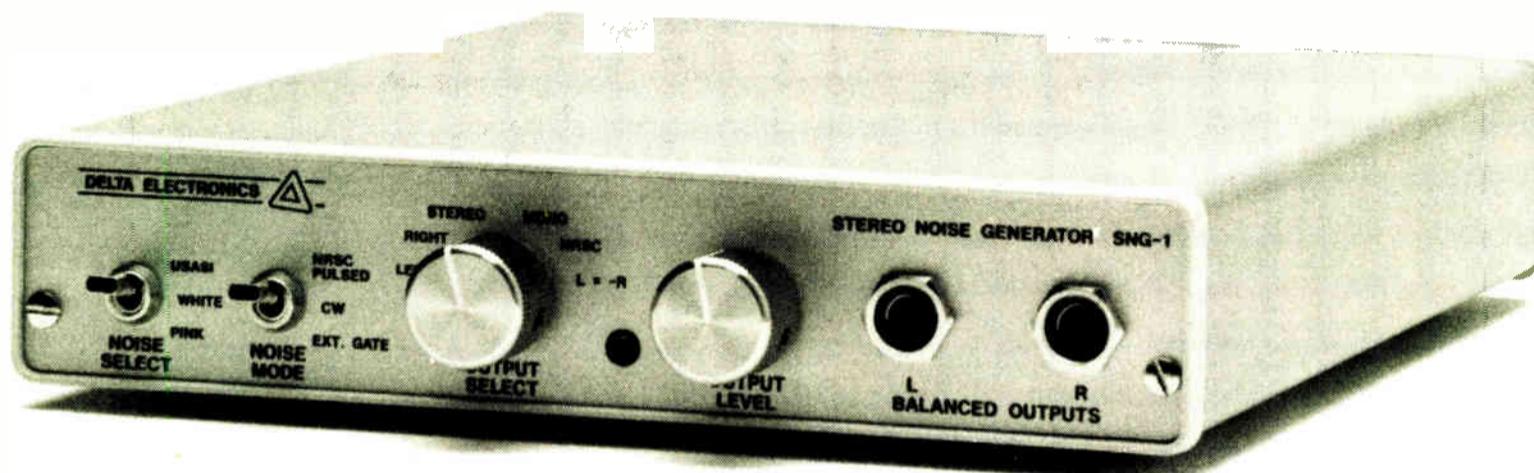
"We don't have any predictions on that," said SPE General Counsel Arthur Schwartz. "We're hoping for an impartial and balanced report."

Chris Imlay, legal counsel for the Society of Broadcast Engineers, said that he does not expect the report to deliver any ground breaking information.

"I think you're going to see no more information than has been in the broadcast press on the subject," Imlay said. "It's not an issue that seems to be getting any worse. And I don't see it resulting in any legislative effort."

For information, contact Ray Thrower at 817-799-9661; Robert Thompson at 202-296-0600; Arthur Schwartz at 703-684-2800, or Chris Imlay at 202-296-9100.

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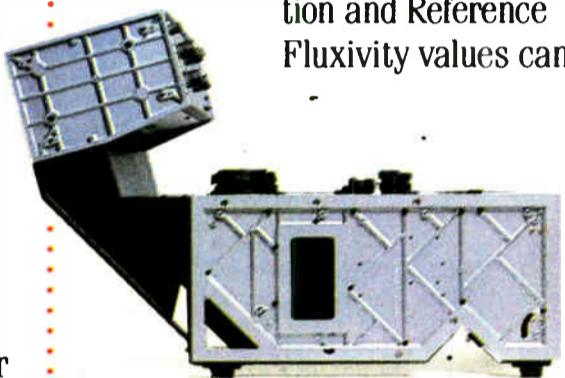
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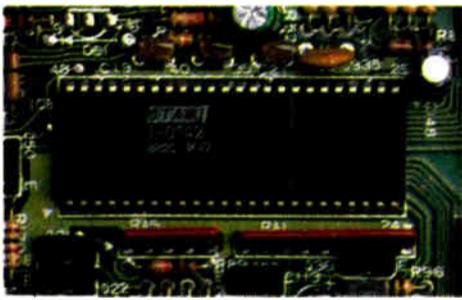
be changed with a flip of a switch. And as you put the deck



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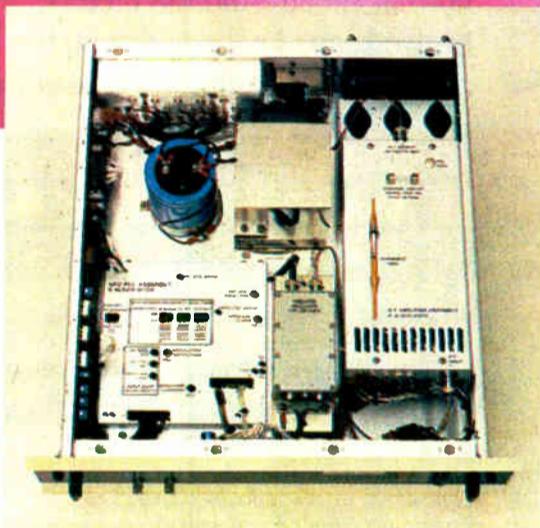
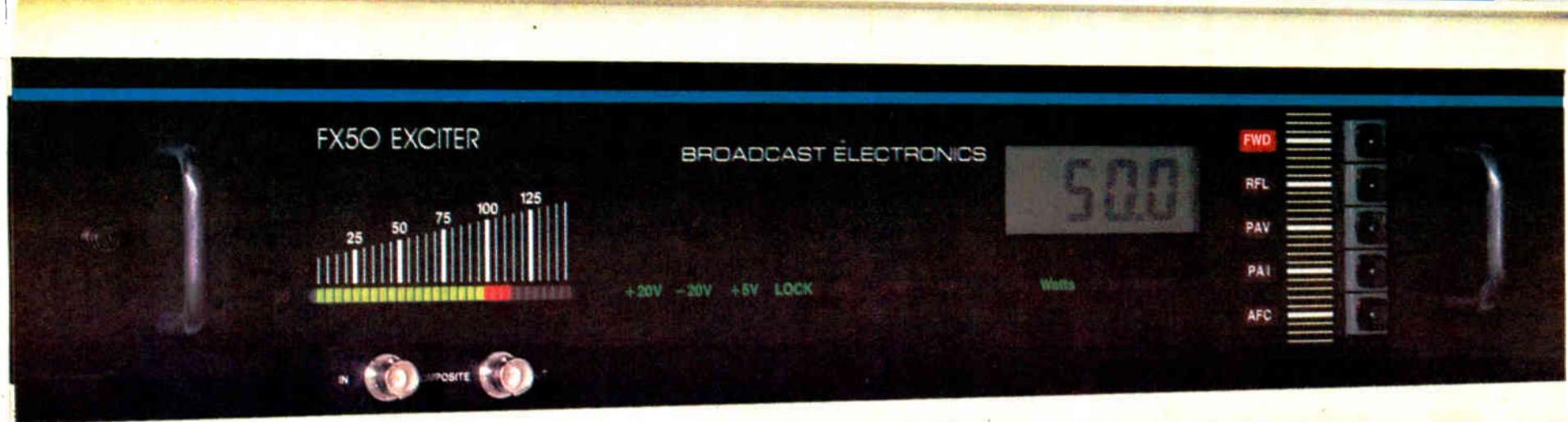
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World Radio History

NTIA Seeks Input on Spectrum

by Benn Cobb

Washington, DC Broadcasters now have an opportunity to tell Uncle Sam their views on how the entire radio spectrum could be better managed—an opportunity that may not come again for 20 years, according to National Telecommunications and Information Administration (NTIA) chief Janice Obuchowski, assistant secretary of commerce for communications and information.

NTIA launched a Notice of Inquiry No. 7 December that "will establish the spectrum policy foundations to lead the US into the 21st century," Obuchowski said.

She encouraged comment from radio equipment manufacturers, firms providing services using the spectrum, individual spectrum users, developers of new technologies and federal agencies that use the spectrum.

NTIA is the chief advisor to the President on telecommunications policy. The agency licenses federal spectrum users and conducts research into such areas as antennas and propagation.

The economic stake in the radio spectrum is considerable. Obuchowski noted that in 1988 the value of radio equipment shipments in the US was \$54 billion, more than three times the investment by telephone companies in local telephone facilities. US exports of radio equipment were \$4.6 billion.

Ponderous questions

The NOI addresses five major topics: regulation, block allocation, alternatives for apportioning spectrum, spectrum conservation and new technologies and forecasting future spectrum requirements.

NTIA said that spectrum sharing and location of appropriate frequencies is made difficult by the absence of unified databases and a single source for information about spectrum use.

"Should general databases of frequency assignments and equipment characteristics be kept and made publicly accessible?" the agency asked in the notice.

NTIA also seeks comment about how internal agency deliberations about spectrum could be made more accessible and about how US participation in international spectrum conferences could be made more effective.

Comments are also sought on the role of private groups and companies in spectrum management. NTIA wants to know how effective private groups have been, how well they advance the interests of parties not already using the spectrum and what government oversight may be needed.

Property rights debated

Auctions and market-based frequency assignments are also controversial subjects in spectrum management today. NTIA asked in the NOI if spectrum users should be granted property rights in the spectrum.

"Are these rights more appropriate for some types of users than others (for example, mobile communications vs. broadcasting)? How could such a system more effectively prevent 'warehousing' of spectrum by users? Who is likely

to gain and who is likely to lose from such a system?"

Several countries are considering or have implemented market-based programs. Canada is charging spectrum use fees; New Zealand shortly will begin spectrum auctions; and Australia recently auctioned the use of two FM broadcast stations in four cities, with bidders limited to existing AM broadcasters. Australia intends to auction more FM stations next year.

Existing spectrum users may also have few incentives to change to new, more efficient technologies, the agency observed. NTIA asked how the current

system could be changed to encourage spectrum-conserving technologies when crowding occurs.

Reallocation of spectrum

Obuchowski was asked whether the study contemplates reallocation of broadcast frequencies.

"When it comes to broadcasting, we are the advisor," she said. "The strength of our ideas is really our only stock in trade. The decisions will ultimately be made by the FCC. So we're approaching broadcasting with that realization. I would certainly say that there are some areas within the array of

broadcast services where efficiencies could be introduced."

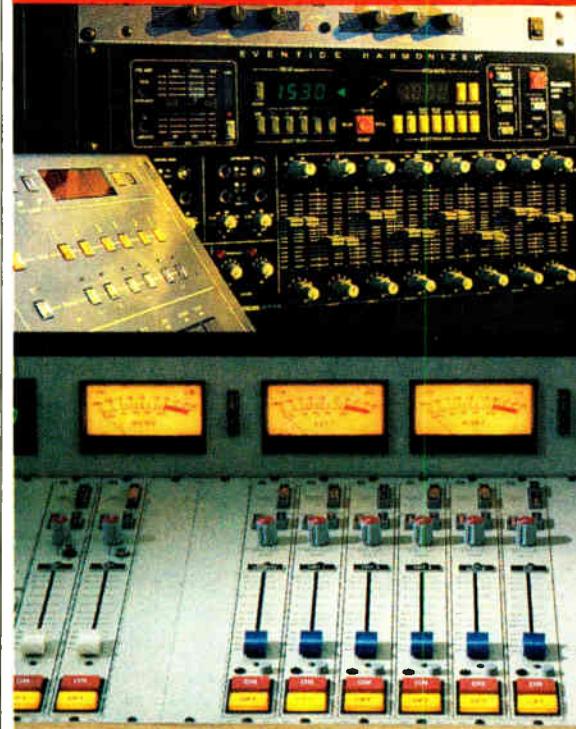
NTIA economist Joseph Gattuso added, "The purpose of the study is to look at the fundamental questions of how we use and manage the spectrum. I don't think anyone is saying that we're considering elimination of VHF television, or elimination of particular FM stations."

Obuchowski said NTIA plans to issue its final report by the end of 1990, and that she hopes the recommendations could be implemented in the "first term of the Bush administration."

Comments are due 23 February and replies 30 March. The full text of the inquiry was published in Section III of the 8 December 1989 Federal Register.

For information, contact Eileen Doherty at NTIA, 202-377-1551.

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Circle 70 On Reader Service Card

Harris' Swanson to Be Honored by NAB

Washington DC Harris Broadcast Senior Staff Scientist Hilmer I. Swanson will receive the NAB Engineering Achievement Award for 1990 at the association's annual convention in Atlanta.

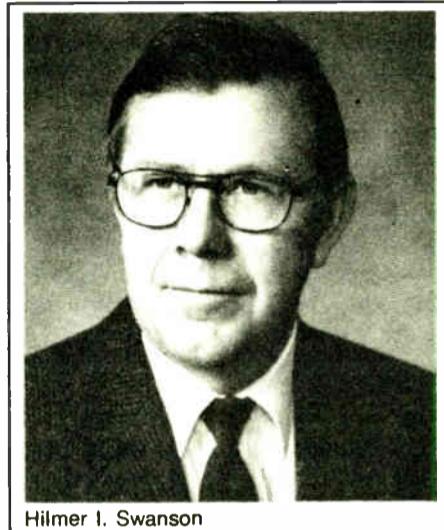
Swanson is credited with development of much of the technology used in AM transmitters. NAB recognized Swanson for giving AM broadcasts the potential to compete with other high fidelity media. His other work dramatically lowered the power requirements for transmitters, saving AM stations an estimated \$50 million in extra power costs over the years.

Swanson joined Harris (formerly Gates Radio) in 1965, following five years with Collins Radio and several years at Bendix Aviation. At Bendix, he began his career as an engineering student and continued his work designing ultrasonic equipment after graduation from Valparaiso Technical Institute with a bachelor's of science in electrical engineering.

But Swanson soon turned his attention to broadcast technology. At Collins Radio, he developed 250,000 W transmitters for Voice of America.

At Harris, Swanson made significant contributions in the development of pulse modulation techniques and, more recently, digital modulation for AM radio. Harris is the first transmitter

manufacturer to market a digitally modulated AM transmitter. Many of Swanson's patents represent the same standards and benchmarks used by transmitter designers worldwide.



Hilmer I. Swanson

He is an honors graduate of the Army Signal Corps and holds a master's degree in electrical engineering from the University of Iowa.

The award will be given during the engineering luncheon on the closing day of the convention, which runs 31 March-3 April.

Ultimate Radio Stalls

by John Gatski

Washington DC For more than a year, the NAB has touted its ultimate radio at just about every meeting or function its representatives attend.

But despite the continued promise of the high quality receiver, which is to feature continuous tuning, AM stereo/FM



NAB's plans for building the ultimate radio have made halting progress.

stereo and FMX, a date for the radio's arrival to consumers remains uncertain without an agreement from a company to manufacture it.

"It's hard to predict," NAB Science and Technology VP Michael Rau said. "We would like to have a deal, but these things are complicated and take time. We certainly have not dropped it from our projects."

Last year, NAB had a preliminary agreement with an undisclosed company to produce the radio. The deal fell through at the last minute, however, the NAB continues negotiations with unnamed manufacturers, Rau said.

Sequerra radio

The prototype was designed by engineer Richard Sequerra. According to NAB, it features FMX, AM stereo capability, continuous tuning and quality audio receiver specifications.

The NAB has one prototype with

removable circuit boards to accommodate C-QUAM AM stereo, ISB AM stereo and one containing both.

Although the NAB has not nailed down a manufacturer, Radio Board Chairman William Sanders said the ultimate radio remains a "high priority" with NAB and not a meeting goes by without its status being discussed.

The NAB has spent approximately \$50,000 on the project so far, according to Sanders.

But, he admitted, getting the project completed has taken longer than originally estimated.

Disheartening debut

Amid NAB hoopla, the ultimate radio originally was unveiled at Radio '88, which was, according to observers, a rather disheartening beginning due to some features not working on the display radio.

Despite that setback and the difficulty securing a manufacturer, Rau said an agreement could be secured early this year.

"I think that by the NAB spring convention we will know where we will stand—whether we have a deal or not," Rau said.

Sanders, however, is not quite as optimistic about having an agreement signed by spring.

"That is a nice goal to have, but I don't want to be pinned down that it is going to happen by that time period," he said.

For information, contact Mike Rau at 202-429-5339 or William Sanders at KICD-AM/FM in Spencer, IA, 712-262-1240.

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Cellular Petition Threatens STLs

by Benn Cobb

Washington DC Broadcasters have been drawn into one of the hot spectrum controversies of the 1990s: the future of the cordless telephone.

Rutherford, N.J.-based Cellular 21 Inc. filed petition RM-7140 in September to reallocate 940-941 MHz to "Telepoint," a new cordless phone service that uses the second-generation digital standard CT-2. The spectrum cited is adjacent to that which includes grandfathered broadcast STL/ICR users—an eventual target that the telecommunications company hopes to move.

But even if frequency is found to move current users, such a move could cost broadcasters at least \$23,000 each, according to statistics quoted by NAB.

The petition is the first of what may be many to come, and broadcasters have raised a red flag in comments filed in December. Another petition was filed by Millicom, which targeted spectrum in the 2 GHz use for television ENG.

New technology

Developed by British Telecom and now licensed to four competing carriers in England, Telepoint gives customers a cordless phone that works at home and in public locations such as airports, shopping malls, train stations, business districts, and filling stations.

Cellular 21 co-founder Matthew Edwards is a broadcasting and telecommunications consultant. He owns the M Street Journal radio newsletter, and is a part-time announcer on WQXR New York.

"The FCC is a reactive organization. We filed the petition because nobody else was doing anything about allocation of spec-

(Cellular 21) is "one more attempt at shrinking the spectrum available to the broadcast auxiliary service . . ."

trum or proposing services," Edwards said.

The Telepoint service is intended to be a low-cost competitor to cellular phones and ordinary home cordless phones.

Unused frequencies

In England, Telepoint uses 864-868 MHz and Cellular 21 holds an experimental license to test CT-2 units in 866-868 MHz.

In 1986, the FCC allocated 940-941 MHz to the General Purpose Mobile Radio Service (GPMRS), which has never used the frequencies. Because the FCC has been stymied by Congress in its de-

sire to auction GPMRS licenses, the Commission has established no rules for GPMRS and licensed no one to operate in that band.

Cellular 21 proposed that as Telepoint becomes more popular in the US, the FCC could make spectrum above 941 MHz available to Telepoint through attrition of broadcast STL operations migrating from that band into higher frequencies. The bands to be migrated to would include 944-947 MHz and 23 GHz.

Increasing spectrum needs

"As it matures, CT-2 would take increasingly larger blocks of spectrum upward . . . on an as-needed basis," Cellular 21 said in its petition. "Even in a worst-case scenario, where the spectrum would have to be shared with broadcast auxiliary services, the CT-2 Common Air Interface logic calls for the CT-2 unit to automatically seek the channel with the least interference."

Cellular 21 also suggested that the FCC offer 901-902 MHz—the lower half of the unused GPMRS pair—to broadcasters for STL use as an alternative to upward migration. The company suggested that service providers might compensate broadcasters for the cost of changing out STL equipment.

In comments on RM-7140, NAB described the Cellular 21 petition as "but one more attempt at shrinking the spec-

trum available to the broadcast auxiliary service . . . Eventually, broadcasters—as well as other government and non-government users of 941-944 MHz—would be squeezed out of spectrum which was allocated for their use a mere five years ago."

The association argued that if any spectrum was deemed necessary for Telepoint, no more than 1 MHz at 940-941 MHz be allocated to the proposed system.

Bonneville International Corp., owner of five AMs, seven FMs and two TV stations, told the FCC that higher bands, particularly 23 GHz, will not work over the lengthy paths now traversed by 900 MHz STL equipment.

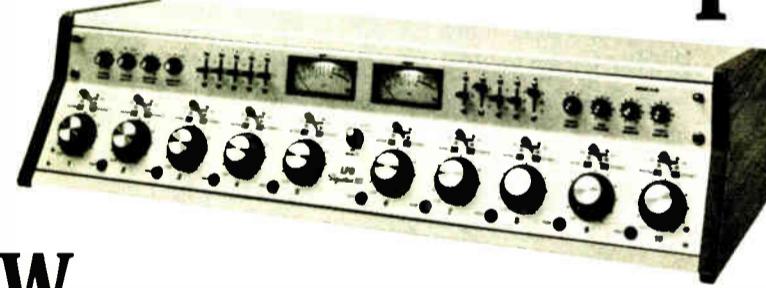
Making bad worse

The SBE pointed out that the new crop of Docket 80-90 frequency allocations will only worsen the crowding in the 900 MHz auxiliary bands.

Regarding Cellular 21's sharing proposition, SBE commented that its ability to coordinate conflicting users in Part 74 bands depends on compatible sharing partners. "There has never been compatibility between STL/ICR fixed users and mobile users, even within the broadcast industry, much less on an interservice basis," SBE wrote.

For more information, contact Matt Edwards or Myron Weiner at Cellular 21 in Rutherford, NJ, 201-507-5200.

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Chances are, it's all of the above. But whatever the reasons, leading stations and engineers across the country demand Signature III's "unstoppable" performance. In fact, they've made it one of the most popular consoles ever built. If you've been spending too much time inside your console lately, contact your broadcast equipment dealer or call LPB for full information and specifications at (215) 644-1123.

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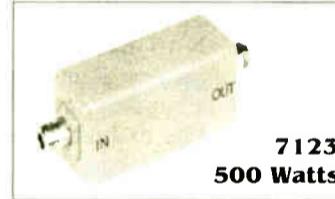
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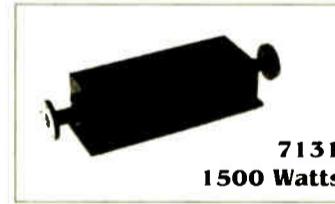
Circle 76 On Reader Service Card

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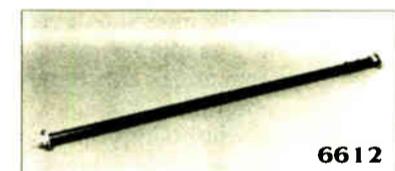
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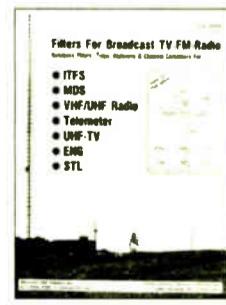
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World Radio History

Circle 30 On Reader Service Card

Capturing the Sound Of LA's Philharmonic

by Frank Beacham

Los Angeles CA In a cramped, dimly lit sound booth, atop tight rows of tiny knobs on the audio console lay an orchestral score for Jean Sibelius' *Symphony No. 5 in E flat, Op. 82*. Inches away, intensely scrutinizing the sound through headphones, is Joseph Magee, part musician, part engineer, part producer and "ear" extraordinaire.

A hundred feet below, in a wooden stage shell in the Dorothy Chandler Pavilion, 100 members of the Los Angeles Philharmonic majestically perform the Finnish composer's "war symphony." It's dress rehearsal and the quest for perfection under guest conductor Vladimir Ashkenazy is intense.

Behind the scenes

Magee, preparing to record the performance for national radio broadcast, has little time left for microphone adjustments. He directs audio engineer Fred Vogler, high atop a ladder in the nearly empty 3200 seat auditorium, to move the microphone array less than an inch.

In the minimalist world of microphone placement, Magee says, a few inches can mean the difference between a great recorded performance and a disaster.

Joseph Magee, 36, is one of a handful of American audio engineer/producers responsible for the broadcast sound identity of a major philharmonic orchestra. A former professional musician who specializes in recording classical and acoustical jazz, he demands that everyone on his engineering team have musical, as well as technical, experience.

A seven-year veteran with the Los Angeles Philharmonic, Magee is in the midst of recording a 13-week concert series with the Los Angeles Philharmonic that will be broadcast on the National Public Radio (NPR) network next summer. The series is being co-produced by the LA Philharmonic, NPR and Los Angeles public radio station KCRW.

For Magee, every performance is different and each calls for a recording technique to suit the circumstances. But the general rule of thumb is the fewer microphones the better. Thus, he refers to his miking philosophy as "minimalist."

Miking the classics

"Acoustical instruments in a classical setting don't sound quite right when you get up on them too close," Magee said. "The overall balance of the ensemble doesn't come together until you get away from it. Same thing with a large chorus. It is really up to the conductor to create the balance in the ensemble, not me. If I can come up with a stereo system that accurately represents what's occurring—as best as I can, because we know this is an interpretation—then the conductor and the ensemble can do the rest."

