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Translators Spark Debate

by Charles Taylor

Washington DC ... The FCC's proposal to further relax noncommercial educational (NCE) FM's use of translators has left a bitter taste with some broadcasters, judging from comments on the Commission's Further Notice of Proposed Rule Making filed in July.

The proposal intends to amend the FCC's March ruling that allows NCE FM translators owned and operated by their primary stations to receive signals from alternative signal delivery, such as satellite or terrestrial microwave.

This is designed to allow stations to increase coverage area substantially over

feeding a translator from the station's over-the-air signal.

In the Further Notice, released in April, the Commission proposed extending the adopted rule change to include NCE FM translators that are owned by parties other than the primary station.

Of the six organizations that filed comments with the FCC, not one supported the latest adaptation of an issue that has stirred controversy throughout its lengthy history.

Birth of an issue

The translator issue was initiated in 1981 by The Moody Bible Institute of

Chicago, which asked the FCC for a permanent rule allowing it to feed its translator by methods other than over-the-air feeds. After delays and repeated filings by Moody, it was passed in March 1988.

In May, four groups—the NAB, National Public Radio (NPR), the National Federation of Community Broadcasters (NFCB) and the Association of Maximum Service Telecasters (MST)—filed a motion of stay with the FCC, claiming that the rule making would deplete currently limited NCE FM spectrum, undermine localism and community access to local spectrum, create a land-rush application process and lead to interference on the reserved FM band and to chan-

nel 6 television stations.

The FCC a month later denied the groups' motion, stating that they failed to demonstrate any irreparable damage the ruling might cause and because their allegations were "nothing beyond pure speculation."

The denial was contested shortly thereafter by the NAB, and in a joint filing, by NPR, NFCB, the Intercollegiate Broadcasting System, the Office of Communication of the United Church of Christ, and People for the American Way.

Four of the seven groups involved in contesting the rule making—the NAB, NPR, MST and IBS—are among those that filed opposition to the Further Notice. Many of their arguments, along with the complaints from other groups, parallel concerns that have been brought up—and dismissed by the FCC—a number of times since the issue was initiated.

Serious policy flaws

The NAB opened its arguments by stating that the current ruling already had brought "serious communications policy flaws." The proposal to extend the policy to non-primary owners "would
(continued on page 7)

Tower Collapse Investigated

Colony MO ... The collapse of a 2000' broadcast tower here in June that killed three men remains under investigation with few clear conclusions about what provoked the disaster.

One source has said that flaws in the tower's steel or error on the part of the three men, who were replacing cross braces when the tower's 350 tons of metal gave way, may be responsible.

The tragedy occurred about 10 AM, on 2 June while the men were reportedly working about a third of the way up the tower from a steel basket.

The mid-section, where the three were working, was designed to fall into three pieces but instead fell straight to the tower's base, driving some pieces of steel 30 feet into the ground, one official said.

The top section apparently fell in a half-circle pattern along the base, and the base section fell north into a nearby forest.

The three workers who lost their lives in the tragedy were Victor Macs, Reginald Davis and Don Sadler. Two were buried in the mass of twisted metal, while the third was not located until the day following the collapse.

The tower was completed in September 1987 and is valued at \$2.5 million.

Off the air

Television station owner KTVO in Kirksville, MO, was knocked off the air following the accident for 32½ hours. The station now is broadcasting from a previous antenna site 40 miles away.

Radio station KRXL-FM in Kirksville also broadcast its signal from the tower, but unlike KTVO-TV, KRXL experienced minimal technical inconvenience.

"We were off the air only a second or two," said KRXL owner and GM Alvina Britz, thanks to an instantaneous alert system.

"When, for instance, the power goes off (at the tower site)," Britz explained,
(continued on page 9)



Workers examine the wreckage of the collapsed tower, which claimed three lives.

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AM Band Deadline Extended

Washington DC ... The FCC has granted an extension on the comment period for the Fourth Notice of Inquiry regarding expansion of the AM band.

The date for filing comments now is 11 August. Reply comments may be filed until 26 August.

The issue of AM expansion involves a plan to open 10 new AM channels, from 1605 to 1705, for commercial use. Plans call for the proposal to take effect 1 July 1990.

Most recently, allotment of the frequencies was settled at an International Telecommunication Union conference in June. Twenty-two Western Hemisphere countries met for discussions.

The extension on the comment period was prompted by a request from the Association for Broadcast Engineering Standards (ABES) in Washington.

The organization said that the original filing dates, 11 July for comments and 26 July for reply comments, were "not adequate to give interested parties to this proceeding time in which to consider and respond to the numerous technical and allocations issues that have been
(continued on page 10)

New Stations Are Risky, NAB Says

by Alan Carter

Washington DC ... The NAB has issued a position paper encouraging restraint in creating new radio and television stations, citing economic and technical considerations to support its stand.

From a technical viewpoint, NAB argued that more stations create greater levels of potential interference.

In economic terms, the paper claims that unregulated competition in the communications industry could set up

a situation where local stations cannot afford to broadcast non-entertainment programs and would not fulfill their obligations to their communities of license.

The NAB Joint Board of Directors approved the White Paper entitled *Is More Necessarily Better?* at a recent meeting. The document, which traces the establishment of the government's role in broadcasting was prepared by the association's legal department.

"This is not an attempt to undo existing rulings," said joint board Chairman

Wallace Jorgenson, president, Jefferson-Pilot Communications, Charlotte, NC.

"It is not an attack on new technologies; it is not an effort to ask policymakers for a complete halt to any new allocations.

"It is an effort to advise policymakers, as they consider future allocations policies, to look at the economic and technical harm which could accrue in an overly congested marketplace."

When the marketplace is overcrowded, Jorgenson said, broadcast sta-

tions are hurt and the communities they serve are hurt, because the stations can no longer compete effectively.

Less audience, less money

The NAB position paper claimed the introduction of more and more new stations in any market will cause a drop off in audience and accompanying revenue for existing stations. But with no decrease in operating expenses, the NAB said stations would have to cut staff or make programming changes.

"A station could be forced to choose between subsidizing news and public affairs, thereby reducing an already low profit margin, or reducing the amounts of news and public affairs programming, thereby risking the chance of losing its license for failure to fulfill its issue-responsive programming obligations," the paper stated.

Other proposals

On the technical side, the paper pointed out several proposals that would allow for more stations.

Among the ideas are downgrading some stations to increase the power of other stations; permitting the use of FM translators to grow without adequate safeguards; considering the use of FM directional antennas that could then permit additional