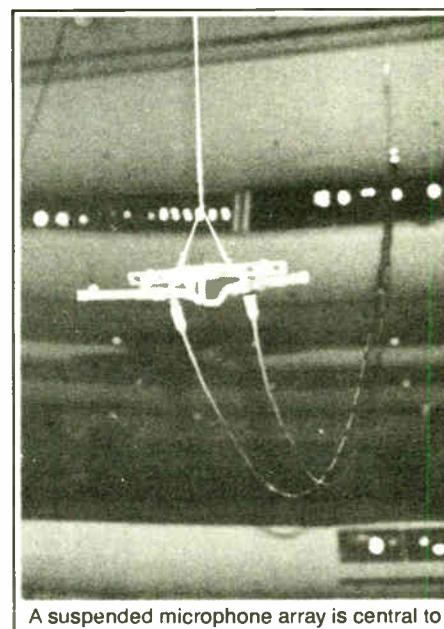
For this performance of the works of Sibelius and Schoenberg, Magee chose a spaced omni/near coincident microphone technique.

"It's a four-microphone system," he explained. "In the center, there's a spaced near-coincident cardioid B&K (Brüel &

Kjaer) 4011 system with about a 110° spread. There are approximately 12 inches from capsule to capsule. Hard left and hard right are Sennheiser MKH 20 omni's."

The four microphones hang in the same plane on a single ceiling-suspended harness about 11' above and 5' in front of the orchestra. There is a distance of about 30' between the two Sennheisers, with the B&K array in the center.

Magee chose this miking technique in part because of the 70' high unsealed wooden shell enveloping the orchestra.



A suspended microphone array is central to the recording process.

"The shell in this house has gaps everywhere. Information is escaping out the back. And the shell doesn't reinforce the double bass instruments. They barely make it into the house," he said.

"By using this combination of spaced-omni and near-coincident techniques we can get in fairly close to the ensemble. So we are not out in the hall far enough to have to rely on that shell to project too far," Magee said.

Knowing the setting

Because of the shell problem, Magee added a Shoeps cardioid as a spot microphone to touch up the principal bass player. "It's the only spot mic out there and that's to get the bow on the string ... the impact and definition. The spot mic is very low in the mix."

From the microphones Magee insisted on using Monster Cable's Pro-Link Series 1 and M1000 cable. "I know. When you start to get into the differences in sound in mic cables there are hard core engineers who are against this, many of them my best friends," Magee said, laughing. "And then other of my best friends who work hard at this and know cables say they are getting to be like microphones and preamps in the way they sound."

"I say the mic cable makes a lot of difference. The way I've proved it to other folks is to have a set-up with an orchestra like this and change only the cables ... nothing else. There was a big difference. That's how I justified getting this cable in here."

(continued on page 20)

World Radio History

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Circle 10 On Reader Service Card

Subtleties of Symphonic Miking

(continued from page 19)

Next in the chain are Jensen Twin Servo microphone preamps, located in the theatre rafters at the top of the micro-



Magee rides gain as the band plays on.

phone hang. "The Jensen has an incredibly beefy power supply. You can hit it with a wallop. That's an important thing to have when it's up in the middle of nowhere," Magee said.

The engineer's console of choice is the original prototype of the Rama WRS-852. "Great simplicity. No automation. Great grounding scheme. Quieter and has better cross-talk rejection than any of the studio consoles I've sat behind. Great for straight-to-two-track stereo recording," Magee exclaimed.

The only processing in the mixing chain is a Lexicon 480 digital reverb unit. "This thing is a lifesaver because when you are doing live recording for broadcast you generally can't utilize ambient microphones due to the noise," Magee said.

Recording process

The only quality concession to skimpy public radio budgets is the recording medium. Magee prefers high-quality analog but called it cost prohibitive in this situation. "In order to do really great analog, it's going to cost you about three times as much as digital. It's a sad thing we can't get our everyday digital to come up to that level," he said.

For the radio broadcasts, two digital recording systems are used simultaneously. The primary recorder is a Panasonic SV-3500 professional DAT recorder with custom-built analog electronics on the front and rear end. A dbx 700 Digital Audio Processor with a Panasonic VHS video recorder also is used to record the concert.

"The first thing I see in all DATs is the analog electronics are very, very poor, no matter how good the digital electronics are," Magee said. "So the first thing we do is get rid of them and put in good analog electronics. This machine sounds very nice but is still a little hard in the high end. A little brittle up there. Otherwise it sounds very nice. I would say most people would be happy with it."

Magee will record two performances by the orchestra of the same material. The best of both concerts will be combined with feature material produced by host Gail Eichenhal for each two-hour broadcast. Post production, which was to begin in early 1990, will be performed on a yet-to-be-determined digital random access editing system.

Magee said.

"If I'm lucky there's someone at a station with equipment that's fairly respectable ... maybe he has Dolby SR, 15 ips; maybe he has a good-sounding or modified DAT; maybe he has a tweaked-to-death F1 ... something respectable. Even if a guy is using Dolby A, 15 ips, with good tape on Studer machines, I'm still happy. But when we get involved with those facilities using 406, 206 and 207 with no noise reduction, even on a good machine ... Come on, we've got problems."



Balancing the sound of an orchestra is the conductor's job, Magee said.

Regardless of the high sonic quality of the original production, Magee is uncomfortable with the broadcast chain that will follow. "We used to have concert feeds which would originate from our master to the satellite at a precise time and stations would take the down-link and go directly to air. But that's not done much anymore. Most of the feeds are now taped by individual stations."

"This is classical music ... the dynamic range is excessive, signal to noise is going to be imperative and the quiet passages are going to end up in the noise floor. This is something I don't really want to think about. There are some stations out there who really care a lot."

For information from Joseph Magee, call him at Magee Audio Engineering, Culver City, CA, 213-558-4208.

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Circle 65 On Reader Service Card

Japan Wary on DAT

by Bryan Harrell

TOKYO JAPAN Sensitive to further criticism from the US, Japanese manufacturers continue to be extremely cautious on questions about DAT, even when the questions pertain to professional broadcast equipment.

An Aiwa representative acknowledged his company's deal in the spring of 1988 to supply 1000 units of a special broadcast-version DAT machine to Harris Corp. of Melbourne, FL. Since then, however, Aiwa has not exported any machines, though some—made their way through grey market channels to America and Europe, alongside those of other manufacturers—Sony and Technics in particular.

The rep indicated, however, that Aiwa has a strong interest in supplying broadcast-use DAT equipment, though there are no definite plans at present.

This fall, Aiwa will make strong efforts to market its new portable DAT recorder. The main unit is extremely compact (3.7" x 1.5" x 5.75", 21.5 ounces), and boasts a price tag to match: 77,000 yen (\$550 at the current rate of \$1 = 140 yen). For recording from analog sources, the snap-on A/D converter (22,000 yen/\$157) is necessary.

Another major feature is still video recording with the connection of a snap-on adaptor (53,00 yen/\$379), which sandwiches some 3600 images alongside a digital audio soundtrack on a single 120-minute cassette. Though resolution is not exceptional, future versions of this technology for broadcast use could be used in such applications as news programs.

Other firms were less talkative on professional DAT.

A representative of Matsushita (Panasonic/Technics) said his company was interested in future development and currently working on several different prototypes but he had nothing to announce at present. Representatives of two other firms currently producing broadcast equipment, JVC and Teac, declined to answer questions on DAT.

Sony's public relations office in Tokyo, however, has a lot to say about the future of DAT. "Professional DAT recorders are not affected by consumer considerations," spokesman Paul Campbell said.

Sony has exported to the US and other countries for the past two years, he said. The Sony professional DAT line now includes a portable recorder, a desk-top recorder and a duplicator and Campbell indicated the line will be developed further in the future.

"Broadcasters are currently using a variety of different systems, both analog and digital," Campbell explained, "and we expect that DAT will be a very attractive proposition to them."

He added that Sony's current range should be extended to suit the needs of broadcasters. "We will be talking to them about this in order to make DAT a broadcasting standard," he said.

Bryan Harrell begins as a Tokyo-based contributor to *Radio World*. He is a correspondent for RW's sister publication, *TV Technology*. Harrell is Tokyo Correspondent for *Stereo Review* and a contributor to *Stereo Guide of Canada*. He also writes a music column for *The Japan Times*.

World Radio History



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From Engineer to Salesperson

Tracing the Evolution Of Calling Cards from Pocket Protectors

by Dee McVicker

Tempe AZ If Charles Darwin were alive today, he would no doubt be intrigued by the radio engineer's pocket protector. A tool holder, maybe. But Darwin would have a time of it trying to figure out how this plastic substance had evolved into a calling card.

Although the data is virtually nonexistent as to how many pocket protectors have transformed into calling cards, casual observations aren't as easy to dismiss as vacant statistics. According to some observers, the emergence of the manufacturer's calling card from the engineer's pocket protector is simply a by-product of the broadcasting environment.

Jeff Detweiler, whose pocket protector turned calling card when he started at

OFFBEAT RADIO

QEI as a sales engineer in 1985, isn't convinced there is an evolution going on inside his left breast pocket. But he does voice concerns that the broadcasting environment is not altogether that healthy. "Broadcasting is not competitive as far as salaries go," he offered. "For the engineering expertise and what it costs to get that, it's a better return on your investment to pursue sales."

Frank Foti, who as director of engineering for Malrite Communications got its powerhouse, New York's Z-100, up to speed is now operator and owner of Cutting Edge Technologies, a processing vendor. Foti echoes similar concerns.

His best guess is that the salary ceiling for radio engineers is somewhere in the neighborhood of \$100,000 annually—not a hefty paycheck given that these engineering jobs are far and few between. Then too, he is quick to point out that comparable radio department heads are paid considerably more.

"The people that are bringing home the major dollars in broadcasting, probably radio or TV, are those that are directly related to the bottom line," he observed. As a good example, Foti compares his accomplishments at Z-100, Malrite's top-ranked New York station, with the accomplishments of his department counterparts.

"If I would have turned my engineering accomplishments into programming concepts that would have directly impacted numbers or notoriety for the station, I would have probably made a half a million dollars," he notes.

The big picture

The puzzle to the pocket protector evolution, however, cannot be pieced together on just salary deficiencies. Rick Funk, previously an assistant engineer with a Chicago station and now an Allied sales engineer, said there's a larger,

more global picture.

"Engineers are being laid off, there's less and less jobs available," he commented, citing his own experiences. "One of the things that precipitated me to look around was the fact that there was a major management shakeup going on at the station."

With the station changing to an easy listening format, Funk reasoned that the

better? "Yes I would," he said, "even the hours notwithstanding."

If it seems that Detweiler is a fish out of water—to coin a phrase appropriate to Darwin's evolution theory—he assures us he's not. According to Detweiler, the transition from pocket protector to calling card is in some ways a natural evolution for radio engineers. "You're a problem solver to begin with," said Det-

"For the engineering expertise and what it costs to get that, it's a better return on your investment to pursue sales."

engineering staff of seven would no longer be practical for a station running on automation.

Funk's observations were correct: six months after he left the station to start his tenure with Allied, all but one engineer were let go.

For Mike McKenzie, formerly director of engineering for Carlson Communications and now product manager for Gentner Engineering, the big picture is all-encompassing. Taking a small pay cut to join the manufacturing ranks, McKenzie opted for greater career opportunity and more challenging work. "For a long time I've had an interest in the bigger picture," he said, adding that it wasn't possible to pursue this "by focusing on one station, or one group of stations."

Mckenzie also finds that the hours are longer in his manufacturing capacity than when he was a radio engineer. But, even the big picture aside, he considers these hours to be more fruitful. "When I stay here 'til 10 o'clock, I have a feeling of accomplishment," he said.

For Detweiler, his sales engineering job is a reprieve from the long hours he kept while engineering a radio station. But he does admit that in some ways he enjoys engineering more than sales. Would he go back to engineering if the pay were

weiler. "With engineering, most of my problem solving was over the phone, dealing with the talent."

Not a stereotyped engineer (he really didn't have a pocket protector), Detweiler began as a radio announcer and then moved into engineering because that too was a natural career progression.

"I run into at least 20 percent of the engineering community that seems to have moved from some on-air position or programming position because it paid better," he said. Compared to engineers in other industries, this background could very well make it easier for the radio engineer to move in to more people-oriented jobs, like sales.

New skills required

Nonetheless, the transition can still be a difficult one. Funk too started in radio as an announcer, but his move from hands-on engineering to sales engineering required a new understanding of people. People skills, said Funk, "traditionally have not been a requirement for the job, so engineers historically haven't developed this skill."

Funk was also taken by surprise by the breadth of equipment on the market. After engineering three radio stations, he

was sure he knew most of the products on the market. "I thought I had a very good overview of all the equipment that was available," Funk said ruefully. As it turned out, his exposure to Allied's vast equipment line was fairly limited and he found himself intrigued—and challenged—by all that was available.

Currently, Funk is challenged by the engineering exposure he gains while working with some 150 stations. The practical knowledge of system design is far more reaching in his current capacity than in his radio engineering days, due to the variety of station problems that he solves on a system level.

The one area that Funk feels he's not getting enough exposure in is engineering on the circuit level. Said Funk, "When you're an engineer, the skills that you refine are pretty much on a circuit or system level. When you get into this area, you're still working on systems, but you don't have that circuit level experience on a day-to-day basis anymore."

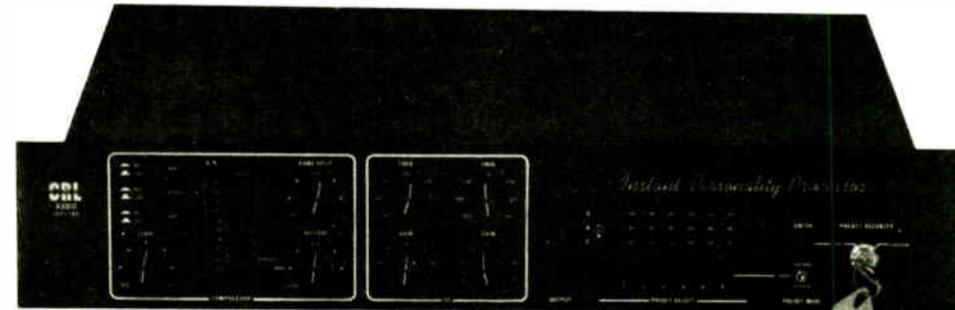
Detweiler echoes the same concerns. "What I try to do," he said, "is go out and help people on a regular basis and stay active. I don't charge for it, because that would be a conflict." Both Detweiler and Funk have tried to maintain as much of their engineering background as possible, including the acceptance of their engineering peers.

When asked if the old Alma Mater considers him to have sold out, Funk replied, "If they have, they haven't told me to my face." Detweiler replied with candor, "Some of them, I'm sure."

This, if it does exist, doesn't seem to hamper the evolution of radio engineering to manufacturing. If there is a grain of truth to Darwin's evolution theory, then it is possible, though unfortunate, that the radio engineer will be an extinct breed in the coming future.

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

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The Limits of DCO Responsibility

To Be on the Safe Side, Inform the Licensee of Violations at the Station

by Harold Hallikainen

San Luis Obispo CA This series of articles is intended to provoke discussion of the FCC Rules regarding the technical operation of radio broadcast stations and to serve as a monthly reminder to the DCO or contract engineer of the various FCC requirements.

INSIGHT ON RULES

I recently received an interesting letter from Tim McCartney of McCartney Radio Engineering (Bemidji, MN). He raised a couple interesting issues for discussion.

Threatened with a fine

Tim wrote of an engineer who was "summoned down to the St. Paul FCC office a few years ago and threatened with a fine because of a major FCC vio-

... I'd say that the DCO is not responsible for acts of the station licensee.

lation at the station for which he was contract engineer." Tim was told that the FCC said the contract engineer should have reported the licensee violation to the Commission, even while working for the station!

I spoke with the station engineer. He told me that a gopher ate through a buried DA control cable, preventing one tower from being switched to DA. Because the ground was frozen and covered with two feet of snow, the station licensee decided to put off the repair until spring (several months). The station operated non-directional at night while awaiting spring.

Disgruntled former employee

Meanwhile, an announcer left the station and reported this situation to the FCC. On inspection, they asked the chief operator if there were any directional problems. The station was fined. A while later, the chief operator received a Notice of Apparent Liability for \$500. The FCC field office wanted the chief operator to report the illegal operation.

Arguing that this would not help his employment situation, the FCC eventually dropped the fine against the individual. I was told that all this occurred in 1984 or 1985.

I have only once heard of a similar situation. In that case, the DCO had destroyed some station logs and instructed the other operators to "fake" new logs.

This was several years ago, so I don't remember exactly what happened, but I believe the DCO lost his license.

In the late 1970s, the FCC first allowed high power or directional stations to be operated by operators holding less than First Class licenses (lesser grade operators). At that time, the concept of a designated chief operator was introduced. My 1980 copy of the rules contains the following:

"73.93(h) When lesser grade operators are used, in accordance with paragraph (d) or (e) of this section, the station licen-

see must designate one First-Class Radio-telephone operator as the chief operator who, together with the licensee, shall be responsible for the technical operation of the station . . ."

Since then, the First Class license has been eliminated, the license requirements for DCO have been reduced to any license not specifically endorsed to prohibit broadcast operation (such as recently issued General Radiotelephone Licenses) and the operator requirements for the various broadcast services have all been combined into one section

(73.1870).

The current 73.1870 requires a station to designate a chief operator. Rule 73.1870(c) requires the DCO to do required inspections, field strength measurements, review station records (logs) and "advise the station licensee of any condition which is repetitive."

Because 73.93(h) definitely said the DCO is responsible for the technical operation of the station and that rule was replaced by a rule that does not definitely say so, I'd say that the DCO

(continued on page 31)

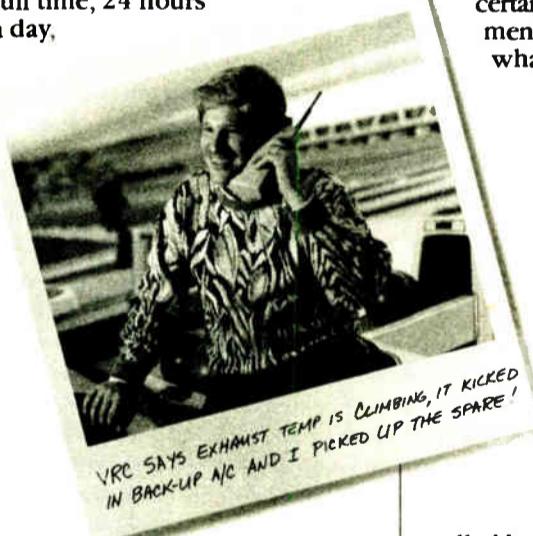
Remote Control Systems

How to get an engineer to babysit your transmitter 24 hours a day, 7 days a week, and like it.

Babysitting the transmitter is no one's idea of a good time. Somehow, nothing seems to go sour from nine-to-five. You get "beeped" or called at the most inopportune moments. They're in a panic and you've got to jump in the car, race to the site and start problem solving. What a nuisance.

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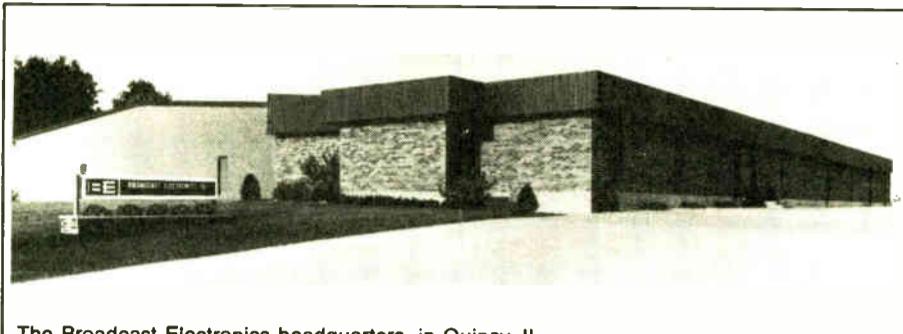
BE at 30 Years: A Retrospective

Quality in Products and Personnel Are Essential To Broadcast Electronics

by Tim Wetmore

Quincy IL The New York Yankees had triumphed in the World Series. Dwight Eisenhower was President and the Soviets had launched the first manned rocket into space. The year was 1959. Most Americans still had black and white television sets and AM was the dominant force in radio.

That same year, Broadcast Electronics came out with the first cartridge machine and the broadcast business has never been the same since. At that time, the company was based in Silver Spring, MD and that's all it did: made cartridge machines.



The Broadcast Electronics headquarters, in Quincy, IL.

would want to be located in rural mid-America.

The reason was the work ethic. Cervon understood that if the company was to avoid suffocating from its past of making one basic kind of product, it needed to expand and diversify, with quality production, and that this could only be done with the strong foundation of a highly trained and dedicated work force.



Then: (seated, from left) BE's VP/Operations W.T. Ash, President Larry Cervon. (standing, from left) Treasurer Robert Weaver, VP/Marketing Curtis Kring, and VP/Product Management John Burtle.

The Broadcast Electronics of today, based in Quincy, IL, is a diversified electronics manufacturer with a stable management team leading a growing staff of dedicated employees.

It has, however, been a long journey, reflecting in its progress some parallels to the changes occurring in the broadcast world itself.

But Broadcast Electronics, unlike the industry at large, has been able to increase both its market share and its reputation. To do this in today's equipment marketplace means that a company must have both the engineering vision to develop advanced products as well as the agility in its management corps to realize that vision.

A puzzling move

In 1977 when BE left the bustle and confusion of the Washington, DC area to relocate to the green, rolling hills of Quincy, IL, very few people beyond Larry Cervon, president of the company, understood why a company interested in building a reputation as high tech electronics contender of the future

He found it in Quincy.

After Motorola vacated a plant there, hundreds of motivated and professionally qualified electronics people were available. Cervon hired as many as he could and, to this day, the vast majority of the employees provided with that opportunity remain with the company.

The management, too, remains stable, with every one of the top six executives having been with the company longer than a decade, some from as far back as 1973. Think about what the broadcast business was like in 1973.

The people at Broadcast Electronics would know because almost all of them came out of the radio business or the broadcast equipment business. Cervon, for example, has been in broadcast since 1945 and later succeeded Parker Gates, running the Gates Division of Harris for seven years.

Products and people

Whenever a company has clearly reached a new level of producing advanced technology for an entire industry, it is always easy to point to the

have before."

Another asset of the company, related by Cervon, but echoed independently by each member of the management team, is the importance of research and development. "We consider it a capital asset," Cervon declares, "a continuous investment which represents a large proportion of our revenue."

Bob Weaver, Treasurer, VP of finance, who also came on board in 1976 when the company was still in Maryland, veri-



Prior to Quincy, BE's headquarters was in Silver Spring, MD.

products.

Products like the Control 16 Automation System; the first single tube, 30 kW FM transmitter, incorporating the patented, folded half-wave cavity; the Mix Trak 90 console line and the Phase Trak 90 cart machine, which introduced the technology of non-encoded, automatic phase correction cannot be ignored when analyzing forward leaps

fies that, "We spend considerably more than the industry average on R&D and more than other companies our size."

Knowledge and love

There is yet another high level manager who has been with the company since 1976. John Burtle, VP of product management, with experience at Harris and Gates prior to joining BE, feels the



And now: (seated, from left) Ash, Cervon and Kring. (standing, from left) Stephen Wall, director of personnel; Weaver; Geoffrey Mendenhall, VP/Engineering; and John Burtle.

of technology.

The real answers, however, can be found among the company's people.

When Cervon joined the company in 1976, VP of operations Tom Ash had already been with BE for two and a half years, having had 15 years of experience as a design and production engineer with Bendix.

"The success of Broadcast Electronics," says Ash, "stems from the direction of its management, innovative and reliable products and the emphasis on quality of service. We also have provided the customer with a choice he didn't

success and longevity of the company are due to the fact that "most of our people are broadcast-oriented and all of them have a knowledge and love of the industry as well as a dedication to the company and the industry it serves."

In regard to the industry and the place of Broadcast Electronics in it, the latter half of the company's 30 year journey has seen a radical shift in the industry's attitude toward the company.

Burtle allows that, "The introduction of the microprocessor controlled automation system, the Control 16 and the

(continued on page 28)



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In fact, even if you haven't spent years in the studio, it will only take you a few minutes to figure it out.

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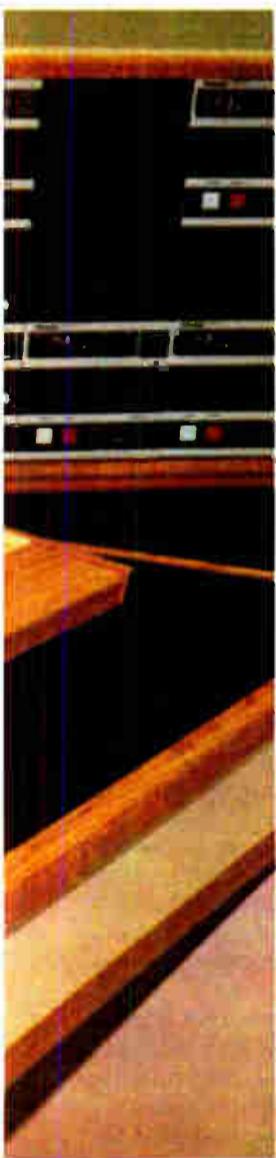
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Looking Back on the First 30 Years of BE

(continued from page 24)

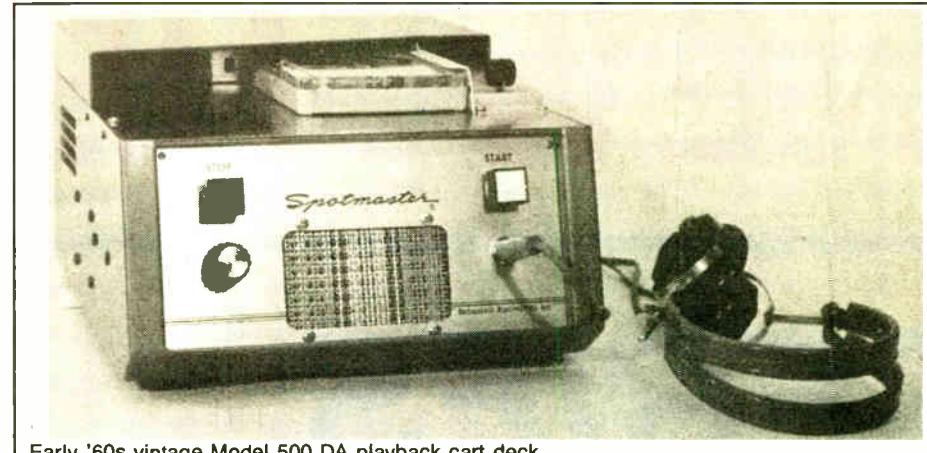
introduction of our advanced FM transmitter line were instrumental in changing the industry's image of us."

The FM transmitter line is the result of a lot of work and insight by many people. The design work is conducted under the auspices of the engineering department directed by VP of engineering Geoff Mendenhall.

After serving as a design engineer with E.F. Johnson and with Gates and

Harris, Mendenhall moved over to Broadcast Electronics to develop the RF Group and was RF section manager until 1981, when he began directing the company's research and development activities.

"The folded, half-wave cavity design had already begun when I got here and was, in fact, part of the reason I joined Broadcast Electronics. The company's dedication to advanced design and quality and to the radio industry were very



Early '60s vintage Model 500 DA playback cart deck

important to me and I continue to insist on that myself."

Mendenhall has continued that tradition, assuring that the advanced technol-

ogy of the company's transmitters can be delivered to places from Thailand to Chicago.

People are the key

Yet the products, Mendenhall insists, are not the only thing he looks at. "The people here are the reason for the success of this company. We have tried to provide the right environment for them to work in, to help foster creativity.

(continued on next page)

More Letters from Readers

(continued from page 5)
want to listen.

Faced with these realities, the solution is to become excited about 100 watts at 100 feet, when present 3000 watt FMs are screaming, begging and legally seeking more power to remain competitive? Doesn't this alone put things into perspective?

No, we do not need to create another class of sub-adequate facilities.

Equally important, the FCC needs to stop pussyfooting around with bringing AM into the same competitive ownership arena. It is now permissible to buy a closer AM. Small solace. My competitors are AM-FM combos in the same community. They combine for double my reach, economy of operation and the added value combo rate ad sales leverage.

For AM to become equal with FM, radio needs to become simply "radio." Let it be owned in the same way—a combination of any two facilities in the market. This would result in consolidation of weaker operations and give the combined entity greater competitiveness with "super stations."

In summary, equity in market ownership privilege, combined with reasonable power levels and reasonable fulltime service, all of this and nothing less is required to spare the demise of smaller local stations now rapidly going dark. Or is the latter the unwritten agenda for "cleaning up the AM band?"

William A. Reck, Owner
WPTL
Canton, NC

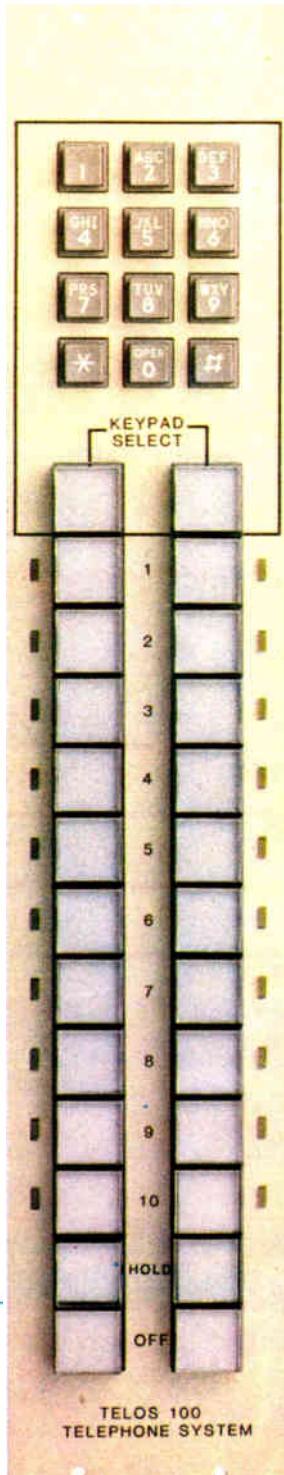
PS: It was mentioned the low power FM would provide good coverage up to 3.8 miles. My tower is 3 miles from the studios so at least my announcers could hear the station. As the owner I probably couldn't—I live 14 miles from the tower site. My 500 watts extend 23 miles or so and listeners still complain about reception (and yes, I have "state of the art" Texar processing, NRSC standard in place, etc.. etc.)

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People, Products Are Key to BE's Success

(continued from previous page)

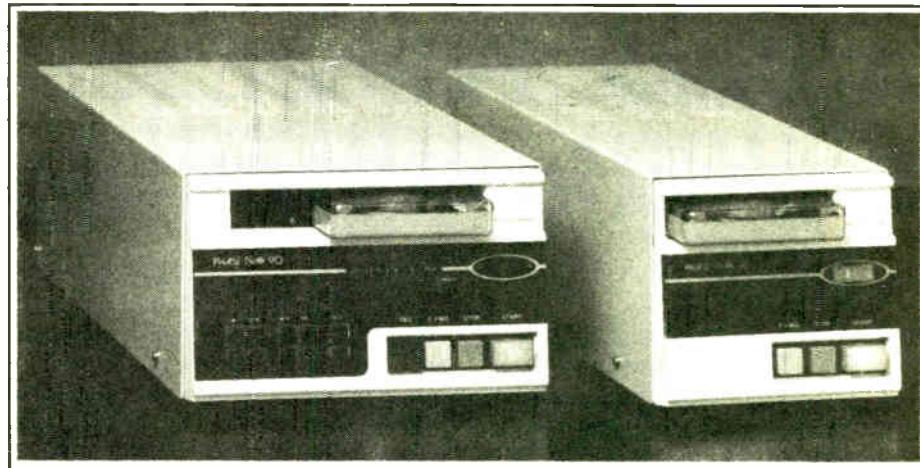
People are more important than a company banner or brand name."

You could almost say this is the company fight song. Curtis Kring, VP of marketing, who arrived in 1977 reiterates the point.

"Our success has been built on a

Group W AMs. In fact, Walden has two of them, in operation for about three years.

"These systems," Walden explains, "were a departure from all previously existing designs, achieved through digital implementation. We made our choice based on the fact that the Broad-



Today's Phase Trak 90 machines are a tribute to the timelessness of their features.



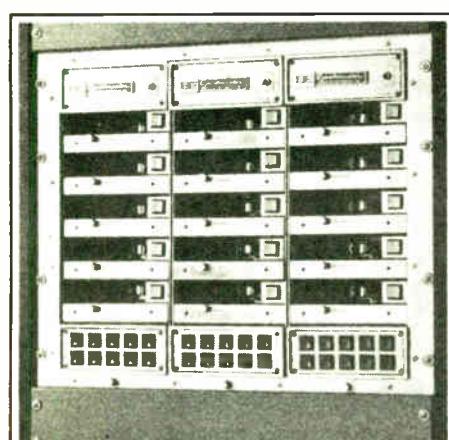
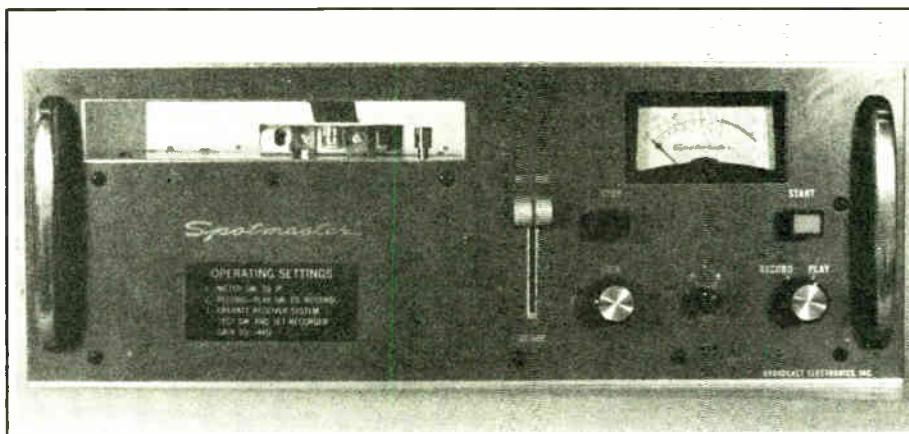
The '60s saw the introduction of the Model 500 variable speed deck circa 1965 (above, left), the Model 400 cart player in 1967 (above, right), and the Model 500 rack mountable deck in 1968 (below).

breadth of product line, a philosophy that quality is everybody's number one concern and the realization that it's the long term strategies that work. Above all this, the biggest thing in our minds, is that our people are most important to us."

Kring's history is solidly in the broadcast world. He worked for Microwave Associates, Harris and General Electric, and has always been in broadcasting, at radio or TV stations or at companies manufacturing equipment for those industries.

Looking to the future

With a concentration over the last two years on marketing improvements, on growing internationally and creating



The Model 305 five-deck cart machine was discontinued in the early '70s.

more organizational depth than in the past, Kring looks to the future of the company as it fits into the industry. "We will need to introduce both new product lines as well as deepen our existing lines with new products. These are, of course, already under way."

Beyond the Dura Trak and Phase Trak 90s, Broadcast Electronics has made significant headway with second generation C-QUAM AM Stereo systems. In Philadelphia, Group W AM Station Engineering Manager E. Glynn Walden opted for the BE system at all the

Perfect reception in long yardage situations.

Shure's new FPI1 and FPI2 field production units help the signal come through loud and clear. The compact size and ultra-rugged design of these units make them perfect for ENG, EFP, film and even sound reinforcement situations. Lightweight, with belt clips, they'll go

anywhere to cover all the action.

FPI1 Headphone Bridging Amp

The FPI2 lets you check any audio line through headphones, without terminating the signal. The unit accepts standard 1/4" or 3.5 mm mini-plugs. Its 96 dB of gain drives headphones even with a weak signal.

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For more information on Shure's complete field production family, call or write Shure Brothers, Inc., 222 Hartrey Ave., Evanston, IL 60204, (312) 866-2553.



A Basic Primer for Digital Interface Use

by Mel Lambert

Studio City CA It is often all too easy to overlook the fact that digital technology, *per se*, doesn't just mean elegant boxes that do such a stunning job of digitizing, storing, processing and replaying stories, music, drama and other essential radio material.

Before there were affordable 16-bit PCM recorders, digital meant dedicated microprocessors and general-purpose computers for controlling automation systems, signal routing, billing and other chores around the station.

Understanding digital recorders

Remember that, in reality, a digital recorder or processor is nothing more than a very fast, custom designed mini-computer. Its sole task in life, rather than process complex spreadsheets, is to convert audio into a string of 16-bit numbers, store them on a magnetic/optical medium and then replay them for our delight and edification. The real magic came in reducing the cost of such systems to a point where we could afford to use them outside of a well-funded R&D lab!

It occurs to me that our current appetite for affordable recorders and editing

systems for air and production studios means more than cultivating a knowledge of general digital interface schemes such AES-EBU, S/P DIF, SDIF-2 and the other lexicons of our age. Most CD players, DAT machines, editing controllers and other recent components of the all-digital studio feature serial and/or parallel control ports, whose origins date from the early days of computer connectivity and networking.

With just a modicum of engineering talent and ingenuity it is possible to

DIGITAL DOMAIN

fabricate a customized system that can streamline some of the more mundane button-pushing and stop/start functions we encounter every day around the station.

Most devices now sport some form of remote control. Parallel, switch-closure type remote ports, while useful, are usually pretty restrictive in the kinds of functions we can effect from a distance. (Not to mention the fact that we need a single connection per function; a cable trunk the diameter of your wrist is prob-

ably not the way to go if you need to access every front-panel button and keypad command!)

A better and more compact approach is offered by serial interfaces of the type we see on a growing number of CD, DAT, reel-to-reel, NAB cartridge and other devices. Using simple commands, running at moderately fast bit rates, we can implement a host of useful functions from a distance.

themselves. As a first-stage implementation, consider fabricating dedicated boxes that can issue commands in response to pre-designated sequences of front-panel button pushes from a mixing console and/or which can direct the appropriate commands to the required CD or DAT machine located in a remotely located rack system.

Subsequently, such a configuration can be easily upgraded to accommodate

The majority of equipment we are likely to encounter in the studio features RS-232 or RS-422-type serial interfaces.

The majority of equipment we are likely to encounter in the studio features RS-232 or RS-422-type serial interfaces. Designed originally to enable computers to interconnect with a range of peripheral equipment, including terminals, printers, modems, plotters, scanners and other input/output devices, we can now use the same hardware and communications protocols to stop/start and otherwise manipulate audio hardware.

Standard RS-232/RS-422 connections can be run via simple two/three/four-wire circuits (422 is, in essence, an electronically balanced version of 232, designed for use in more "hostile" RFI environments, and over longer distances) using simple, two/three/four-byte commands.

Two scenarios immediately present

a central computer which, with suitable software, will extend the programmable capabilities within a radio facility.

Applications

Typical applications might include the setting up of an automated replay sequence using a collection of CD players or pre-recorded DAT tapes; controlling various CD, DAT and conventional tape machines in a full-on production suite from one remote control panel, rather than cluttering the console with a bunch of different remote boxes; or maybe automating routine machine alignment tasks around the station, utilizing a microprocessor-controlled test station and an off-the-shelf general-purpose PC.

A simple configuration might comprise a controller located at the sound

(continued on page 41)

Clean up dirty

For some listeners, waiting for things "you can't say on the radio" is part of the fun. But with today's free-wheeling talk radio formats, controlling what actually goes out on the air is more essential than ever. Now Eventide's BD941 and 942 Broadcast Audio Delays are here to make effective obscenity protection more affordable than ever.

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OK, you're on the air, and someone's just opened his or her mouth a little too wide: Just hit the *Delete*

talk dirt cheap.

button to delete an obscenity, and you're instantly back in real time. The BD941 and 942 delays also have a set of relay contacts that close automatically when *Delete* is pressed. You can use the relay to start a cart or other device to fill the delay period. Then, after the delay period expires, the unit automatically switches back online for full delay protection. What could be simpler?

The full bandwidth audio performance of the BD941 and 942 is everything you'd expect from Eventide, the world leader in talk show delays. All at a price that makes talk cheaper than ever. How much cheaper? Talk to your broadcast distributor, or call Eventide for the good news.

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What to Do About Licensee Violations

(continued from page 23)
is not responsible for acts of the station licensee.

However, the DCO is, of course, responsible for her/his own acts and must not violate FCC Rules, even if so directed by the station licensee (see section 13.62, Violations; aiding and abetting).

In many cases, I believe, it would be difficult for the station licensee to violate a rule without the DCO also violating the rule . . .

ting). This may make the station licensee unhappy and could result in the firing of the DCO, but that would perhaps raise reasonable grounds for a wrongful discharge suit.

FCC speaks

I spoke with Leonard Langley of the FCC (by the way, his number is 202-632-7000) regarding this issue. Based on our conversation, it appears that when the FCC changed its operator licensing procedures, they made the station licensee responsible for the selection of qualified operators.

If the acts of an operator get the licensee in trouble, there may be grounds for civil suit by the station licensee against the operator, but the Commission will probably not take action against the operator. To be prudent and comply with 73.1870, the DCO should notify the station licensee of any violations in writing.

Mr. Langley did not say it was necessary to notify the FCC.

In many cases, I believe, it would be difficult for the station licensee to violate a rule without the DCO also violating the rule, or at least "aiding and abetting,"

which would then cause the DCO to violate 13.62.

The DCO should know the rules. Assume nothing! Don't assume because you've heard or read something (including here) that it is fact. When in doubt, read the rules. With notification of the FCC, the rules allow almost anything to go wrong at a broadcast station and allow the station to continue to operate and not violate any rules.

What to do

To comply with 73.1870, the DCO must notify the station licensee of any repetitive violations (possibly due to transmitter operator error or equipment in need of repair or replacement). I believe such an approach will minimize FCC action against the station or the DCO.

Finally, early this year I got a copy of the vast majority of violation notices issued to broadcast stations in 1988. These 2500 pages were obtained through a Freedom of Information Act request with the FCC.

We received "Notice of Radio Station Conditions" (FCC form 790), "Official Notice of Violation" (FCC form 793), Notice of Apparent Liability (NAL), Notice of Forfeiture and all related station correspondence. The 1200 or so violations have been put into a database and sorted by FCC rule section.

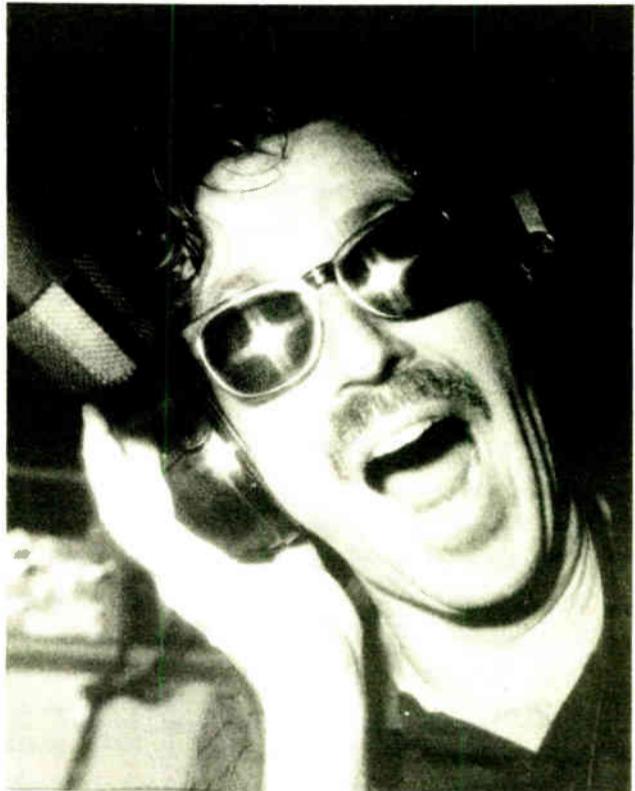
The rule section, station call, fine, reduced fine and comments are listed for each violation. The comments are a summary of what the FCC found and how the station responded. Chief operators can use this list (which runs 25 pages) as a more complete "FCC Checklist" to check compliance at individual stations. Call or write for a copy.

Again, I will look forward to your comments on these issues or other FCC issues you are facing.

• • •

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.

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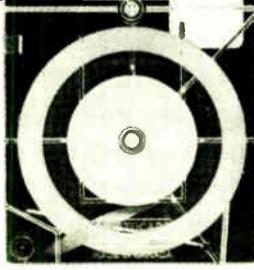
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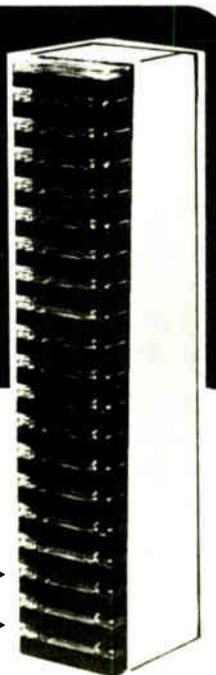
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Origins of Today's Digital Technology

This is the first installment in a 12-part series called An Introduction to Digital Electronics. Northern Virginia Community College will offer 1.3 CEUs (continuing education units) to registered students who successfully complete the course and an examination mailed at its conclusion. To register, use the coupon below.

by Ed Montgomery

Part I of XII

Annandale VA The latter portion of the twentieth century has brought great changes to the world of electronics. The field has changed from one concerning itself with linear operation of active

devices to a controlled non-linear operation identified as digital electronics.

Fundamentally, digital systems are electronic devices that operate in two discrete states. This principle combined with the development of the integrated circuit is the driving force behind pocket calculators, clocks, personal computers, video and audio discs, and state-of-the

art transmitters.

It is now important that all individuals working in electronics have an understanding of digital circuitry.

Analog versus digital

For years, linear or analog operation was the standard in electronics circuit design and operation. Figure 1 is an illustration of one cycle of a sine wave. An analog circuit will take this signal and attempt to reproduce its electrical signal variations at every instant throughout its cycle. The voltage and

Much of the digital technology associated with communications has its roots deep in the history of electronics. One of the first circuits employing electronic circuitry surrounding the concept of operating at defined levels is the television sync generator.

Birth of the sync generator

The sync generator was developed in the 1930s by RCA when it invented the totally electronic scanning system. The original generator required several racks of equipment. Most of its functions can

Figure 1.

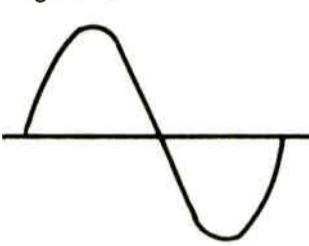
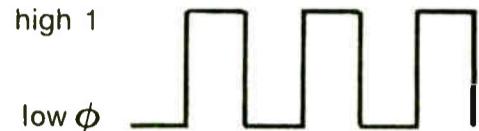


Figure 2.



current within an analog circuit can be said to vary continuously.

A digital circuit operates at defined electrical levels. Figure 2 is an example of what a digital circuit might look like. Digital circuits are designed to handle signals only classified as "high" or "low" as illustrated in Figure 2. These levels are often referred to as "0" for low and "1" for high.

This rather simple form of circuit design has resulted in circuits with a high degree of reliability and accuracy in very small packages. The development of this technology has brought about programmable watches, robotics and synthesized speech. Test instruments relying on digital technology include multimeters, counters and oscilloscopes.

In communications one must remember the digital technology employed in Pulse Duration Modulation transmitters. This technique has improved transmitter audio at high power reducing harmonic distortion along with the amount of power required to run the transmitter.

now be performed on a small chip.

In the early 1960s, Gates developed the first direct FM broadcast transmitter. This system employed "serrisoid modulation" converting analog signals into a series of pulses resulting in a frequency modulated signal.

This technology employing sawtooth waves and triggers is very similar to PDM technology in present day AM transmitters and FM systems going all the way back to Edwin Armstrong's research. The method of encoding an analog signal into frequency deviations contains much of the technology surrounding the digital audio in use today.

Additional study material for this course includes the American Radio Relay League Handbook and an excellent text: *Digital Electronics*; third edition, by Roger Tokheim, McGraw Hill, 1990.

• • •

Ed Montgomery currently is an electronics teacher at Thomas A. Edison High School in Fairfax County. He has taught broadcast engineering at Northern Virginia Community College and has worked as a broadcast engineer for several radio stations.

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Voice Power by Mic Processing

by John "Q" Shepler

Rockford IL Everybody wants that BIG VOICE sound. You know the one: The master's voice rumbles through the stereo speakers and plates fall off the walls. Those who have no fantasies of sounding bigger than God at least want to cut through the music. Nothing sounds more wimpy than being buried by the opening riffs of the next selection.

Giving nature a little help is nothing new. Most main line processors have very complex systems for creating the illusion of audio that's larger than life. It's the illusion that's important. Raw audio is boring. Even the classical stations squeeze a good 20 dB just to sound "normal."

Sometimes the main processor coupled with the right mic will be all you need for music and voice. However, if your voiceovers need more punch or you just want to smooth out some of that high power talent, then supplementary microphone processing is the answer.

The basic microphone chain

The microphone processing chain can be as complex as your main processing. It can cost as much, too.

Sounds strange, but remember that the music has already been processed at the recording studio. What comes off the

already processed music.

Voices don't have a lot of inherent power. If you look at the mic signal on a scope you'll see lots of peaks and a fairly low average. You want to bring that average up but not destroy the peaks.

Peak limiting the microphone often tends to have a negative effect on the announcers' ability to punch the heavy

traction by reading or announcing while you practice, skim an aircheck of their mic audio only. This has to be raw audio from the mic preamp and *not* off the air. Now hook the EQ to the output of the tape against the raw audio. When everybody thinks the equalized sound is better, you're done.

You'll also notice that the compres-

Now the effect is done with microprocessors or charge-coupled devices and is a lot more controllable. Reverb does add some liveliness to raw mic audio, especially in a dry room. However, resist the temptation to add more than just a touch. It has a tendency to come out sounding like a broadcast from the deep dark caverns.

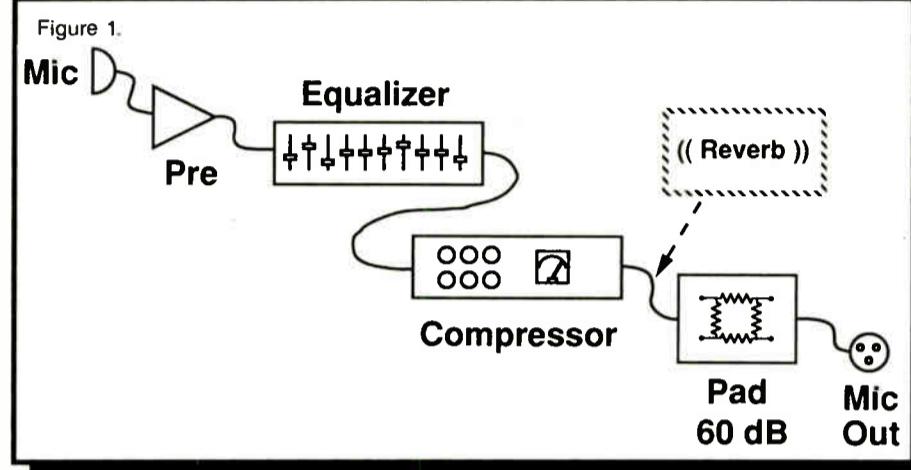
Final touches

Most processing gear is line level in and out. You feed the first box from an outboard preamp. Board preamps may or may not have enough gain. If not, you'll need a booster which is easy to make. If you have severed the preamp output, then the last device is padded down somewhat less to drive the mixing buss.

Preserve your headroom by getting the levels set to their previous values. Also, remember to preserve impedances. The mic input expects to see 150 ohms. The pot or mixing buss expects something different.

Mic processing can be a lot of fun. You can roll your own or use one of the all-in-one boxes on the market. Just be sure to add only a *touch* of processing power to make those voices sound realistic, but indeed larger than life.

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



peak limiting and trigger on the peaks of the studio output. If the mic peaks are cut off, the music peaks will grab the limiter and bury the microphone. You are better off leaving the mic unprocessed but turned up a bit so that the voice peaks can punch through the music.

What you want is a compression effect to make the voice heavier. This is done with moderately fast attack and release times. If the release is too slow, then no power will be added. If the attack is too fast, then you'll get peak limiting. A compressor with adjustable attack and release time constants is great to play with. Otherwise, you have to swap resistors and capacitors until you get the desired effect.

Fast recovery compression takes some getting used to. The usual comment is that it "sucks you into the microphone." This is especially true on pauses when the gain reduction keeps recovering. Studio noises are amplified and headphones become feedback sensitive.

A solution is to gate the compression so that when the announcer stops, the gain freezes. Also try limiting the amount of gain reduction. Forty dB of compression is probably worse, not better than 20 dB.

The power microphone chain

Figure 1 shows a power processing chain with a compressor and a few additions. An equalizer has been added after the preamp. This can be a graphic or parametric EQ. It is driven by an outboard preamp, or by breaking the output of the preamp to insert the processing equipment.

The equalizer needs to be fine tuned for each voice. It's like creating a custom microphone for each announcer. If your announcers are working close to directional mics and sound mushy from the proximity effect, you can pull out the mush at 200-400 Hz and boost the EQ at 50-100 Hz to keep a tight low end. You'll probably also add some presence in the 3-5 kHz band.

Here's a hint for tuning the equalizer. Instead of driving the air staff to dis-

sor changes the EQ requirements. As the time constants are speeded up, the low end gets denser and some of the high end gets a little too crisp. You'll have to compensate.

An optional piece of gear is the electronic reverb. Years ago, this was a box of springs originally designed for electronic organs. Boing ... Boing ... Boing ...

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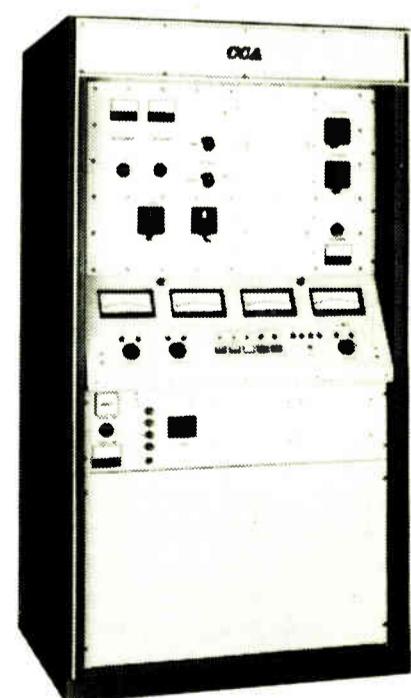
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Q-TIPS

CDs may have been through a million dollars of sweetening equipment before it got turned into little digital bits. Your voice signal probably comes straight from a \$100 cardioid mic that's located in a less than perfect acoustic environment.

The bare minimum microphone chain should be a good quality mic driving a low noise, large headroom preamp. Most board preamps are OK. You can check by feeding an oscillator to the mic input at -55 dBm. Then leave the board pot alone and crank up the drive until the preamp starts to clip. If you're lucky, you'll have 40 or more dB.

You need this overload capability to take care of screamers. Remember, the mic goes directly to the preamp. The pot is after the preamp and won't do a thing to prevent clipping.

Pick a mic you like. Things to look for are a gently rising response at the higher frequencies for a crisp sound and good overload capability. A lot of the older dynamics sound dull. The condensers may bite a little too hard. You decide.

Just one suggestion: If you're not going to process announcers individually, try to make all of the mics in the station the same. You'll get a lot more consistency from air to news to production.

Where it begins

Mic processing usually starts with a compressor or gain rider. Mic compression is done for the same reason as main line compression ... to add power to the signal. In this case, the idea is to add power to the voices so they can effectively compete with the

Observations on SBE 1989, or Greetings from KAY-CEE-MO

by George Riggins

Culver City CA Back in the "Good Old Days" of WW II, Kansas City was always talked about as a wonderful three-day pass town. Never did find out why myself, never having the privilege of a pass any time I was anywhere near KC-MO. But, we all know how legends grow with each telling.

During the 1989 SBE Convention in the aforementioned town, we—Helen

and I—stumbled onto a very nice steak house in the basement of the Radisson Suites Hotel just two short blocks away from the convention center. The service was excellent, and the steaks were tender and juicy. The filets were cut the old fashioned way—across the grain. Most enjoyable, but not cheap! The 1989 SBE Convention is history. Is the history we want to remember good, or are there items that should be changed for next year?

Where are the young folks?

The first observation that hit me was the lack of an under 35 crowd. Yes, there were a few who were not yet 35, but the majority of the participants seemed to be over 45. Where have the young folks gone?

There was good traffic during the hours that were allocated for the attendees to visit the lairs of the vendors. All of the vendors with whom I conversed reported good attendance and participation at the trade show.

As reported to me, one no-show exhibitor divided booth hours by the show costs and decided the costs were too high. The particular vendor is a mathematician who looks at everything only in a dollars and cents manner. No

long-term outlook! No thoughts about what talking to potential purchasers could do for future sales.

One comment overheard concerned the quality of the audio/visual presentations. The words were something to the effect of "I could only hear about half of the audio, and could neither see nor



read the visual presentations. If I tried to make a presentation to my management with the same quality of audio or visual, I would be thrown out." (No criticism of the audio system of the convention center, just that we as technical people have not learned how to use what we construct.)

Trying to use a computer display and an overhead projector leaves much to the imagination. At times the printing is impossible to read, colors are washed out and graphics are barely passable.

Another comment came from an engineer who says that he is color blind. He cannot read most of the visuals because of the colors used.

One positive observation regarding the visual portion of the presentations involves two of the commercial vendors. Both Broadcast Electronics and Harris had good graphics, although on one or two slides some of the clutter could have been removed by going to an exploded view. Color choices were good and the size of the printing was large enough to be read from the back row of the room.

Devil's advocacy

It is not my domain to comment on the technical sessions other than to try to be devil's advocate.

To that end, I submit Bell Atlantic, which, with its new fiber optic installations, planned for delivery of standard telco signals and anything else that can be sold for a profit. It seems to me a little presumptuous for one of the telco companies to try to figure out how private choices made inside the home can be documented and the results sold for a profit to anyone with money to spend.

Admittedly we are a profit driven society, but it seems to me that there are some areas of business that are not ethically correct. Perhaps legal, but not ethical!

There was much talk about AM stereo and the fact that most of the stereo signals are better than the mono signals. What about the fact that the entire audio chain must be properly matched (levels and impedances), the transmitter must be broadband and the antenna must present essentially a flat load so the side bands are not restricted by rapid changes in radiation resistance or "j" factor when the carrier is modulated.

In short, the plant must work in the best possible manner for the stereo AM signal to sound decent. On the negative side, there is some degradation of signal in the fringe areas.

Radio in the outback

We drove to Kansas City by way of Tucumcari, NM, and Liberal, KS. Very interesting to try to find a listenable station before daybreak out in the hinterlands of the US. Five miles out of town, about an hour before sun-up, the two best stations to be received in western Kansas were KFI and KNX.

Yes, there were other stations, but the fade from the east made listening untenable, stations from the north had the wrong nighttime patterns and the southern Texas stations could not be heard. It took almost 45 minutes after the sun was over the horizon for KFI and KNX to disappear. After that it was the local station or nothing.

Listening to FM is an interesting experience in the "outback" as our friends from Down Under would say. It does not take long to know which FM outlet has all of the SCA channels sold that are possible to sell. The auto-seek on the receiver stops but the audio level must be turned up almost to maximum to hear any sound.

Perhaps one should not try to do any serious FM band listening when out of sight of the antenna. No wonder tape sales are so good. In fact, by stopping at any controlled intersection and listening to what comes from the automobiles, one soon learns that tape or CD is what the 18 to 26 year olds have coming from the vehicle and at a very high volume. The BMW and Mercedes crowd is a little more laid back, windows closed, but again, other than traffic reports, tape is the thing.

(continued on next page)

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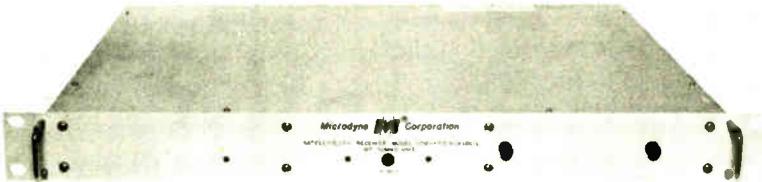
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59 YEARS AGO

Noises in Sets Defined

Hissing, Howling, Popping and Other Interference

By Fred D. Rowe

Radio Interference Investigator, Pacific Radio Trade Association, San Francisco

THE classification of noises has recently been made after an exhaustive study of various kinds of interference. The following is a list with definitions that can be made to suit any particular type of noise:

1. GRINDING—like the sound of gears running. (Not in a set but in some kind of machine.) This may be from motors in general, but possibly originates in some types of electrical equipment. It may also be "atmospherics," or more generally known as static. Some phonograph records also cause this noise.

2. ROARING—sounds quite a bit like an airplane making a power dive. Oil burning furnaces cause this particular sound, and also diathermy equipment, when such equipment is fairly close to the receiver. The oil-burner noise will vary in time, on which may be from 30 seconds to 90 seconds or more, approximately.

3. HISSING—like the sound of steam escaping. This is especially true of diathermy apparatus, heard at a distance from the interfering source. The effect is background "hiss" with a distance station or low power local, and after a certain distance away from the apparatus this "hiss" is perceptible only with the station being received riding in on its

carrier wave and not on a dead spot on the receiver. What is known as a power leak may sound quite a bit the same but will generally have a lower pitched note and contain a faint "roar."

4. POPPING OR SPUTTERING—No definition need be required. It is just as the name implies. An occasional "pop" is generally caused by a circuit somewhere being turned on or off. A series of "pops" in rapid succession may be from street car trolleys or rough track or the controller being operated on car trolleys or rough track or the controller being operated on the car. Flashing signs also will cause this unless properly filtered. Keying of code transmitters can cause it also.

5. HUM—This effect is often more or less confused by the layman with a so-called "power leak." It is commonly known to radio men as an "A. C. hum." Its pitch is a sound something like a steamship's whistle and of course continues as long as the set is turned on, regardless of the volume adjustment or any station being received at all. Some sets have more or less hum on account of their design. Others that normally do not hum, and such developments may be due to defective tubes, parts, etc., or occasionally from a poorly grounded or ungrounded neutral service wire. This hum "rides in" with one or more stations and is generally not heard on a "dead spot."

6. BUZZ sounds like a bumble bee. Characteristic of "power leaks" on high powered lines. Also may

originate at several other sources of most any power. The effect may have a varied pitch, depending on the voltage and source, but will generally be a combination of "hissing," "roaring" and "humming" all in one.

7. GRATING sounds like the scraping of sand paper on some object. The bare aerial wire swinging in the wind against some object may cause it, or high resistance connections or defective condensers and resistors in the set.

8. SINGING such as one hears on long distance and sometimes local telephone lines. This may be prevalent on a trans-continental broadcast and sometimes elevator motors in apartment buildings may sound quite a bit the same, but much louder. Street car motors have also been heard creating the same effect.

9. HOWLING—This should not require definition. Generally caused by defective (especially gassy) tubes, or can be other defects in the set itself. May also be from improperly operated receivers, or occasionally originate in the microphone at the broadcasting station.

10. WHISTLING may come from (a) weak tubes, (b) defective condensers, (c) heterodyning of two stations, (d) weak batteries of a battery-operated set, (e) regeneration receiver in the vicinity or (f) one's own set.

(From "Pacific Radio Trade Association News," a section of the San Francisco "News.")

Reprinted from Radio World, 18 July, 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.

Thoughts on Kansas City

(continued from previous page)

Motorola, represented by Steve Kravitz, was pushing AM Stereo and had listings of available receivers and original equipment for the 1990 model cars. Also available was a listing of all stations using the C-QUAM Stereo system. Rather interesting.

No war in country

One final comment from the drive to and from Kansas City. The sound quality seemed to be easier to take as we got further from the competitive big city markets. Must be less processing with no loudness wars.

Another thought concerns the educational FM stations. The majority of the signals were excellent, good dynamic range, no loudness wars being fought. Just good audio being presented. No comments regarding the programming or type of entertainment being presented.

How about a couple of sessions next year on proper microphone techniques and visual presentations? Perhaps another session should be put together on

how to best influence and impress management with what we as technical people can do for our employer.

Why not make a list of desired goals for the coming year? Break the goals down into small increments and then further set goals by the day, week and month. Show cost per month, week, day and hour. Do the same with each task or improvement thought necessary.

How many of us have an equipment budget or even a list for future use? How many of us even think about new studio equipment until something breaks or blows? Many subjects for future discussion.

Planning for SBE 1990 should have started within 60 seconds of the close of SBE 1989. At least I hope it's already underway.

■ ■ ■

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

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When Is it All Right To Mock the FCC?

Prepare for Inspections By Conducting Your Own, with These Lists

by Tim McCartney

Bemidji MN Because your station is going to be inspected, fines can be avoided by preparing for the inevitable. The best strategy for a pleasant meeting with the FCC inspector is to conduct your own mock inspections on a regular, surprise basis.

First, the staff needs to know about the inspections. You and your management team need to decide in advance how to deal with the results, in order to be discreet with those "sensitive new age announcers" likely to be encountered.

Once these infrastructure decisions are made, a checklist is needed to guide the inspection. A few options exist here. The FCC Field Operations Bureau (FOB) has published and makes available checklists designed to help stations maintain compliance and thereby be ready for an inspection.

The FOB has prepared two such checklists in the last several years. The more recent, from 1987, is FO Bulletin

No. 18 entitled *Broadcast Service Checklist (AM/FM/TV)*, FCC Rule Part 73. It is brief in comparison to its predecessor published in 1984, with no publication number listed, entitled *AM & FM Broadcast Station Checklist*.

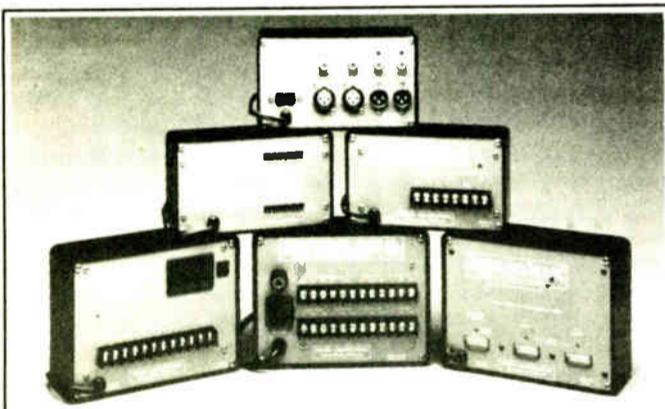
The approach is different for the two documents. Figure 1 is a compilation of the 1987 issue, while Figure 2 summarizes the 1984 checklist.

The former suggests procedures for compliance while the latter delves into

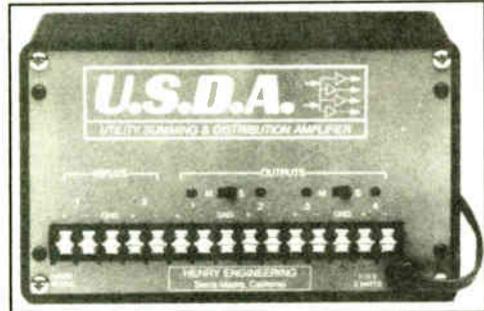
**... it's cheaper
and easier to be
ready for the
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far greater detail concerning those items likely to fall under FCC scrutiny. Both, however, expand upon the titles shown by listing the relevant FCC rule numbers for each category, although the Figure 2 (1984) checklist differentiates between AM and FM rules.

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**Figure 1.
Broadcast Service Checklist
(AM/FM/TV—1987)**

Interference

- Operation within limits
- Remote control, ATS equipment, extension metering
- Directional antennas—maintenance

Safety

- Antenna structures and lighting
- Fencing requirements
- EBS requirements

Service quality

- Technical parameters
- Modulation

Administrative and non-technical

- Licensed operator on duty
- Designation of chief operator
- Posting of station and operator licenses
- Public inspection file
- Station logs
- Special technical logs
- Measurement records
- Station identification
- Specifications for indicator instruments

Figure 2.

AM & FM Broadcast Station Checklist—1984

- Station documents and records
- New station notices to be filed
- Transmitters
- Studio and control point
- Tower and antenna
- Modulation monitor
- EBS
- Remote control operation
- Extension metering
- Station log
- Public inspection file
- Automatic logging
- Radio operator
- Other operating requirements
- AM measurements
- Directional antenna system
- Stereo and SCA operation
- Automatic transmission systems
- Auxiliary broadcast stations
- Remote pickup stations
- Aural broadcast auxiliary stations (205 individual checklist items under the above categories)

The shorter Figure 1 checklist, for example, advises stations to "maintain a public inspection file that is complete, current, easily accessible and readily available for inspection by the public, at a permissible location."

The more detailed Figure 2 checklist addresses the same issue with 11 additional points. For example, does the file include annual employment reports? Issues/programs list? Public and Broadcasting Procedural Manual? Political Use Requests?

It's not always easy to obtain these checklists from regional FOBs. And,

even with them in hand, there may be areas which you feel are not clear or not covered adequately. They do, however, serve as excellent resource materials from which to design your own mock inspection checklist, incorporating those concerns unique to your station's operation.

In any case, it's cheaper and easier to be ready for the FCC visit than to pay the fine. This is clearly one situation in which it's good business to mock the FCC!

Tim McCartney is a contract engineer in Bemidji, MN. He is an SBE Senior AM/FM Broadcast Engineer, a former radio station engineering director and general manager, and has a masters degree in human resources management. He can be reached at 218-751-1680.



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Get More Creative With Your Sampler

by Bruce Bartlett

Elkhart IN In last month's *Line Out*, we explained what sampling is, how it works and what its parameters are. Let's continue our coverage by suggesting some effective techniques for sampling.

When recording a sample, first set the sampler to its highest sampling rate for maximum fidelity. If the end of the sound gets cut off (because memory is used up), reduce the sampling rate.

You can save memory by using the lowest sampling rate that provides adequate sound quality. Some samplers let you change the sample rate after recording. You might want to record at the highest rate, then lower the rate until the sample starts to lose high frequencies. Set the rate slightly higher than this point.

Another way to save memory is to record at a slow rate so that the tone quality is dull. Make it bright again by run-

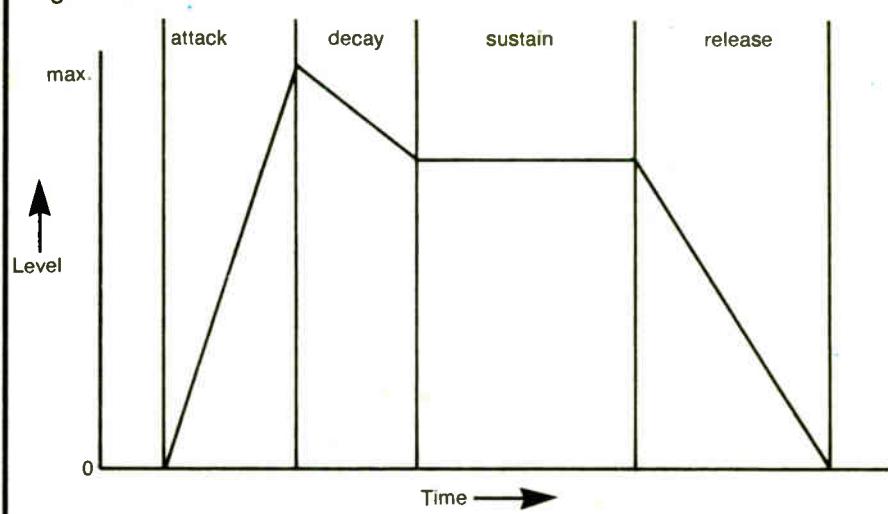
In other words, many sounds can be stored in different memory locations. The multi-samples can be different pitches of the same instrument, or can be different instruments.

Adjusting for pitch

After you record a sample, see how far up or down you can transpose its pitch before it begins to sound strange. Multisample the sound at those pitches. Bass

(continued on page 38)

Figure 1.



LINE OUT

ning the sample through an exciter signal processor.

Microphone selection and placement are critical when sampling. Use a high-quality microphone—one with low noise and wide, smooth frequency response—and place it carefully as suggested in previous *Line Out* columns.

Headphone check

Before sampling a sound source, turn up your headphone volume to listen for noises. Get rid of rattles in acoustic sound sources and clean up hum and hiss in electronic instruments.

You might want to record multiple takes of each sample on analog or digital tape first, then transfer the best take to your sampler. Record a wide variety of sounds for each sample. For instance, sample a snare drum at different miking distances for different amounts of ambience. Or sample a sax playing softly as well as loudly.

When recording a sample, record at as high a level as possible without clipping. Most samplers have a small "clip" light that indicates whether the signal is distorting. Note that slight distortion for a few milliseconds on percussive sounds may be inaudible.

To capture the attack (the beginning of the note), start recording first, then play the sound to be sampled.

Listen to the sample just after recording to make sure it sounds clean and accurate. If not, reset the recording level and sample again. Play the sample over the keyboard range in which you want to use it. Does it sound usable at all transpositions? If not, you might not want to keep it.

If you want room ambience as part of the sample, record the sample in a room with suitable acoustics and place the mic relatively far away.

If you fill part of the memory with one sample, you can fill the rest of it with other samples, up to the memory limit.

Be prepared.

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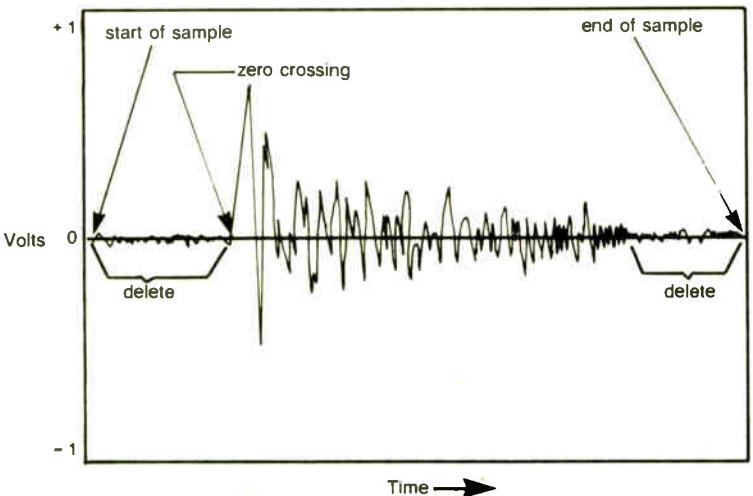
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Circle 93 On Reader Service Card

World Radio History

Figure 2.



Effective Techniques For Audio Sampling

(continued from page 37)

sounds transpose up well, so one low-pitched sample is enough for the full range of the keyboard. One sample (mapped or assigned to middle C) is usually enough for a tom-tom or cymbal.

The envelope of a sampled note is its rise and fall in volume with time. Playing a sample an octave lower cuts the speed of its envelope in half; raising it an octave doubles the envelope speed. The same is true for any modulation of

the sample (such as vibrato, tremolo, phasing or beating).

When you're multi-sampling, record high frequency instruments or long duration notes first, because they fill the most memory. If you record these sounds last, they might cut off should the memory be used up.

Processing samples

You might want to equalize the sample while recording it so that it sounds right whenever you play it.

Many samplers let you modify samples. For example, you can use the sampler's low-pass filter to filter out high

Microphone selection and placement are critical when sampling.

frequencies either to change the timbre or to filter out clock noise when transposing downward.

Or you can change the envelope: give a piano note a slow attack time so that it gradually rises in volume. Or you can map (assign) the attack time to key velocity: the harder you strike the keys, the faster the attack time.

Several samples can be layered or mixed to create a new sound; for instance, layer a tubular bell with voices. You can combine the attack of one sample with the rest of another sample: a sound might start as a piano and end as a flute.

Editing samples

You can edit the sampled waveform by using a computer connected to a port on the sampler. The computer runs sample-editing software. The waveform of the sample (its voltage vs. time) appears on the computer monitor screen.

When you look at the waveform, you'll see that it has an envelope or overall shape—a rise and fall in amplitude or volume (as shown in Figure 1). The four parts of an envelope are attack, decay, sustain, and release. During the attack, the volume rises from silence to some preset level. During the decay, the volume falls to its sustain level. During release, the volume drops from the sustain level back to silence.

One type of waveform editing is trimming. Immediately after recording a sample you want to keep, you should trim off or truncate silent portions of the sample before it starts and after it ends. That is, remove the portion of the waveform to the left of the attack and to the right of the decay (as shown in Figure 2).

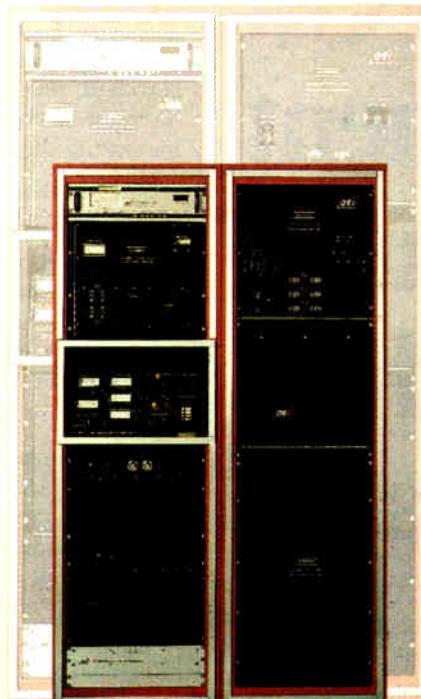
The reason for trimming is that if there are a few milliseconds of silence at the start of a sample, it will play late every time it is triggered. Also, by trimming each sample as you make it, you'll get more samples into a given amount of memory.

Look for the spot where the waveform starts to make large vertical movements.

(continued on page 41)

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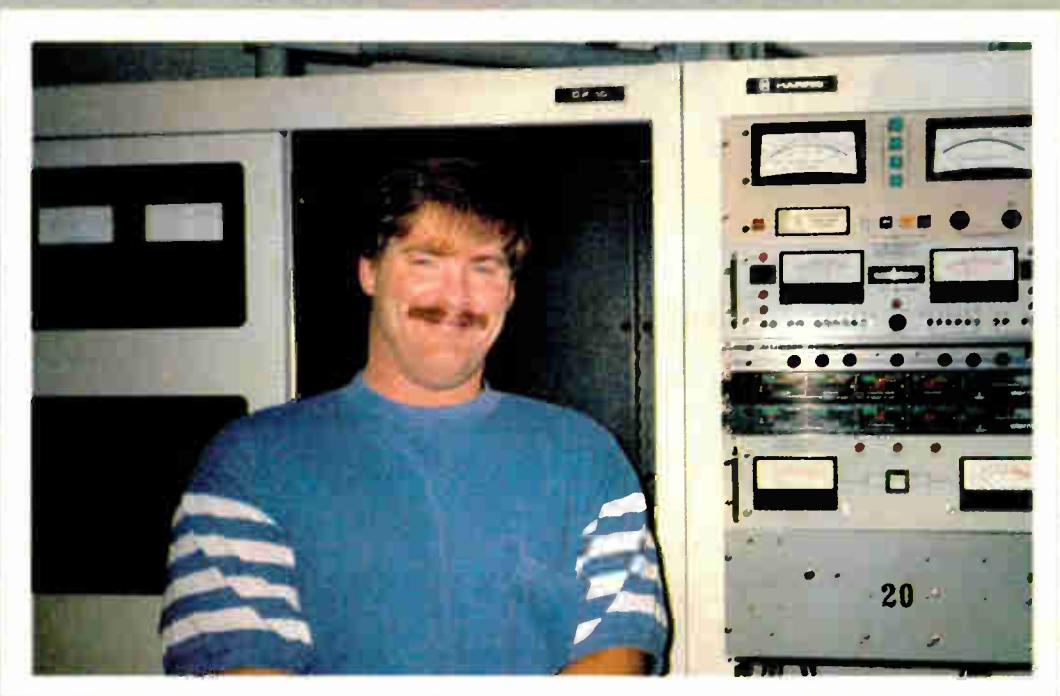
WSEA AM serves the Delmarva region and South Jersey from Georgetown, Delaware. They recently acquired a 10 kW day/1 kW night directional authorization, a Harris DX 10 digitally modulated solid state AM transmitter—and a new Corporate Chief Engineer, Terry Dalton. "By the time WSEA's owner Great Scott Broadcasting hired me," Terry recalls, "they had already decided on the Harris. I could understand that, since the fifteen year old Gates at WSEA still passes its proof of performance tests. But I needed to be sold on the new Harris transmitter. I'd heard about the DX series' all-solid-state design and its digital modulation, but I didn't expect them to make much difference."

Terry ran his DX 10 into a dummy load at full power continuously for six weeks before putting it on the air. "I was ready to jump on the slightest malfunction," he admits, "but I couldn't find anything. That kind of stability and reliability was one thing that turned my head around."



OR AT HOME. DX PERFORMANCE IS AUDIBLY SUPERIOR.

The other was performance—in A/B comparisons we ran with the old Gates, the two signals were like day and night. We had NRSC-2 pre-emphasis on both and an Optimod 9000 with the high end cranked all the way up on the Gates—but the Harris DX



Chief Engineer Terry Dalton

AND "THE BLOWTORCH" WSEA'S NEW HARRIS DX 10 DIGITALLY MODULATED AM TRANSMITTER.

was still cleaner and brighter. The low end from the DX 10 was tight and punchy, with none of the old transmitter's boominess."

When WSEA finally put their new DX 10 on the air, they did it with no announcements at all. "That very first day," Terry reports, "we got calls from people picking us up in places where they never could before. Others commented on how much better we were sounding, even on car radios. We were still running 1 kW under our old non-directional authorization. But we were burning up every other AM in the market, including some that put out an audibly overmodulated signal. Our sales department immediately named this new DX 10 'The Blowtorch'."

Terry verified the DX 10's increased coverage personally on a drive to New Jersey. "I used to lose WSEA around Cape May," he says. "This last time, the signal stayed clear all the way to Atlantic City—a 35 mile increase in range without any more power."

Measurements showed me why we're getting out so much further now. The asymmetries are incredible: I'm running 98/9% negative peaks and 119% positive, with absolutely no distortion or splatter.

In tests, I've taken the positive peaks even higher, and it stays clean. Digital modulation and solid state circuitry make a real difference."

"I was ready to find things wrong with the DX 10," Terry admits. "But its performance and reliability have me 100% sold. As far as I'm concerned, any new Great Scott Broadcasting AM stations will have Harris DX transmitters."

We're glad the DX 10 won Terry Dalton over. It shows that DX transmitters are doing everything we expected of them. After all, real innovations should make a difference in the real world.

If you'd like more information on DX series AM transmitters from 10 to 50 kW*, call (217) 222-8200, Ext. 3408. If outside the continental US, fax your request to (217) 224-2764. And for studio equipment to take full advantage of DX transmitter performance, call Allied Broadcast Equipment at (800) 622-0022.

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Digital Serial Interface Schemes

(continued from page 30)

engineer's position that could control, via a serial interface, the primary transport and front-panel functions of a CD or tape machine. A medium-complexity configuration might involve a master controller that could set up to control transport, record/replay and other functions for various "families" or subsets of machines.

Master controller scenario

Moving on to an even more complex scenario, we might need to establish a master controller that would be able to select a specific CD or DAT machine, for example, from among a family of dozens of transports that can be selected for on-line use, and then maintain full remote control of its various functions.

If such a system reminds you of an IBM PC or Apple Mac connected to a couple of printers, with keyboard selection of routing the current output to either a dot matrix, letter-quality or laser printer, that is hardly surprising. The same type of serial interface we currently

use between these various units can also be used to provide on-line control of studio hardware.

The one possible fly in the production ointment is that suitable software to implement remote control of serial-equipped CD players, DATs and other hardware isn't exactly available off-the-shelf at your local computer store. But, having dabbled recently in the development of a remote control system for a well known brand of DAT transport, I can tell you from personal experience that some powerful tools do exist to simplify your life, at least partially.

Sure you can write the software in BASIC, FORTRAN, PASCAL, C or one of the other higher-level programming languages. (I doubt that you will need to resort to machine or assembly code, simply because the speeds at which we need to run such serial-control software are relatively modest.)

What often happens, however, is that writing the program section that extracts switch closures from the keyboard, compares them with a look-up table, and

then executes the appropriate commands, can take maybe five minutes, while the development of a suitable screen display can often be extremely time consuming.

HyperCard solution

One way around the problem of writing various menu displays that ask questions of the operator and then display the results is to use one of the newer dedicated software languages being developed for hypermedia applications.

One excellent example of the genre is Apple Computer's HyperCard software, which utilizes a very intuitive language known (not unsurprisingly, perhaps) as HyperTalk. Based on simple on-screen button icons, keyboard clicks and/or inputs to one of the Macintosh's pair of serial ports, it is possible to very quickly develop a series of sophisticated control programs.

In essence, each of the various screen panels, or "Cards," can contain a variety of text display windows and buttons. A series of "scripts" written in the easy-to-learn HyperTalk programming language let you write sequences of commands that implement complex input/output routines for controlling virtually any unit equipped with a serial port that communicates via RS-232/422 interfaces.

The information flow can also be bi-directional. Certain audio and video decks, for example, output information

that can be used to display current motion status and shuttle speeds on the Mac's display screen.

And, with the addition of a simple serial-to-MIDI interface, we open up an entire world of remote control of MIDI-equipped signal processors, mixing consoles and effects units.

With such technology you could develop a system that automatically inserts pre-set EQ profiles into the signal path for different DJs or voice-over talent. Or what about being able to switch-select various compression slopes, attack and release times via remote control?

And your future might even include a multi-channel mixing and processing workstation, whose myriad MIDI-and serial-based functions can be controlled entirely from a CRT using a mouse and a few keyboard instructions.

I realize that not everybody has the time and/or inclination to develop sophisticated software for controlling such hardware around the station. But if you are looking for a way to implement a flexible, easy-to-program, relatively inexpensive system for remote-controlling a variety of recording and production devices, a Macintosh running customized HyperCard serial-control software might bear some additional investigation.

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

Techniques for Sampling

(continued from page 38)

That's the attack. Delete all sound data before the start of the attack. (You might want to transpose the sample as low as possible to make silent spaces longer and more audible.)

To make trimming inaudible, cut the signal at a zero crossing where the signal voltage crosses the 0-volt line on your monitor screen. Similarly, cut off all noise at the end of the sample to save memory and reduce noise.

Splicing

Another type of waveform editing is splicing, in which you digitally connect pieces of the same or different samples. In this way, you might create a sound that starts like a guitar, changes to a voice and ends as a harmonica.

You can also loop samples: take a central segment of the waveform and have it repeat continuously, for as long as you hold down a key on the keyboard. When you hold a key down a sample loops during the sustain portion of the envelope. When you release the key, the sample fades out according to its natural release.

To make a loop, choose appropriate points in the sampled waveform to join. The two points should be equal in average level to prevent audible glitches when the loop repeats. The loop can be just one cycle long or longer to include modulations of the note as it plays.

Trim the start and ending of the loop to a zero crossing; this eliminates unwanted clicks at the loop point. Or use crossfade looping which creates a smooth transition.

Some sample editors offer automatic looping and bidirectional looping. This last feature continuously plays the sample forward and backward. Thus, you can double the length of a sustained sample without doubling memory requirements. With this type of looping, you don't necessarily want to trim the beginning and end to a zero crossing. Rather, they should be at the same peak signal voltage at the loop points.

Most samplers or sampler software can play samples in reverse, and can layer or mix two of them. With velocity cross-fading, one sample plays when you hit the key softly; another plays when you hit the key hard. Thus the timbre changes depending on how hard you hit the key, as it does with a real piano.

By following these suggestions, you should be able to record and edit quality samples for use in musical productions and remote work.

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

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Tower, 418' FM, 600' cable 1-5/8", 2 bay antenna tuned to 96.3, also beacon. LJ Maierhofer, WTGC, 101 Armory, Lewisburg PA 17837. 717-523-3271.

Need 190' AM used guyed tower. G Vaile, KITA, 723 W 14th, Little Rock AR 72202. 501-375-1440.

CP antenna, 6-8 bay, tunable to 96.9 MHz, minimum 10 kW input rating; 500'-700' tower, must be cheap. D Carver, KZBK, 107 S Main, Brookfield MO 64628. 816-258-7458.

Self supporting tower, 75' in gd cond, light to medium load capacity. E Goetsch, WXPR, 303 W Prospect, Rhinelander WI 54501. 715-362-6000.

Tower, 900-1100', on ground or standing needed by 1/190. K Austin, KFXI, POB 392, Marlow OK 73055. 405-658-9292.

AM phasor cabinet, 5 tower 1kw tower, w/turning components, any freq, gd cond., T McGinnley, WPGC, Box 10239, Washington DC 20018. 301-441-3500.

Ron Radio Communications, Inc.

AUDIO PRODUCTION**Want to Sell**

UREI 527A EQ's (2), \$500/both; (2) 560 feed-back suppressors w/rackmount, \$350/both. C Bucy, Cisco Snd, POB 16583, Lubbock TX 79490. 806-792-1662.

dbx 224 simultaneous stereo encode/decode Type II NR unit, vgc, \$125. P Combs, Only Son Prod, 2316 Forest Home Ave, Dayton OH 45404. 513-236-2340.

dbx 142 NR units, w/manual, need I/O plugs, \$150 ea/BO; CRL SPP-800 stereo preparation processor, no manual, \$200. M Tosch, KIFM, 5125 Convoy Ste 304, San Diego CA 92111. 619-560-9800.

AKG stereo reverb BX 20 E w/remote, excel cond, amp updates, 2nd unit for spares, manual included, \$395/each. Klaus Heyne, 415-664-0163.

BROADCASTERS

Strozier Electronics Inc. is now buying and selling new and used broadcast equipment. Call us **TOLL FREE** and compare prices and quality.

Call Charlie Strozier
1-800-888-5615

Mic Mix TW-1 time warp effects unit w/manual, as is, looks gd, \$75. D Bailey, 3422 Beech, Roulette TX 75088. 214-475-9796.

Orban XT2 6-band limiter accessory for use w/8100A-1, w/book, new cond, \$1700; Koss digital delay/reverb effects system, rack mt, vgc, \$300; Eventide FL201 instant flanger effects system, as new, w/book, \$400; Sansui QSE-5/QSD-1B 4 chnl encoder, decoder system, rack mt, configured for bdct & recdg std, w/Sansui match box & manuals, \$700; Dolby 334A/FM stereo audio processor w/type 66FM peak limiter module, manual, \$800. E Stoltz, KWOD, 1425 River Park, Sacramento CA 95815. 916-929-5000.

\$199 Mic Mixer

Model MM-6: Six Mic Inputs, 2 Aux's Options: 48V Phantom, Meters, Tone Controls, Bal.Out, Clip LED's. Call!

Gaines Audio 1237 E Main St.
Roch, NY 14609 800-442-2070

Howe 2100 Phase Chaser phase correction unit, excel cond w/manual, \$600/BO. C Osgood, WMWV, POB 2008, Conway NH 03818. 603-447-5988.

Henry Mix-Minus, never used, \$185. T Dugger, 818 Quail Ct, Healdsburg CA 95448. 707-433-9370.

Realistic 12 band graphic EQ, stereo, & a stereo parametric EQ, \$100/both. R Coates, Lakes Recdg, 110 W 11th, Spencer IA 51301. 712-262-3113.

UREI 546 parametric EQ, \$500. B Musser, WMID, Ohio & Murray, Atlantic City NJ 08401. 609-344-5113.

FOR SALE**8 Track Production Studio**

Includes Otari 8 & 2 trk R-R, dbx NR, Technics TT's, Quantum & Soundcraft mixing boards, E-V mics, digital reverb & much more. Too much equipment to list. Would like to sell all for \$15,000 or will sell separately. Call Bob for more information

516-471-2359

Revox B-77 remote tape drive control, full function w/25' cord, never used, \$50; Shure Level Lok audio level controller for mics, new, \$100; UREI 527-A 27 band 1/3 octave EQ w/security cover, \$450. B Spitzer, KKL, Box 460, Rapid City SD 57701. 605-343-6161.

SAE 180 4 chnl parametric EQ, excel cond, \$200. W Laughlin, 753 Ruth, Hurst TX 76053. 817-282-9033.

Audiolab TD-2 degausser, will handle 2" tape, timer & fan, \$150 pls UPS; Atec 1591A compressor, mint, \$175. J Kreines, DeMott/Kreines Fils, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Beyer DT 109 headsets (2), vgc, \$100 ea. M Rice, WKBK, 2360 Hampton, St Louis MO 63133. 314-644-1380.

Luxo-LM 1 mic arm, beige, almost new w/table mount, \$30/BO. W Dougherty Jr, 314-998-2377 aft 6PM.

Various pieces of studio equip including Sound Craftsmen TG-2209-600 EQ; Ampex tube type mic mixer; Ampex 351 tube type R-R; Ampex tape transport system; mc swivel stands; BE cart rewinder; Tapecaster 700-RP stereo cart machine; Marti omni-directional antenna; Rust remo control system, call for details on all these items. Adolph, 915-949-2112.

dbx 140A type II NR units (2), \$250 ea or \$425/both plus \$20 shpg. D Peluso, KJUL, 2880 E Flamingo, Ste E, Las Vegas NV 89121. 702-732-2200.

SM-7 (2) in excel cond; MAP two processor mdls 231; Ampex ATR-700 in excel cond; Ampro 8 chnl board in gd cond, you pay freight. Pam Sutherland, WFON, POB 1388, Gaffney SC 29340. 803-487-7885 aft 5PM.

Tascam 42B used 6 mos, \$2150 pls \$25 shpg. D Peluso, KJUL, 2880 E Flamingo Ste E, Las Vegas NV 89121. 702-732-2200.

Mic-Mix XL-210 reverb unit, new, BO. G Chapekis, POB 22122, Denver CO 80222. 303-721-9156.

Henry Engineering Mix Minus Plus, never used, \$160. T Diggers, 818 Quail Ct, Healdsburg CA 95448. 707-433-9370.

Orban 111B reverb unit, like new, BO. S Chapekis, POB 22122, Denver CO 80222. 303-721-9156.

Shure M267 & M268 M267 \$350. and (2) M268 \$190/ea. mint cond. Orig. manuals and plking, D Jackson, 708 E. Whaley, Longview TX, 75601, 214-236-3015.

Tascam 10 12 x 4 prod board (2), sold as a lot only, \$300 u-pick up/\$500 we ship. L Albert, WKMS, POB 2266, Murray KY 42071. 502-762-4664.

Symetrix T-101 Telephone interface never used (2), BO. D Eressy, 509-945-4855 am.

Orban 245F Stereo synthesizer, never used (2), BO. D Eressy, 509-945-4855 am.

Shure SE-30 mixer/compressor, rack mtg, \$135; Soundcraftsman RP-10-12 10 band graphic EQ, pre VU-metered, 800 ohm out, rack mountable, \$125; Altec 1650 1/3 octave graphic EQ, mono, w/security cover, rack mtg, \$135. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Shure M267 mixer, like new, BO. D Eressy, 509-945-4855 am.

Orban 8000 6 yrs. old, gd. cond. \$1800. B Weeks, PO. Box 107, B Falls VT 05101, 802-422-4890.

Shure M62V audio level controller modified for AC operation, gd cond, \$30. G Mondkowski, 12918 Smalley, Grandview MO 64050. 816-966-0731.

Want to Buy

Parametric or quasi parametric EQ in gd cond. R Coates, Lakes Recdg, 110 W 11th, Spencer IA 51301. 712-262-3113.

Fairchild 670 stereo or mono model compressor; Pultec EQ-1A EQs, working or repairable cond. Mike or Tony, 615-824-9439, 9-5PM Central.

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Older headphones & cards, call or write. J Taylor, WGCA, Box 467, Quincy IL 62306. 217-223-7700.

Texar FM (2), in gd cond. K Hedge, Box 351 Pulaski VA 24301. 703-980-2702.

AUTOMATION EQUIP**Want to Sell**

Automated Broadcast Controls tone generator (2), \$150; Conex CS-25 Sensor, \$150; BE dual tone generator, \$50. C Green, Century 21 Programming. 800-937-2100.

IGM automation system including (3) 48 tray Instacarts, mono, will sell separately, (3) Scully 280 stereo decks, (2) SCM stereo decks, (2) UMC time announce decks, Techtron disc drive, Exel logger, Brain w/10K event & keyboard, new CRT in cart, spare parts kit, (5) racks, \$6000 ea/Instacarts, \$17,500/system. K Stone, 512-345-9300.

BE 16X complete w/4 Revox PR99s, time advance, delay record, live assist & much more, removed from service 2/89, excel cond, \$27,500. D Remy, KKL, 2808 International, Colorado Springs CO 80910. 719-636-1000.

Control Design CD-28, including racks, Carousels, R-R, time announce controller, gd working cond, spare parts, sell separately or as one. E Histed, WDNH, 350 Erie, Honesdale PA 18431. 717-253-1616.

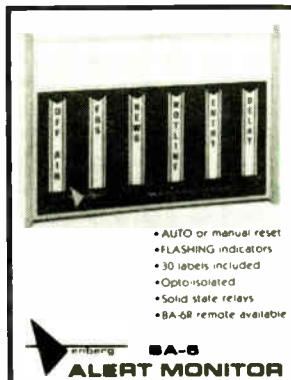
Various pieces of studio equip including Sound Craftsmen TG-2209-600 EQ; Ampex tube type mic mixer; Ampex 351 tube type R-R; Ampex tape transport system; mc swivel stands; BE cart rewinder; Tapecaster 700-RP stereo cart machine; Marti omni-directional antenna; Rust remo control system, call for details on all these items. Adolph, 915-949-2112.

Insta-Cart 48 PBM, like new, all heads perfect, mono, \$5000 or trade w/extral control chassis. D Kohn, KESM, 200 Radio La, El Dorado MO 64744.

Revox PR-99 4 deck, original boxes; P-3A controller, BO. J Phillips, WZOM, 409-1/2 Clinton, Defiance OH 43512. 419-784-1059.

SMC DPI-C automation system including (4) 350 RSB Carousels, (4) SMC/Otari R-R PBs, SMC dual cart, single play deck, (4) matching equip racks, logging w/X-tel printer, digital programmer w/brain & remote encoder w/monitor & manuals, \$13,500. Deb KCM, POB 886, Carroll IA 51401. 712-792-4321.

Sono-Mag/IGM mono 24-slot Carousel cart players (2) in roll-around rack, spare parts & manuals, vgc, \$850 pls shpg. B Mountjoy, WIDD, POB 1240, Elizabethon TN 37644. 615-543-5849.



Panasonic WV-555B, complete ENG package, brand new, \$2500; JVC KY-1900, complete ENG package, \$1450. R Lawrence, Moonshadow Video, 4280 Reston Rd, Roseburg OR 97470. 503-679-8966.

JVC KY310, Fujinon 12x lens w/2X extender, AC adapter/charger, battery, cable, case, gd cond, \$2295; Panasonic WV6000 camera, 10x lens, AC adapter/charger, battery, cable, case, like new, \$1095. D Brennan, Brennan Custom Video, 3596 Lorna Ridge, Birmingham AL 35216. 205-823-0088.

Sony HVC-2800 Trinitron color w/Sony HVA-220/220 AC adapter, works well, \$250. W Watrous, Watrous Video Prod, 739 S Orange, Sarasota FL 34236. 813-366-3316.

Panasonic WV-777 3-tube camera, ENG configuration 12 x 1 lens w/(2) Nicad batteries, (2) chargers, hard case, A/C adapter, operators manual, service manual, 4-pin DC input adapter, \$150. B Marshall, Instant replay Video, 3836 Harvey, Western Springs IL 60558. 708-246-3110.

Sony BVP-30 w/CA-30L, Fuji A14X9 berm, BVF-50 viewfinder, RM-P3, BVW-25, BVBM8021, O'Connor mdls 50 system, all excel cond, low hrs, call or write T Wagner, USArt, 512 S Hanley, Ste 90, St Louis MO 63105. 314-649-7777.

Ikegami IT-2405 (2), 3-tube saticon cameras, complete w/lens, cables, CCU, \$2000 ea/\$3500/both. L Mintzmyer, KOOD, 6th & Elm, Bunker Hill KS 67626. 913-483-6990.

Sony DXC-M3 (2), 3-tube cameras, excel cond, ea has Canon 15X bdc lens, complete w/case, charger, field battery pack & extras. D Kahn, TV 33, 601-21 Newark St, Hoboken NJ 07030. 201-659-1700.

JVC BY110 3 tube camera w/S-VHS upgrade, Fuji 16X zoom lens, MK50 shotgun mic & optional KAM-50 mic grip, A/C adapter-charger, (2) DC11U nicad batteries, VF400 4" B/W studio viewfinder, studio zoom & focus controls, (2) cables, custom case, high resolution & a top quality performer in like new cond, \$3695. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

Norelco PC72, PC70, PC970, color cameras, 15:1 lens, lots of parts, yokes, etc. BO. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

CEI 310 color camera w/CCU w/rear zoom controls, etc (2), \$2000. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

IVC 240 film chain incl CCU and camera junction unit, must be picked up in Tulsa, OK. FREE. R Hardy, 3239 S 90th East Avenue, Tulsa OK 74145-1661. 918-627-2937.

Schafer 800-S solid state 10 chnl system, \$800; Schafer 902 solid state system w/new cards, 10 chnl, 4 racks, net join, remote control, 6-24 tray Carousels (250'), 5 random access units, \$5,875; 2 racks, \$100/ea. T Nordan, WSHN, 517 N Beebe, Fremont MI 49412. 616-724-5729.

SCHAFFER 800 w/schematics, (4) Ampex reels, needs work, \$1000/BO. D Niccum, KOZA, 1301 S Crane, Odessa TX 79760. 915-333-3101.

BE Spotmaster 1070 RP, gd cond RP (2), low hrs, workhorse, original packing, \$350 ea or \$650/both. R Robbins, Box 1079, La Conner WA 98257. 206-445-6616.

Spotmaster cartwinder w/timer, \$350. C Benner, WUSL, 440 Domino, Phila PA 19128. 215-483-8900.

Fidelipac CTR 12 stereo cart machine, \$1000; Allied A/1 500 N cart rack, \$374. T Teagarden, KELI, POB 3834, San Angelo TX 76902. 915-555-9879.

ITC WRA Series stereo ITC 3 tone record unit, excel cond, BO. C Miller, Studio VU Prod, 4722 Pocahontas Ave, San Diego CA 92117. 619-270-6908.

Spotmaster BED-17 RP single deck mono, gd cond, \$250; ITC standard record electronics, stereo, gd cond, \$450. G Gardner, KLGG, 243 W Main, Dela UT 84624. 800-864-2423.

Sono-Mag 350 RS (2) 6 yrs. old, both in gd cond. \$800/ea. or \$2/1500 pls. frt. cst. B Weeks, PO. Box 107, B Falls VT 05101, 802-722-4890.

CAMERAS (VIDEO)**Want to Sell**

JVC BV-110 3-tube camera w/case, (2) batteries, pwr supply & charger, (2) cables, 10X lens, like new, \$2300/BO; (4) JVC 1-tube cameras S-6U, \$400 ea/BO. T Quinn, Monte Vista Std, 208 Cherry, Capitola CA 95010. 408-475-0423.

Ikegami 79D excel cond, just overhauled, \$6000; Sony Betacam portable studio camcams, excel cond, \$6000 or \$10,000 for both. Ugly George, 212-677-2200, M-F, 9-5; Fax 212-956, M-F, 9-5.

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Ampex 350 FT w/Inovonics elect in roll around walnut floor cabinets (2), \$800 ea; Scully 280B 4 trk 1/2" recorder, gd cond, in roll around floor console, \$1795. G Liebisch, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

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

Ampex 350, 7.5-15 ips, FT, cabinet mounted, \$400; Teac A1200, complete, cond unknown, \$100/BO. J McDonald, 303-869-3442.

Studer PR 99's, play only tape decks (8), 2.5 yrs old, balanced audio output, gd working cond, w/capstans recently replaced, rack mounts, speeds 1.875 & 3.75. Also (2) 25 Hz Conex tone detector panels each w/four detectors, manual, package price \$10,500 or BO.
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Otari ARS-1000 (\$1200; MCI JH-110 PB only (2), \$1800; MCI JH-110C mono, \$1800; Otari 5050II 8 trk, \$3200. C Green, Century 21 Programming, 800-937-2100.

Crown 700 1/2 trk stereo portable, exc cond, \$250; Ampex 602 FT, mono, \$100; Ampex 440 1/2 trk, stereo, exc cond, \$1000. W Kremer, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Sony PCM -701-ES digital 2 trk processor/recorder use w/lany VCR, \$1500/firm. B Ford, Spunk Prod, POB 1052, El Granada CA 94018. 415-726-4786.

Revox A-77 15/7.5 ips w/Dolby B 2 trk stereo, \$450/BO; Revox B-77, 15/7.5 ips, exc cond, \$1250/BO. B Henry, KLLK, 12 W Valley, Wilits CA 95490. 707-459-1250.

Otari MX5050-4, 1/4" 4 trk, heads just lapped, \$950. B Petrucci, Rouse St Prod, 804 E Old Hickory, Madison TN 37115. 615-868-8516.

Ampex 1200 24 trk matched pair, all the mods, great shape, heads have been lapped, many spares, \$30K/pr, will consider 15K ea breaking set. D Hewitt, Remote Record, Box 334, Lahaska PA 18931. 215-794-5005.

Ampex AG 500-1 & AG500-2, both in vgc, \$600/both/BO. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

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Ampex 601 tape transport, as is, for parts \$30; (3) Rotron 115 V Whisper fans for equipment cooling, \$10 ea or \$25/all. E Welch, Welch Media, POB 1455, Moncks Corner SC 29461. 803-761-7585.

Otari 5050B 2.5 & 1.5 ips 2 trk, less than 1 yr old, exc cond w/manual, \$950/firm. S Mahaffey, Mahaf Prod, 3592 N Delsea St 12, Vineland NJ 08360. 609-692-3439.

Revox B77 exc cond, \$1000/BO. D Johnson, J-Con Ltd, 200 E Rackquet Club, Ste 31, Palm Springs CA 92262. 619-323-4399.

Ampex ATR 800 (6) 1/4" stereo R/P, exc cond, manuals, \$2400 ea or \$13,000/all or BO. V Killion, KRVN, POB 880, Lexington NE 68850. 308-324-6717.

Revox PR-99 (4)w/Persons Programmer 3A, mint cond, BO. J Phillips, WZOM, 409-1/2 Clinton, Defiance OH 43512. 419-784-1059.

Tascam 122 fairly new, \$600. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-6348.

Ampex ATR 800 roll around consoles (2), \$200 ea. Kavouras Radac 500 color radar, 120 & 240 mile range, phone dial-up access, low hrs, \$5000/BO. V Killion, KRVN, POB 880, Lexington NE 68850. 308-324-6717.

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Crown SX844 4 chnl 1/4", like new, \$850; Crown SC844 variable speed 4 chnl 1/4", mint cond, \$1200; Magnecord 1022 4 head, 1/2 trk stereo RP, 4th head 1/4 trk play, mint, \$300. J Parsons Sr, Parsons Electr, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Scully 1/2 trk tape heads (28) play; (12) mono Magnecord Presto, play; (16) Magnecord stereo lapped Presto, play, sacrifice price. Call 616-782-9258.

Studer Revox B77 1/4 trk, exc cond, \$675. R Herman, Frontier Radio, POB 9292, Austin TX 78766. 512-280-5691.

Denon DN950F cart-CD player, new in box, \$1000; (2) ADC Pro Patch chassis PPA-3-18, Mark II, NO, new, \$500 ea; ADC Pro Patch assembly BJJ 104-4, Mark II, new, \$500. J Perez, 1901 Amy, Santa Rosa CA 95401. 707-565-5050.

Teac A-170S, top load cassette recorder w/Dolby, gd cond, \$75; Teac R-435X auto-reverse w/Dolby B & C, dbx, metal, record mute, microphone inputs, like new, \$150. L Hoover Jr, Logical Audio Solutions, 325 Saude, Essington PA 19029. 215-521-2933.

Tascam Series 8 trk studio equip, including 80-8 recorder, DX-8 dbx unit, M-35 board, A-3300SX 2 trk master, much more, \$12,000. R Pound, POB 493, Pound VA 24279. 703-796-5146.

Teac A-3300SX 1/2 trk, vgc, almost new heads, 7.5 & 15 ips, 10" reel capability, remote, \$450. J Block, The Prod Block, 906 E 5th, Austin TX 78702. 512-472-8975.

Infonics 200 Series cass Dup 1-10' RR master, 1-4 pos. slave (2), \$1500/ea. T Bodie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Sony DTC-1000ES U.S. midi DAT machine, like new, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. At 2PM CST.

Revox PR-99 (4) used very little, \$5000 or BO. J Phillips, WZOM-FM, 4081/2 Clinton, Defiance OH, 43512. 419-782-8591.

Revox PR99 (2), \$650/ea. Mr. Hays, 505-397-4969.

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FAX: (708) 843-7493

Akai 4000DS MK II in exc cond, needs reel retainer for supply reel, \$300. T Devine, WVLK, 300 W Vine, Lexington KY 40507. 606-253-5900.

Technics RSB-85 w/dbx, 3 heads, Dolby B & C, \$275. S Chapekis, POB 22122, Denver CO 80222. 303-721-9156.

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North Hollywood, CA 91607 818-907-1616

Tascam EM 1542, new reel motor for Tascam 38 deck, \$75. J Roper, Imperial Snd, RR 31 Box 405, Terre Haute IN 47083. 812-877-2663.

Yamaha K-960 w/Dolby B & dbx, metal, memory rewind, timer, record mute, mic inputs, vgc, \$225. L Hoover Jr, Logical Audio Solutions, 325 Saude, Essington PA 19029. 215-521-2933.

Ampe 602 & 622 speaker/amp, exc cond, except PB head has developed an open circuit, \$100. A Smith, Smith Sound, 52 Sumner, Westboro MA 01581. 508-841-2209.

Kenwood KX-720 top load cassette recorder w/Dolby, gd cond, \$75; Sony TC-660 auto-reverse w/built-in amp & speakers, gd cond, \$200. L Hoover Jr, Logical Audio Solutions, 325 Saude, Essington PA 19029. 215-521-2933.

Teac A3440 4 chnl w/warranty, new, BO. G Chapekis, POB 22122, Denver CO 80222. 303-721-9158.

Denon DRM-33 3 hrs, Dolby B & C, \$200. S Chapekis, POB 22122, Denver CO 80222. 303-721-9158.

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Tascam 38 1/2" 8 trk, low hrs, exc cond, \$1875; K Flory, The Production Co, Box 1027, Siesta Springs AR 72761. 501-524-4626.

teac Syncaset 124, \$200 pls UPS. N Mischa, POB 335, Lynbrook NY 11563. 516-582-1338.

Ampe AG-440B 1" 8 trk roll-around console, gd cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. At 2PM CST.

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Technics 1506 2 trk record, 2/4 trk PB, direct-drive quartz-lock, low hrs on head, vgc, \$600. Alan, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-4444.

Uher 4000 Report-L in good condition with all acc.\$30. W Dudley, 6919 19th Street, Tampa FL 33610. 813-237-6516.

Infonics 200 Series cass Dup 1-10' RR master, 1-4 pos. slave (2), \$1500/ea. T Bodie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Sony DTC-1000ES U.S. midi DAT machine, like new, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. At 2PM CST.

Revox PR-99 (4) used very little, \$5000 or BO. J Phillips, WZOM-FM, 4081/2 Clinton, Defiance OH, 43512. 419-782-8591.

Revox PR99 (2), \$650/ea. Mr. Hays, 505-397-4969.

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Ampex 440-B (2) in roll-about consoles, low hrs, exc cond, stereo 2 trk, \$1750 ea; Scully/Metrotech slow loggers (2), gd cond, on air thru Apr', \$395 ea. B Lunderville, Radio New England, 75 Gardner, Hirsham, ME 04043.

Sony TC-640 7" 1/4 trk stereo reel, vgc, buyer pays shpg, \$50. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

Otari ARS-1000 (2) 6 yrs. old, gd. cond. \$1000/ea, or 2/\$1600. B Weeks, P.O. Box 107, B Falls VT, 05101, 802-722-4890.

Ampex AG-350 FT in roll around, \$350; Ampex 351-2, reproduced only, solid state, \$250; Liberty CW-20 cart loader, BO; Electro Sound ES 100-48C cart & cassette loader, BO. D Lundy, POB 408, Heidrick KY 40949. 606-546-6650.

Ampex 601, 1/2 T machine in excellent condition, \$100. W Dudley, 6919 19th Street, Tampa FL 33610. 813-237-6516.</

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Fairchild 641 stereo Mastering Disc Sys 740 variable pitch lathe, 542 cutterhead, 644 amp, 645 pwr sup, 602 conax, beta amp, spare tubes, stylus, etc. \$2500. T Bodie, 12202 Union, Cleveland OH 44105. 216-752-3440.

Klipsch La Scala speakers, Klipsch horns, road cases, fiberglass finish, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Aft 2PM CST.

EV Sentry II control monitors, walnut, excel cond, \$200/pr. D Lundy, POB 408, Heidrick KY 40949. 606-546-6650.

Want to Buy

Digital delay or digital reverb for small market recdg studio, affordable price. Write WLD Recdg, W Dougherty Jr, Rt 1, Music Valley, Mill Spring MO 63952.

JBL 4315, 4333, 4343 monitors in gd cond. R Cobb, Solid State Svc, POB 5332, Sun City FL 33571. 813-634-1940.

Ibane MSP-1000 limiter-EQ-notch finder. D Wade, Collegium Sound, 35-41 72nd, Jackson Hts NY 11372. 718-426-8555.

JBL 4315, 4333, 4343 Loud speakers. R Glenn, 1718 Shenandoah Road, Wimauma FL 33598. 813-634-1940.

LIMITERS**Want to Sell**

Orban 8000A Optimod, works perfectly, \$1800. K Reising, WRZQ, POB 690, Columbus IN 47202. 812-379-1077.

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CRL CC-300 composite controller, works fine w/documentation, \$350. E Scheiter, KMLE, 645 E Missouri Ave, Phoenix AZ 85012. 602-264-0108.

CBS Labs stereo limiter, 1 side chnl not working. Universal Audio BL-40 Modulimiter. 1 opn. 915-949-2112.

Harris MSP 90, studio end works fine. xmtr end needs work, BO; DAP 310 AGC peak limiter, has been updated. BO. T Rusk, KITA, 723 W 14th, Little Rock AR 72202. 501-375-1440.

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Neumann U-47 Nuvistor (2). Kinura Records, Box 660236, Miami Springs FL 33166. 305-887-5329.

Vega R-41 wireless w/Dynex II, like new, \$1500. D Scales, Scales Film Snd, 3142 Market Pl, Bloomington IN 47403. 812-339-4446.

Vega 66 RCV-77TX (2) wireless w/Dynex II, gd cond, \$1000 ea. D Scales, Scales Film Snd, 3142 Market Pl, Bloomington IN 47403. 812-339-4446.

Nady 501 VRLT wireless mics (2) w/lav body packs, 185.15 & 215.15 MHz, \$800/both. TFG, Box 9, Wethersfield CT 06109. 203-527-2972.

EV 635A omni dynamic, excel cond, w/clamp, \$40 plus shpg. M Saedy, First City Recd, 141-60 84 Rd, 3E, Briarwood NY 11735. 718-846-2062.

Sennheiser MKH815, \$500 & MKH 816, \$575, shotgun w/foam windscreens in mint cond. D Scales, Scales Film Snd, 3142 Market Pl, Bloomington IN 47403. 812-339-4446.

Neumann U47fet (2), mint cond, w/leather box, warranty, \$995/ea. Klaus Heyne, 415-664-0163.

Shure 5B, antique ring & spring type w/stand, gd cond, \$385. R Cane, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Neumann KMR 82 shotgun, like new, leather case & windscreens, \$650. D Scales, Scales Film Snd, 3142 Market Pl, Bloomington IN 47403. 812-339-4446.

Sennheiser MD421, (2) w/boxes; RCA 77, perfect pair, matched w/original bags, BO. J Phillips, WZOM, 409-1/2 Clinton, Defiance OH 43512. 419-784-1059/

Audio Technica all models, call. K Taylor, Image Support, 103 N Aspen, Sterling VA 22170. 301-864-4841.

AKG DD202E (4) w/clip, vgc. (2) w/case, \$100 ea. M Rice, WKBQ, 2360 Hampton St Louis MO 63139. 314-644-1380.

Sony C-55P (3) very rare, mint cond, FET condenser, tiltable capsule for front or side pick-up, w/case, mic holder screen, \$500/BO. J Diamond, Box 102C Chubbic, Canonsburg PA 15317. 412-746-2540/4040.

RCA 77DX, BO or trade for E-V RE-20s. D Kelley, KISZ, POB 740, Correco CO 81321. 303-565-1212.

EV CO-90 tie clasp lavalier mic (2), like new. \$79 ea; Vega Orator III bodyback wireless mic systems bidirectional tie clasp mic, like new. \$545. G Meyer, 231 N 2475 W, Provo UT 84601. 801-375-4074.

AKG N-60 tube condenser pwr supply, w/swap for Sony type CP-2, CP-3A, or CP-3B pwr supply. E O'Brien, RR31 Box 405, Terre Haute IN 47803. 812-877-2663

RCA 77 DX mt cond., matched pr. Also 44JR original babs, 750/3 or BO. J Phillips, WZOM-FM, 409-1/2 Clinton, Defiance OH, 43512, 419-782-8591.

Want to Buy

Orban 8000A Optimod, new or used, preferably refurbished, price negotiable. J Scindler, Family Stations, 290 Hegenberger, Oakland CA 94621. 415-568-6200 X240.

Audimax & Volumax, any cond, junk to excel, call or write w/lowest prices. T Crockett, Hot Tracks, Box 10501, Blacksburg VA 24046. 703-953-0222.

Tube limiters, compressors & EQs, especially Fairchild 660 & 670, Teletronix LA2a, LA3, any Pultec EQs, Lang EQs, etc; also need other vintage tube signal processing equip. J Kreines, DeMot/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Orban Optimods 8000A, 8100A, 8100A/1, 9000A, 9100A, 9100B. Hall Electronics, 1305-F Seminole trail, Charlottesville VA 22901. 804-974-6466.

UREI LA-3A or LA-4 prod compressor/limiters. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Aft 2PM CST.

DBX 700 (2) for 23GHz STL sys, in gd cond.

RCA 77DX vintage ribbon mic, excel cond, BO; Neumann U-67 vintage tube mic, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Aft 2PM CST.

Shure DY-2 w/Dazon floating stand, \$20 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Altec 639 complete w/yoke & cable stand mounting, gd ribbon, will trade for small dual trace scope. L Beigel, POB 85042, LA CA 90072. 213-466-3595 or FAX 213-466-3596.

Neumann U87 (2), excel cond w/AC power supply, \$2500. F Badeaux, Musik Faktory, 1812 Procter, Port Arthur TX 77640. 409-982-7121, 8-4PM CDT.

EV 649B lavalier dynamic (5), gd cond, \$35 ea. G Mondkowski, 12918 Smalley, Grandview MO 64050. 816-966-0731.

RCA ribbon mics including (1) 44BX; (1) 77D; BK-11; 74-B; (2) SK-46; Shure 330 ribbon; Dynamics (2) Shure 555W, \$60 ea; EV 611; EV 630; Astatic DN-HZ. Tracy Eaves, 615-821-6099 (evenings).

Want to Buy

RCA 77's, 44's, Neumann 47's, 87's, will purchase or trade R-R's or T-T's. W Kremer, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Old mikes, WE, Altec 630, 633, 670, Shure 556, SM-33, 300, any Amperite, American D-33, DR-330, RCA Velocity Jr, Turner 94, working or not. D Igou, KGNB, 1540 Loop 337 N, New Braunfels TX 78130. 512-625-7311.

Vintage tube condenser mics, especially Neumann, Telefunken, Schoeps, AKG & classic ribbon mics, RCA 77s/44s. J Kreines, DeMot/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

RCA, JBL Mod 1-0001 RCA ribbon mic, mod 4311B, studio monitor loudspeaker (1). RL McDonald, 5231 Horton, Mission KS 66202. 913-722-2677.

RCA 44's, 77's, etc, any model working or not; WE 633 mics, etc. B Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

RCA 44BX or 77's, vintage ribbon mics. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-271-7625. Aft 2PM CST.

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Custom studio furniture, (2) pedestals & top to form console, in walnut & black laminate, \$100; various headsets (3); all work, \$10. D Bailey, 3422 Beech, Roulett TX 75088. 214-475-9796.

Various pieces of equip including Fisher audio component system; TT's; table top lazy susan; xmtr breaker box; on-air lights; Exel 1AF 11 R printer w/stand & book, Multilift offset md 85, GE AP printer, stands, etc. call for details. Adolph, 919-949-2112.

Toshiba 720K 3.5" disk drive w/mounting kit to use in 5-1/4" slot, new sealed in box, \$80. M Peterson, 3610 Lancaster Ste 6, Plymouth MN 55441. 612-544-6391.

Bdct Development Group, Don Werlinger, if you have had towers erected or equip installed by the above, I would like to hear from you. Chuck, 919-623-9966.

RCA equip manual from 1967; boards; xmtrs, etc, excel cond, \$25. D Miller, Airborne Audio, 11647 W 83rd Terr, Lenexa KS 66213. 913-492-8822.

Phasemaster T-7500-A2 240V single phase to three phase rotary phase converter, 1 yr old, \$3500. D Quinlan, KLAD, 1020 Pine, Klamath Falls OR 97601. 503-882-8833.

Patch panels (7), 4 stereo TRS, 3 mono double plug type. BO: 25 Hz tone gen, missing cover, no instructions. 3.5" rack mount, remote controllable. BO. P Hess, 134 Derwent Dr. Pgh PA 15237. 412-366-1249.

Misc equip racks, call for details. Adolph, 919-949-2112.

Large amount of misc furniture/furnishings including steel/padded vinyl chairs, kitchen table, desks, R-R stands, lamps etc, call for more details. Adolph, 919-949-2112.

Excess wire & cable inventory, Belden types 8449, 8447, 8790, 8422, 8459, 9750, 8448, 8663, 662"; control cable, microphone cable, bonding cable, various lengths, some spooled, some rolls, all new, you ship. R Kerawby, WTJN, Box 1127, Beckley WV 25802. 304-877-5592.

Sprague EM/RFI noise line filter assy, model JN17-23, rating 3 phase, 125 A, 440 VAC, new, \$125. A Emerald, KGA, 8956 Swallow, Fountain Valley CA 92708. 714-962-5940.

Heavy duty road case, foam lined, 43.25" x 27.25" x 8" inside dimension, \$60. D Wade, Collegium Sound, 35-41 72nd, Jackson Hts NY 11372. 718-426-8555.

Exel AH/P11R teleprinter w/stand, like new, BO. J Anderson, WKCU, 2192 Hwy 72 East, Corinth MS 38834. 601-286-8451.

Magnavox BM7622 12" composite computer monitor, 60x25 amber display, audio input for sound, like new, \$75. L Hoover Jr, Logical Audio Solutions, 325 Saude, Essington PA 19029. 215-521-2933.

Exel AF-11 teleprinter (3), G Hofer, KJLT, POB 709, N Plate NE 69101. 308-532-5515.

Radio Shack TRS-80 Mdl II includes 3 drive expansion unit, Okidata 820A line printer, working when removed, \$600/BO pls shpg. D Kelley, KISZ, POB 740, Cortez CO 81321. 303-565-1212.

Dynaco PAT-4 transistor preamp, inputs: special, tape, head, phono, tape tuner, tape monitor w/high & low filters, vgc, \$125. L Hoover Jr, Logical Audio Solutions, 325 Saude, Essington PA 19029. 215-521-2933.

Exel AF-11R teleprinter, needs some work, includes service manual & 79 rolls of printer paper, cond unknown, \$150/BO pls shpg. D Kelley, KISZ, POB 740, Cortez CO 81321. 303-565-1212.

Potter & Brumfield KHP17D11 12V DC relays, never used (approx 140). \$1 ea. T DeVine, WVLK, 300 W Vine, Lexington KY 40507. 606-253-5900.

Finebilt record pressing plant, (2) semi-auto rec presses, steam boiler pumps, punches, extruders, trimmers, electro-plating sys, chemicals, supplies, etc. \$12,000. T Bodie, 1220 Union, Cleveland OH 44105. 216-752-3440.

Conex AS101 audio switchers (2) no lamps; (6) Conex AS401 remote controls, BO. D Eressy, 1457 Main Street West Chatham MA 02669. 508-945-4855 am.

Sales training video tapes (16), VHS format, 30 subjects covered. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Luxo LM-1 multipurpose arms, less base (4) in excel cond, \$50/all. T Devine, WVLK, 300 W Vine, Lexington KY 40507. 606-253-5900.

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Microdyne 1100-FFC-X1-RD(R) SCPC rcvr, also Cal Microwave demod shelf & Mod As-sociates cue alarm, \$800/all. S Icenogle, KTRS, 251 W 1st, Casper WY 82601. 307-235-7000.

RCA Super Controlfone 500 UHF repeater crystalized on 464.3 MHz transmit, 469.3 MHz receive, in weather tight rack cabinet w/Decibel DB472 6 cavity duplexer, Decibel DB-410 16 bay high gain antenna w/mounting clamps & approx 160' of 5/8" hardline w/connectors, \$900/system or will break up pieces. M Peterson, 3610 Lancaster, Ste 6, Plymouth MN 55441. 612-544-6391.

Scientific Atlanta 7300/7325 digital satellite rcvr, 15 kHz, 1.75 kHz, voice cue card, (3) crystals, like new, \$9000; HD955 delay, mono, 6.4 seconds, 15 kHz, \$1750; ABC Talk Radio cue demod, McCurdy MRP-1, w/interface & printer cables, \$500. J Katz, Westcoast Bdcg. 209-686-2866.

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Aerotron PAC II 6 chnl 5 W VHF hand-held (4) w/wall charger & extra battery pack for EA PL encode, one unit w/DTMF, leather case, \$75 ea; Motorola 6010A coaxial antenna for 450-470 MHz, can be used mobile or fixed (2), new, \$15 ea. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

Johnson Electronics ST-4A subcarrier receivers, converted for 4600 baud data reception, 92 & 67 kHz. D Leinen, Independent Resources, POB 23498, Oklahoma City OK 73123. 405-721-1187.

Marti RR50/450-2 remote pickup rcvr tuned to 455.800 & 455.850, excellent condition, low hrs, \$600. R Hardy, 3239 S 90th East Avenue, Tulsa OK 74145-1661. 918-627-2937.

Marti RR50/450 RPU late md UHF rcvrs, exc cond, \$600 ea; Marti MR-100 (2) UHF RPU rcvrs, exc cond, \$200 ea or \$375/both. R Wright, WLLX, 1208 N Locust, Lawrenceburg TN 38464. 615-762-6200.

Want to Buy

Scientific Atlanta 7300 dual 7.5 kHz audio card. T Shinn, WKSF, POB 6447, Asheville NC 28816. 704-257-2700.

Group home radio club needs ham receiver & xmr, USB, DSB, LSB, LW, must be gd cond, call or write, I Dechow, WHBI, 696 Wood, Avenel NJ 07001. 201-602-1242.

Manual for R-391 receiver. S Daitch, PSC 1 Box 362, APO San Francisco 96286.

Used EBS receiver in working cond. S Kie, Keckman Inst., 10493 Dupont Rd, Bloomington MN 55431. 612-888-1627.

KLH 21 FM table radio, will buy or swap other equip. J Roper, Imperial Snd, RR 31 Box 405, Terre Haute IN 47803. 812-877-2663.

Motorola 2-ways, 2m or 10m ham rig. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Scientific Atlanta digital satellite rcvr, DPU w/pwr supply & DMX plus cable to receiver, DAT 32. D Royer or M Tinsley, 804-847-1286.

Scientific Atlanta or Fairchild looking for rec. pkgs. for ABC Radio Net., contact R Hall or A Reis, SMN Chicago, 708-479-1717.

Satellite rcvr set for Satcom 1R-21. J Corcoran, 509-662-7135.

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QEI 7775 ATS, will sacrifice, BO. J Katz, KJUG, 717 N Mooney, Tulare CA 93274. 209-686-2866.

Data Signal MTI-700 modular telephone interface, BO. KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Harris SCA gen card for MX-15 exciter, BO; Moseley SCG-4T sub-carrier gen, BO. KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Gentner VRC-2000, \$3000 cash. W Cox, WCGA, Rt 9 Box 240E, St Simons GA 31522. 912-638-1100.

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Secode DTMF 5 chnl decoders (2), Vega data control telemetry system includes xmtr & rec units, FS keying, BO. R Juckey, KJLF, POB 336, Butte MT 59703. 406-723-4006.

Wegner satellite rcvr & decoder for SMN, country & Starstation (AC) formats, includes all the electrc you'll need for both, plus auto-lock switchers for both formats, \$3200/alt. D Silver, KNKK, Layton Hills Mall, Layton UT 84041. 801-973-7759.

Ringo Ranger II on 161.70 MHz & Ringo Ranger II on 450.950 MHz, used on temporary installation, includes documentation, mounting hardware, \$20 ea or \$35/both. F Bobbe, Great Northern Bdct Co, POB 5031, Lima OH 45802. Fido Net 1234/16.

TFT 7601 configured for 110 kHz/67 kHz operation or 2 wire telco, works great w/manual, \$1800/BO; Moseley 505C presently on 945.5 MHz, older version, works well, needs some alignment, will consider trade for Marti RPU gear, \$1500/BO. E Scheeter, KMEL, 645 E Missouri Ave, Phoenix AZ 85012. 602-264-0108.

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 408-438-4273

CRL SCA 330A, new in box, tested but not used, BO. D Laustsen, Sunset Comm, 19 Meadow, Doylestown PA 18901. 215-340-9738.

Short haul xmtr remote control, home brew, straight forward circuit, controls & meters, one xmtr over 4 pair wire, \$150/BO. D Carver, KZBK, 107 S Main, Brookfield MO 64628. 816-258-7456.

Marti SCG-10 subcarrier gen tuned to 92 kHz, 7 mos old, \$1000. A Matos, WRFE, Box 846, Aguada PR 00602. 809-868-7793.

Marti STL-8 (2) xmtrs & rcvrs, 946.850 & 947.150 MHz, \$2000/BO. B Stuart, KSUE, 3015 Johnstone Rd, Susanville CA 96130. 916-257-2121.

Scientific Atlanta 7300 2.8m dish, 120K LNA, 7300 BPSK rcvr, 7325 DPU, 15 kHz card, 7.5 kHz card, 3 kHz card, vgc. 19-23-3.5 crystals, typical Westwood 1 set-up, \$7000. M Lehman, WSNL, 1944 Innerbelt Bus Ctr Dr, Overland MO 63114. 314-426-0101.

LAUX satellite system, to be sold as package only, call for details; Harris satellite system also to be sold as package, call for more info. Adolph, 915-949-2112.

Marti STL-8 xmtrs/rcvrs (2), tuned to 950.375/950.625 MHz; HRC-8 xmtr combiner, rcv combiner, cables & books, recently removed from svrc, ready to ship. \$2800/BW pls shpg. L Ayer, KPRL, POB 8849, Moscow ID 83843. 208-882-2551.

Moseley TRC-15AW recently removed from svrc. JR Curtis, KAEZ, POB 4299, Longview TX 75606. 214-663-3700.

Moseley 606/C tuned 947.500 MHz, \$7500. T Langham, TL Engr, 1508 S Owasso, Tulsa OK 74120. 918-587-0941.

Moseley MRC-1600, exc cond, 2 yrs old, \$3500/BO. B Simmons, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Fairchild Dart 384 15 kHz dual audio card in gd working order, have two only one, \$750. RL Wood, KOWO, 222 N State, Waseca MN 56093. 507-835-5555.

Moseley SCG-8 92 kHz subcarrier gen, 6 mos old, \$850, or gd cond ITC-750 deck as part. K Brown, KTRZ, Box 808, Riverton WY 82501. 307-858-2922.

CP for FT AM great dial position, populated area, 10-kw non-dir. days; 500-w, DA. Can move within 5-miles of Nashville and increase to 50-kw days. P Severy, P.O. Box 40333; nashville TN 37204, 615-832-4653.

Want to Buy
 Looking for AM, FM or LPTV, problem stations (turnarounds, daytimers, etc), broadcaster seeking new challenge, send complete details w/price & terms. J Powley, 1536 Logan, Altona PA 16602. 814-944-8571.

AM stations: high power turnarounds at gd price, top 150 markets, daytimers & dark stations OK, include price/terms & city grade coverage map. Mr Stevens, POB 732, Langley SC 29834.

STATIONS . . . WTB

Looking for FM or AM/FM in Northwest Ohio, Southeast Michigan, confidential serious replies only. F Vobbe, Great Northern Bdct Co, POB 5031, Lima OH 45602. FidoNet 1:234/16.

AM/FM stations or CPs including dark stations, bankruptcy situations, assumption of debt situations. Doc Pollock, First Bdct Corp, POB 691, Wilmette IL 60091. 312-902-4410.

STEREO GENERATORS**Want to Sell**

Moseley SCG-3T stereo gen, BO. KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Moseley SCG-4T subcarrier gen, like new, may be returned. J Kramden, WBRL, 3342 Perry, Marsellus NY 13215. 315-673-9049.

Motorola 1300/1310 C-Quam stereo system, 1360 kHz, CRI SPP 800, (2) SEP 400, SMP-900, all gd cond, BO/whole package. J Davis, WCHL, POB 2127, Chapel Hill NC 27514. 919-942-8765.

Modulation Sciences DSCA-t88 data Sidekick SCA gen, 92 & 62 kHz. D Leinen, Independent Resources, POB 23498, Oklahoma City OK 73123. 405-721-1187.

Harris TE-3 exciter, (2) stereo gen, (2) SCA gen 87 kHz, BO. C Benner, WUSL, 440 Domino, Phila PA 19128. 215-483-8900.

Gates 6095-6146 exciter/stereo gen in 4' rack, includes stereo Audimax processor, metering, on-off controls, manuals; complete working 10 W stereo xmtr, \$700/BO pls shpg. M Meyer, 313-686-0447.

Harris MS-15R w/manuals, BO. R Hays, KYKK, 619 N Turner, Hobbs NM 88240. 505-379-4969.

Harris SCA module, 87 kc for MS15 & MX15 exciter, working, \$200; extender board for MS15 & MX15 exciter, \$35 pls shpg. E Davison, Multiplex, 135 N Illinois, Springfield IL 62702. 217-787-0800.

CRL SC-800 slightly used, \$650/BO. R Bendheim, PO Box 135, Redway CA 95560. 707-923-2513.

SWITCHERS (VIDEO)**Want to Sell**

Echo II SE6 switchers (2) w/RCA TG-3 sync/pulse pattern gen/wracks, \$1400, may sell separately. R Lawrence, Moonshadow Video, 4280 Reston Rd, Roseburg OR 97470. 503-679-8966.

Cross Point Latch 6112 w/8 inputs 2ME5 encoded chromo key, downstream keyer, \$2500. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5657.

Sono-Mag DS20A 6 yrs. old, gd. cond. \$500. 8 Weeks, P.O. Box 107, B Falls VT, 05101, 802-722-4890.

Want to Buy

DP-1 w/AS switcher. L Nelson, WSPY. 708-552-8985.

TAPES, CARTS & REELS**Want to Sell**

Fidelipac NAB-300 carts, vgc, \$2 ea & (215 red) Master carts at 7.5 min long, \$2 ea/BO. R Pastior, WCMY, 216 W Lafayette, Ottawa IL 61350. 815-434-6050.

U-Matic cassettes, like new, one pass only, mostly 5 or 10 minute lengths, include library cases, some shipping cases, approx 350-500 avail, \$2 ea pls shpg. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

Approx 100 10.5" NAB reels, oldies. J McDonald. 303-669-3442.

Fidelipac 300 (34), vgc, 4, 5.5, 7.5 lengths, \$1 ea plus shpg. M Saady, First City Recd, 141-60 84 Rd 3E, Briarwood NY 11735. 718-846-2062.

20 year collection of 600 plus R-R tapes containing jingles, airchecks, various prod, music tracks, etc. Will sell w/dbx & Dolby NR equip. BO. Send SASE for specific info. F Vobbe, Great Northern Bdct Co, POB 5031, Lima OH 45802. FidoNet 1:234/16.

Reels, (1000) 5" w/NAB hubs, BO. S Voros, 1537 S 81st, Milwaukee WI 53214. 414-475-6200.

Fidelipac Mastercarts (approx 700) w/MOR music, 2.5-3.5' lengths, gd cond, \$2 ea. J David, KMPL, POB 907, Sikeston MS 63801. 314-471-1520.

Audiopak AA-3, AA-2 (150) assorted lengths, all reloaded w/new high output tape, new pads, excel cond, BO. R Kaufman, PAMS Prod, POB 462247, Garland TX 75046. 214-721-7625. Aft 200 PST.

London Music Library 78 RPM, circa 1950. D Eressy. 509-945-4855 am.

Scotch & Sony U-Matic UCA & KCA cassettes in boxes, excel cond, mostly 30's, some 40's & 60's. (\$8). \$290. A Allegro, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Various reels of tapes, 5', 7', 10', OK for background, non-essential use. BO. A Allegro, 1380 Valley Forge, Lansdale PA 19446. 215-368-4444.

Fidelipac Cobalt 100 carts, 50 ea, 40 and 70 sec. New, sold as unit only. \$425 firm. A or S Reis, 308 Eastgate Court, New Lenox IL 60451. 815-485-7388.

Want to Buy

ET's 16" Thesaurus Here's to Veterius guest star, orig or top quality tape copies & library catalogs. C Fuller, Voices, POB 153, La Grange IL 60525. 312-579-9578.

Used tapes & reels for automation, 10" reels. A Moll, KLXQ, 128 Memory Trail, San Antonio TX 78232. 512-496-0677.

New, boxed, unused Seeburg/Rowe 16 rpm background music records, any quantity, write price; also jazz/swing 78 rpm libraries or collections wanted. F Luppino Jr. Mktg Insights, 1445 Sunset Ridge, Glenview IL 60025. 312-729-2047.

Thesaurus, standard, Capitol ET's or gd 14" dubs, also catalogs, call collect. C Hunt, Voices, POB 153, LaGrange IL 60525. 708-579-9578.

Tape reel hold downs for Ampex 300,301,302,354,AG440 MR 70 ETC; pwr cords for Ampex 301, 354 & AG 440. Mainline Comm, 100 Poplar Street Portage PA 15946. 814-736-3883.

Experienced on-air/programming, (8 yrs) wisome engineering seeking position, currently working in top ten market. Dade Moore, 713-441-8193.

College Grad, 4 yrs exper, veteran, highly praised metal show, gig wanted in CT crazy, dynamic pro, top blade skills. M Dodge, 203-787-9277 or 787-1006.

Will relocate over 7 yrs. exp. in news, spts., prod., and on-air. Resume on request. T Lalili, 533 South 2nd Apt B, McAlester OK 74501.

On-air, MD, ND, PD w/5 yrs exper seeks on-air in South Dakota/surrounding states, avail now, leave message, B Csonrad 605-882-3239.

Quality entertainer w/33 yrs exper, marketable, specialize in Big Bands, oldies, 7-midnight or all night. J English, 2450 Pine Island, Matlacha FL 33909. 813-283-3910.

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3380 Blailey Ave., Eau Claire, WI 54701
(715) 835-7347

Radio reading service for the blind & print-handicapped in CT looking for donation of 2 cart machines for Fairfield county satellite studio, will pay for shipping or pick-up. Cynthia Clark, CRIS Radio, 589 Jordan Ln, Wethersfield CT 06109. 203-246-3579.

Missouri River Christian Bdctg seeks 1 kW FM xmtr, exciter, stereo gen, FM monitor, cart machine. Will help w/appraisal for taxes. J Goggan, KGKV, POB 87, Washington MO 314-239-0400.

Christian Ministry needs donations for low power, 250 W, FM station: FM mod mon; FM AGC processor limiter; hi-gain antenna on ED band; 7/8 coax, 400-900'; (4) R-R, mono; (4) mono cart machines; Marti RPU xmtr & antenna; Marti rcv & antenna; CD players (2). J Setzer, POB 93, Brookfield MO 64628. 816-258-5310.

El Salvador Christian station needs (2) 8008 pull-outs & usable 892Rs, we pay freight. J Counter, YSL, 5484 San Patricia, Santa Barbara CA 93111. 805-967-6410.

Need cart machines, phone hybrids, 12+ chnl console, EBS monitor, racks, TIs, CDs, mics, downlink, prod equip donations. J Carlson, KMUD, POB 135, Redway CA 95560. 707-923-2511.

FM Station needs translator, and to upgrade almost everything, tax deductible, we pay shipping. R Bendheim, PO Box 135, Redway CA 95560. 707-923-2513.

Non-profit comm radio station seeks used audio console, RTRs, cart machines, phone couplers, TIs, studio & portable cass & mics for training student volunteers. S Perez, KZSC, Univ of CA Santa Cruz, Santa Cruz CA 95064. 408-459-2811.

Eng student desiring donation of old bdct eqn (anything in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

TEST EQUIPMENT**Want to Sell**

General Radio 1606A impedance bridge, excel cond w/fittings & manual, \$800/firm. F Shields, KERV, POB 2187, Kerrville TX 78028. 512-895-1230.

Delta 01B-3 & RG-3, gd cond, \$4000/BO. J Battison, 2684 State Rte 60, Loudonville OH 44842. 419-994-3849.

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RCA WF48A AM freq meter, 1070 kHz, gd cond, BO; Nems Clarke 108E phase monitor, fair cond, BO; RCA WA7-44A audio oscillator, fair cond, BO; military surplus audio oscillator, fair cond, BO. J Keller, WKOK, POB 1070, Sunbury PA 17801. 717-286-5838.

Tektronix 1L20 spectrum analyzer, 10 MHz-4.2 GHz; Tek 547 oscilloscope, BO. C Springer, KSEC, POB 890, Lamar CO 81052. 719-336-2206.

Old test equip to sell or trade, includes Heathkit oscilloscopes, color bar gen, resistance sub box, condenser sub box, iso trans, grid dip, ant imp, EICO multi tracer, Senco transistor checker, genometer, Sprague telomike, EICO 950, Cornell Dubilier, Jackson TV-2, military signal generator & more, also a lot of tubes. R Scott, Box 35, Canby CA 96015. 916-233-4106 or 233-5151.

Potomac Instruments AG-51, excel cond. \$1000. P Lancaster, Howard Schwartz Recd. 420 Lexington, Ste 1934, NYNY 10170. 212-687-4180.

Sencore VA-62, NT64, CV63, PR-57, all like new, \$2500. L Clinton, KARN, POB 4189, Little Rock AR 72214. 501-661-7500.

TRANSMITTERS**Want to Sell**

Thomson-LGT EVHF-10S LPTV, 10 W, high band VHF, near new. Ch. 9, \$4500/BO. L Batey, LPTV, 3317 Barrow Hill Tr, Tallahassee FL 32312. 904-893-1382.

McMartin BF25K 27.5 kW grounded grid, no PCBs, spare HVPS, circuit boards, transformers, in service, \$30,000. D Solinske, WWRM, POB 22000, St Petersburg FL 33702. 813-576-1073.

Harris 3.5K, mint cond, \$23,000. R Wachter, KNSX, 3418 Douglas, Florissant MO 63034. 314-921-2121.

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EMPLOYMENT SECTION

HELP WANTED: Any company or station can run "Help Wanted" ads at the flat rate of \$25 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

POSITIONS WANTED: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

Mail To: BROADCAST EQUIPMENT EXCHANGE, PO Box 1214, Falls Church, VA 22041

TRANSMITTERS ... WTS

RCA BTE 15A FM exciter w/stereo generator & SCA generator. M Young, WJON, POB 220, St Cloud MN 56302. 612-251-4422.

Gates BC-1F 1 kW AM, excel cond, \$2000. J Kramden, WBRL, 3342 Perry Rd, Marselisburg NY 13215. 315-673-9049.

Jones-Tepco J-317 FM translator, 10 W. \$1400; antennas also available. D Silver, KNKK, Layton Hills Mall, Layton UT 84041. 801-973-7759.

RCA BTE-10C/BTS-1A exciter, stereo gen, metering panel & CBS stereo Volumax in 4' rack w/spares, complete 10 W xmt, will sell separately, \$700 pls shpg. T O'Laughlin, O's Own Labs, Rt 1 Box 41, Barneveld WI 53507. 608-924-2001.

CSI 3 kW FM, 93.5 MHz, 600', 1-5/8" foam filled coax, isolocoupler, 3 bay antenna, Gates 1 kW AM xmt for parts. K Holcombe, WJK, POB 350, Evergreen AL 36401. 205-578-2780.

AM TRANSMITTER
1984 Harris
MW-1A
PMA Marketing
414-482-2638

Collins 21E 5 kW AM, gd work cond, original owner, \$5000. C Webster, WGVM, 1383 Pickett, Greenville MS 38701. 601-334-4559.

INR Tech Mdl 1000 drive-buy radio transmitter, synthesized FM xmt to advertising message, uses standard endless cassette tape for message, new in box, \$425/BO. M Peterson, 3610 Lancaster Ste 6, Plymouth MN 55441. 612-544-6391.

RCA 250M excel cond, less than 500 hrs, full power, clean, you pick up. BO. LJ Maierhofer, WTGC, 101 Armory, Lewisburg PA 17837. 717-523-3271.

McMartin BF25K-FM, 1979 27.5 kW w/low pwr cut back, grounded grid, spare HVPS & boards, panels, iron from stripped second unit, \$30,000. D Solinske, WWRM, POB 22000, ST Petersburg FL 33742. 813-576-1073.

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Harris MW1, 500 W D 1520 Hz, like new, BO. HS Killgore, KMPG, POB 1507, Hollister CA 95023. 408-637-7476.

Harris plate transformer for MW 5A, new, in crate, \$1000/BO. J Long, 4452 Koblan Ct, Hixson TN 37343. 615-877-9000.

RCA BTF 20E1, to trade for Harris or Collins 1-10 kW FM xmt. J Mauk, KMJ, POB 70002, Fresno CA 93744. 209-266-5800.

Johnson Viking I 100 W shortwave xmt vfo bands 80-10m, AM, \$75. J Feasel, 13549 Morse, Pataskala OH 43062.



FM TRANSMITTERS
250W Collins 731A
27.5 kW McMartin BF-27.5K
1 kW Gates FM-1B
5 kW Gates FM-5B
5 kW CCA 5000D
5 kW Harris 5H
10 kW Sintronics S-10
10 kW RCA BTF-10D
10 kW CCA 10,000D
12 kW AEL 12,000KG
20 kW CCA 20,000E
20 kW CCA 20,000D
20 kW RCA 20E-1

AM TRANSMITTERS
5 kW Gates BC-5E
5 kW RCA BTA-5T
5 kW Gates BC-5B
5 kW Collins 21-E
5 kW Collins 820-E
10 kW RCA BTA-10H
50 kW Harris MW-50
50 kW GE BTC-50B
50 kW RCA BTA-50H

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Telex 229882 Fax 619-239-8474

Nautel AMPFET 10 AM solid state, 1510 kHz, 2.5 yrs old, excel cond, includes spares, etc., towers, ATU's, (4) tower phasor, will negotiate. B Williamson, WALL, One Bdct Pl, Middletown NY 10940. 914-343-7400.

FM TRANSMITTERS
10 kW
1970 CCA 10000D
12 kW
1979 CSI 12000E
20 kW
1976 Collins 831-G2B
PMA Marketing
414-482-2638

Harris FM-5 H3 5 kW FM tuned to 98.1 MHz w/TE-3 exciter & documentation, avail immmed, \$14,000. F Giardina, Dittman Group, 2146 Highland, Birmingham AL 35205. 205-933-9274.

Home brew 50 W AM, will set to your freq, \$500. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Lea SE-1201/240-60-2 xmt line voltage surge protector for xmt or studio unit, new, \$1400. K Austin, KFXI, POB 392, Marlow OK 73055. 405-658-9292.

QEI 695T 3.5 kW, avail after 1/90, includes QEI 695 exciter & spare parts kit, \$18,000. K Austin, KFXI, POB 392, Marlow OK 73055. 405-658-9292.

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Bird Terminaline 8732 coaxial resistor, water cooled dummy load, 10 kW 50 ohms, \$400. C Benner, WUSL, 440 Domino, Phila PA 19128. 215-483-8900.

CCA 5000G 1987 FM xmt w/exciter, like new, \$18,683/BO. L Torgersen, WQIC, Box 5353, Meridian MS 39302. 601-693-4851.

RCA BTA-1M 1000watt, AM, Gd. cond. \$2500. C Ratliffe, #1 Radio Street, Wadesboro NC 28170. 704-694-2175.

Wilkinson 1000A 1976 mdl tuned to 1300KC, BO. B Hearst, WQCH, PO Box 688, Clarion PA 16214. 814-226-5800.

Gates BC1J Operational, some spare pts, spare tubes, inc. 833's BO, P Beal, Burren Road, Rogersville TN, 37857, 615-272-3900.

Harris FM2.5 kW w/MS-15 excit, avail. mid-Dec, \$12,000. You pick up/ship. J Tudor, WMNC/WQXZ, PO Box 969, Morganton NC 28665. 704-437-0521.

RCA rack mount TV text xmt, low pwr, chnl 12, w/manual, \$150 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Kintronics Power Reduction Kit New, set up to reduce 1KW to 222 watts, easily modified. \$800. P Beal, Burren Road, Rogersville TN, 37857, 615-272-3900.

RCA BTA 50 F 50 kW AM, fully operational, many extras, \$16,000 pls shpg; RCA BTA 5F 5 kW AM, excel cond, w/all floor layouts, manuals, tubes, etc. \$9000 pls shpg; RCA new mod transformer for BTA 5F xmt in original crate, \$600 pls shpg. G Heidenfeld, 2880 W Lake, Wilson NY 14172. 716-751-6187.

Harris Transmitter MW1 one thousand watts, exc. cond. BO; H Kilgore, PO 1507, Hollister CA 95023. 408-637-7470.

Collins 21-E 5 kW AM's (4), Gates BC-5E (3), RCA BTA-5T (1) Choice \$8700. 1 kW AM's, Gates BC-1G (2), Gates BC-1F (3), Gates BC-1J (2), Collins 20V3 (2), McMartin BA-1K (2), \$2000-\$5500. Jerry Kautz, Armstrong Transmitter. 315-488-1269.

Want to Buy

TTC XL10FM 10 W FM translator. J Machie, KRSB, POB 5180, Roseburg OR 97470. 503-672-6641.

Any 1kW amp, xmt, translator for channel 61. S Kappa, 402-476-6115, Fax: 402-476-6000.

Any 10,000-20,000 W, fixable w/manuals, any age, w/filters & tunable to 101.5 MHz. M McVey, 620 Lake Rd, Ottawa IA 52501. 515-682-0498.

Low band (2-6) VHF TV, 100 W to 11 kW; RCA TTU-1B or TTU-2A UHF TV for parts. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

Dummy load for 20,000 W FM xmt, used in gd cond. Kurt, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

UHF & VHF TV translators, 10 to 100 W, will consider old UHF band (70-83) equip. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

Parts for RCA TT10AH/TT25BH as well as 5762 & 6166A tubes. J Paciorowski, The Imes Group, 603-641-9060.

Late model FM 1000 W stereo w/exciter or without, late model exciter. LJ Maierhofer, WTGC, 101 Armory, Lewisburg PA 17837. 717-523-3271.

Parts for RCA TT10AH/TT25BH as well as 5762 & 6166A tubes. J Paciorowski, The Imes Group, 603-641-9060.

Late model FM 1000 W stereo w/exciter or without, late model exciter. LJ Maierhofer, WTGC, 101 Armory, Lewisburg PA 17837. 717-523-3271.

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TUBES

Want to Sell

Tek CRT's for 528, 528A, & 1420 video monitors. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

EIMAC 8170/4CX5000A, new, unused, \$925. A Emerald, KGGA, 8956 Swallow, Fountain Valley CA 92708. 714-962-5940.

ELECTRON TUBES

Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10, 000H3, 4CS5000A, 4CX35, 000C

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Eimac 4-400A (4) new, \$88 ea; many other tubes in stock, most new. M Brown, KKGR, 503-245-4889.

Econo 6166A/7007 RCA, never used, \$1800. M Nowak, WBKB, 1390 Bagley, Alpena MI 49707. 517-356-3434.

Varian/Eimac 4CX5000A, new tubes in factory sealed cartons (2), \$500 ea. E Swanson, WZTR, 520 W Capitol, Milwaukee WI 53212. 414-964-8300.

3CX1500A7, 4CX5000A, 6146B, 4CX2508, 4CX3000A & more. We carry large inventory all major brands, Eimac, Amperex, RCA, etc. Call Steve 1-800-842-1489.

Want to Buy

Surplus electron tubes, all kinds, all quantities, sockets, plate caps, etc. C Dripps, Kurluff Ent, POB 2204, Irwindale CA 91706. 818-444-7079.

RC 6181, used as final in RCA TTU-1B UHF TV xmt. J Powley, 1536 Logan, Altoona PA 16602. 814-944-8571.

RCA 8021 xmt tube, any cond, used in old RCA TT-5 xmt. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

4CX3500-A needed. A Moll, KLXQ, 128 Memory Trail, San Antonio TX 78232. 512-496-0677.



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TURNTABLES**Want to Sell**

Russo Studio Pro w/Graco wood arm, \$100. W Kremer, 301 SW 16th, Ft Lauderdale FL 33315. 305-524-5652.

Ramko SP8/E (4) stereo TT preamps, \$75ea; Micro-Track 303 12" tonearm, vgc. \$75. E Stoltz, KWOD, 1425 River Park, Sacramento CA 95811. 916-929-5000.

Panasonic SL-1700 MK 2, Technics quartz direct drive TT system, vgc. \$150. D Weston, KCOOP, 5922 W 76th, Los Angeles CA 90045. 213-216-7814.

Scully LS-78 stereo mastering system, lathe Westrex 301II system; Technics SP-10 MK II. Kinura Records, Box 660236, Miami Springs FL 33166. 305-887-5329.

RCA 328 12" (4), includes tonearms & preamps, \$265/all plus shpg. D Silver, KNKK, Layton Hills Mall, Layton UT 84041. 801-973-7759.

RCA tonearms (2), BO; (4) Micro-Trak tonearms, BO; (2) Gates MG244B mono preamps, gd cond, BO; (2) RCA BA26B mono preamps, gd cond, BO. J Keller, WKOK, POB 1070, Sunbury PA 17801. 717-286-5838.

QRK 3 speed 12" w/Pek-O-Kut tonearm, gd cond w/white brown left top, \$85/BO. W Dougherty Jr, 314-998-2377 aft 6PM.

Technics SP-15 vgc w/Technics hardwood base, dust cover, EPA titanium tonearm, Stanton 600A cartridge w/pen stylus, \$700. Corey Greenberg, KBTS, 4030 W Braker Ste 175, Austin TX 78759. 512-345-9300.

QRK (2), one in gd cond, one in fair cond, drilled for Micro-Trak 303 tone arms, some spare parts including motor, BO. P Hess, 134 Derwent Dr, Pgh PA 15237. 412-366-1249.

Ramko P-93/S stereo TT preamp, vgc. \$150/BO; Russo Fidelity Master stereo TT preamp, \$80/BO. D Kelley, KISZ, POB 740, Correco CO 81321. 303-565-1212.

Russo Studio Pro B w/Micro-Trak 303 tonearms & Stanton 500AL cartridges (2), \$100ea or BO. D Kelley, KISZ, POB 740, Correco CO 81321. 303-565-1212.

Rek-O-Kut N-33H 12" TT, \$25 pls UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

Sony TTS-3000 belt-driven table w/PVA-237 arm, all manuals, as is. \$30. W Laughlin, 753 Ruth Ln, Hurst TX 76053. 817-282-9033.

QRK 12-C TT's (2) w/gray tone arms & carts, vgc. \$130/BO; M Brown, KKGR, 503-245-4889.

Technics SP-15, new, full factory warranty, were \$980 list, now only \$490 while supplies last. Call NEBL 518-793-2181.

Gates 6169 solid state stereo preamp, 600 ohms line level out. L Beigel, POB 85042, LA CA 90072. 213-466-3595 or FAX 213-466-3596.

Want to Buy

RCA, Presto record cutters. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Technics SP10MKII instructions & service info needed, photocopy OK, will pay for postage & copying charges. P Hess, 134 Derwent Dr, Pgh PA 15237. 412-366-1249.

Disc recorders, RCA or Presto or Rek-O-Kut. V Davies, Virgo Prod, 5548 Elmert, N Hollywood CA 91601. 818-761-9831.

RCA or equal TT, arm, spare needles & preamp suitable play 33/78 rpm transcriptions, 16" & records, write description, price asked. F Luppino Jr, Mktg Insights, 1445 Sunset Ridge, Glenview IL 60025. 312-729-2047.

Turntable, 16" w/Stylus, prefer RCA or Gates. T Knapp, Univ of NV, Las Vegas NV 89154. 702-739-3305.

TV FILM EQUIP**Want to Sell**

Buhl Multiplexer 573-200-(190) film chain w/4" lens, (2) Kodak 650-H projectors, manuals, top cond, video, film, slide dup & transfer, \$500. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

RCA TP-66 projector, optical sound only. \$2240. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Want to Buy

RCA TK-26 film camera. A Weiner, Britton Rd, Monticello ME 04760. 207-538-9538.

Kodak VPI or VPX super 8mm video player. H Ellenbogen, Ellenbogen Eng & Video, RD 5 Box 270, Kingston NY 12401. 914-331-5849.

VIDEO PROD EQUIP**Want to Sell**

Sony CVM-1900 profess monitor/cvrs, low hrs, excel cond (2), \$700 ea. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

Telemet 350B video test signal gen, w/ access, \$250; Computer Image Corp 3 bus program & prod video switcher, EFX, joystick, 2 faders, variable border, chroma-key, \$2000; (2) RCA proc amps/DA card frames, modules, pwr supply, \$50/lot; Conrac 7" mono monitor, HP7803A scope, 19" Conrac dual rack frame, \$150/lot; Telechrome video/audio modulator, chnl 4 module incl, vgc, \$1000. E Stoltz, KWOD, 1425 River Park, Sacramento CA 95815. 916-929-5000.

Sony SLO-383 edit recorder, new cond (2), industrial Beta, \$1200 ea. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

Sony RM-580 remote control unit for VTR, never used, \$525. B Bridges, KCAM, 827 Meridian, Nashville TN 37207. 615-226-1122.

Tekskil 909 teleprompter, complete & portable, exc cond, \$2800. B Bridges, KCAM, 827 Meridian, Nashville TN 37207. 615-226-1122.

Telimation TSE200VS special effects gen, 6 inputs, 8 wipes & keyer, BO. M Cramer, WGBA-TV, 1391 North Rd, Green Bay WI 54307. 414-494-2626.

Audio Kinetics Pacer chase synchronizer w/remote pacer pad & interconnect cables to Tascam Series audio recorders, sync-locks multi-track ATR to any make VTR, new cond, \$1500. B Dombrowski, Whirlwind Prod, 10356 W Warren, Dearborn MI 48126. 313-584-4038.

Illusion digital EFX, all upgrades thru 1988, bubble, perspec, rotation, exceptional unit w/striking effects, like new, \$22,000. B Bridges, KCAM, 827 Meridian, Nashville TN 37207. 615-226-1122.

Panasonic AU-B110 AC adaptor, new in box, \$125. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

Sony SLO-260 RP, new components to SLO-383 edit pac (2), \$600 ea. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

Sigma CSG-350A video master sync generator, new, \$925. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

Panasonic AU-A30 edit controller, new, \$650. B Bridges, KCAM-TV, 827 Meridian, Nashville TN 37207. 615-226-1122.

JVC 3/4" edit system, CP 5500 player, CR 8200 recorder w/convergence controller ESC 90, includes all cables, breakout box, new head, exc cond, \$4200. Vanessa Gerwels, Peregrine Prod, 317 Weisgerber Blvd, Lewiston ID 83501. 208-743-8618.

Trompeter original gold J13-75 patch jacks, PN-2BE-75 (2M, 1F) paralleling, PNS-3/525 & PNS-4/625, TPC-9-75. O Berliner, SoundDesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

JVC CR4400U (4) 3/4" portapacks w/ access, \$800/BO; (3) JVC BR6400U VHS source edit deck, \$1400/BO; Kodak 16mm telecine projector, RCA 16mm telecine projector, editing system w/Sony RM 400, VP 2260, VP 2860, \$2000/BO; 3M image enhancer; Panasonic NV 9300 recorder; Sony 2610 recorder. T Quinn, Monte Vista Stds, 208 Cherry, Capitola CA 95010. 408-475-0423.

JVC LP-101 digital audio processor, new \$2000/BO; Microgen M-150 character gen, like new, \$1800/BO; Sony FCG-7000 frame code gen, new, \$1800/BO; liquidating video studio, everything goes. R Lawrence, Moonshadow Video, 4280 Reston Rd, Roseburg OR 97470. 503-679-8966.

RCA & Panasonic M-format prod/post prod system, complete w/Hawkeye camcorder, AV220 portable, (2) edit decks w/built in TBC, controller, etc. \$7500. A Romanoff, First Light Video, 374 N Ridgewood, Los Angeles CA 90004. 213-467-1700.

Vidifont Mark IV CG w/2 disk drives, font compose, address keyboards, etc. \$1000/BO. D Boggs, Anderson Univ, 1100 E 5th St, Anderson IN 46011. 317-641-4344.

Panasonic NVA-950 edit controller for 3/4" VCR's, \$50; Froehlich 190-300 video stereo control center, \$90; Sony VCR-4 telecine adapter, high resolution uniplexer, gd cond, \$80. W Watrous, Watrous Video Prod, 739 S Orange, Sarasota FL 34236. 813-366-3316.

5850 w/address track mod, low hrs since overhaul, excellent machine, \$4000; 5600 address track mod & shuttle conversion to work as edit source, well maintained, \$2500. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004, 213-467-1700.

Panasonic AG1950 (2) VHS editing system w/AG95A edit controller, exc cond, \$1750. J Winslow, Creative Video, 716 Prescott, Endicott NY 13760. 607-754-6767.

CBS Labs 529 image enhancer (2), horz & vert equalizing, BO. M Cramer, WGBA-TV, 1391 North Rd, Green Bay WI 54307. 414-494-2626.

Sigma VPA-100 video processing amp, \$50 plus UPS. G Kirby, Marysville Bacs, 13613 US 36, Marysville OH 43040. 614-261-8871.

RCA Hawkeye Camcorder, \$6000; IGM VG2000 Prod. amp, cleans up sync, luminance & pedestal, chroma phase, (4) video outputs & 2x4 audio DA, \$500. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004, 213-467-1700.

RCA HR2 edit recorders & (2) M1 Format built-in T & B & C's, cases, etc, \$2000; HE1 edit controller together, \$4000. System needs minor work. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004, 213-467-1700.

Faroudja record ex image enhancer, battery/AC operated, works great, \$200; (2) Sony edit cables for type S/440, \$50/ea; Postex 8753 interface, \$300. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004, 213-467-1700.

M1 Format Production Package, System needs minor work, \$6000 complete. A Romanoff, 374 N Ridgewood Place, Los Angeles CA 90004, 213-467-1700.

Barco CTVM-38 15" color monitor, rack mount 9 mHz bandwidth trigun type, \$500. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5857.

Amtron AM17 17" color monitor, rack mount, in-line gun type, \$200. H Larson, Matrix TV, POB 536, San Luis Obispo CA 93406. 805-544-5857.

Telimation TSE200VS special effects gen, 6 inputs, 8 wipes & keyer, BO. M Cramer, WGBA-TV, 1391 North Rd, Green Bay WI 54307. 414-494-2626.

Buhl mobile multiplexer w/(2) Ektographic 35mm slide projectors, (2) 100-150 mm zoom lens, (2) projector cases, Sharp RD665 sync recorder, (4) Carousel trays, (2) 80's, (2) 140's, (2) spare 300W quartz bulbs, \$1875. B Hines, IPS, Rd 1 Box 413A, Export PA 15632. 412-468-4115.

Want to Buy

Sony RM-400 edit controller w/cables in fair cond. P Badger, Box 104, Birdsnest VA 23307. 804-442-4037.

Foxtex 4030/4035/4050 SMPTE synchronizer & controller. M Sokol, JMS Prod, 121 E Baltimore, Hagerstown MD 21740. 301-791-2568.

Unimedia SMT-9 (2) to convert to cross/pulse operation, need old or junked 065-0102A cross/pulse board, schematic/POC layout, source number for Unimedia-labelled chips. P Combs, Only Son Prod, 2316 Forest Home Ave, Dayton OH 45404. 513-236-2340.

Digital timer for TCA TR-60 videotape recorder. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Grass Valley 906A video AGC module. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

Tektronix 1450 or 1450-1 television demo & tektronix TDC-1 tuneable downconverter, VHF band. J Fuehrer, NTV Network, POB 220, Kearney NE 68848. 308-743-2494.

VVEarly TV cameras & studio equip, also early & pre-war TV sets. R Van Dyke, Caffrey House, Squires Ave, E Quogue NY 11942. 516-728-1327.

**VIDEO TAPE
RECORDERS****Want to Sell**

JVC CR4400U 3/4" port recorders (4) w/ access, \$800 ea/BO; (3) Sony RM-430 edit controllers, \$500/BO; JVC BR6400U VHS recorder, \$1500/BO. T Quinn, Monte Vista Std, 208 Cherry, Capitola CA 95010. 408-475-0423.

JVC, Sony, Panasonic, (8) players, all need some repair or use as parts, \$50 ea. K Taylor, Image Support, 103 N Aspen, Sterling VA 22170. 301-864-4841.

Misc 3/4" decks for sale/trade for other AV equip. Write/call w/want list & list of what you have to trade; Also needed stereo cart machines, Ampex 350 R/P solid state elect & more. N Mishana, POB 335, Lynbrook NY 11563. 516-582-1338.

Ampex VPR-2B 1" studio editing VTR's (3) w/slomo & spec effects, (2) TBC's, exc cond, \$21,000 ea or \$50,000 for all. Ugly George, 212-677-2200, M-F, 9-5; Fax 212-941-0956, M-F, 9-5.

JVC CR6600U 3/4" recorder, low hrs, nice shape, \$1250. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Millbrook AL 36054. 205-285-6179.

Panasonic AG7400 S-VHS

MARKETPLACE

Send us your new product info. Be sure to include a black and white photo. Send all submissions to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041



Expansion connector

Cablewave Systems has a new expansion inner connector assembly.

This assembly is an option to the bullet anchor inner connector usually supplied with rigid line sections.

The sliding contact surface is made with a silver plated beryllium spring.

The connector is available for Cablewave rigid line sizes 3 1/8", 4 1/16" and 6 1/8".

For information, call Al Criscuolo at Cablewave: 203-239-3311, or circle Reader Service 3.



Telephone hybrid

Gentner's SPH-5 is an analog hybrid with the following features: low distortion, low noise specs and maximum telephone frequency response; dual transformer hybrid system and a call record feature.

On-air calls can be recorded or calls can be taken off-air for later playback.

The SPH-5's front and rear panels are identical to those of the DH-2.

The cue button switches the send audio being fed to the caller between the console's mix-minus and the talent's mic preamp output.

For information, call Kelly Maag at Gentner: 801-975-7200, or circle Reader Service 89.



Transmission test set

Neutrik's TT402A audio transmission test set can be used as either a standalone or a computer integrated audio measuring system.

Line monitoring, field trouble-shooting, quality assurance and data acquisition may be accomplished via the "one button-one function" front panel. The TT402A is able to both operate independently in the field and in permanent installation.

For information, call Ken Smalley at Neutrik USA: 609-327-3113, or circle Reader Service 35.



Stereo synthesizer

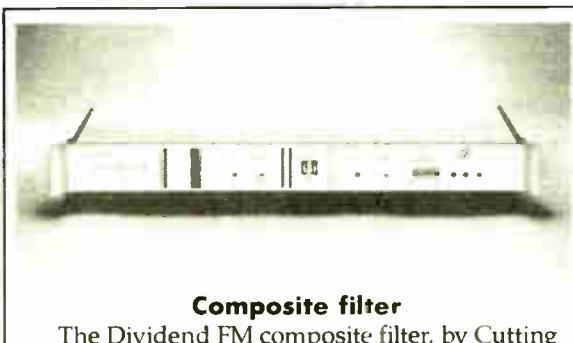
The Last Word, by Titus Technological Labs, is a microprocessor-based, automatic stereo synthesizer and stereo audio correction device.

The unit corrects audio problems such as loss of a channel, loss of signal or inverted polarity.

The TLW-2 can automatically insert an internal dynamic stereo synthesizer into an air chain.

The unit also provides full metering and audio monitoring.

For information, call Larry Titus at Titus Technological Labs: 203-633-5472, or circle Reader Service 11.



Composite filter

The Dividend FM composite filter, by Cutting Edge Technologies, operates on the portion of the composite spectrum above 53 kHz. This reduces main channel crosstalk to -60 dB or more.

The Dividend allows full stereo separation with no overshoots.

The filter also is designed to be phase linear.

According to Cutting Edge, users can typically increase modulation by five percent to reach the legal limit.

For information, call Joe Foti at Cutting Edge Technologies: 216-241-3343, or circle Reader Service 82.



Audio volume meter

The AVM audio volume meter, by FM Systems Inc., is a hand-held, digital, battery-operated RMS meter calibrated in dBm in a 600 ohm circuit.

Steady digital meter readings are obtained by storing and displaying only the highest RMS measurement made during the measuring interval.

The AVM meter reads audio levels in a 70 dB range from +20 dBm to -50 dBm in 0.1 dBm steps with basic accuracy of ± 1 percent ± 1 digit.

For information, call Frank McClatchie at FM Systems: 714-979-3355, or circle Reader Service 96.

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A SUCCESS STORY

THE OBJECTIVE was no small task: design a radio console that would become the new standard.

THE METHOD involved listening to veteran broadcast engineers and installers. After all, they're the people who have seen and experienced all the ideas that came before. From this research we learned of the problems that had to be solved and the features that broadcasters required. We then added ten years of console building experience and innovation, and created the A-500a console.

THE RESULT: An unsurpassed console that exceeds prior broadcast standards. Its module/mainframe interface borrows from the computer industry, utilizing all-gold contact insulation displacement technology. The logic system is based on programming the module slot, allowing full module interchangeability. It also provides for separate programming of the module's "B" input selection, thus avoiding embarrassing false starts and mutes. Full console-to-machine control is supported without extensive use of interface boxes and cables. Three audio busses are provided to enhance talkshows and remote functions. There are separate processing loops for the speech and music paths, as well as individual channel insert points. A complete line of microphone and line inputs, remote selectors, and machine control modules is offered in virtually any combination, configuration or mainframe size you desire. The A-500a also features a full family of studio turret and turret components to ease facility design.

THE PERFORMANCE: Needless to say, it's a new age for audio, and the A-500a is a step ahead. While specifications don't say it all, ruler flat frequency response, .003% distortion, crisp square wave response and a noise spec that's unheard of deserve merit. Couple such performance, reliability and innovation together, and a new broadcast standard is set.

THE SUCCESS: WHEATSTONE broadcast consoles are installed in major markets all over the country, from frontline independents to national networks. They are in use right now at some of the world's largest institutions.

THE POSSIBILITIES: The possibilities are up to you.



Wheatstone Corporation

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Circle 57 On Reader Service Card

World Radio History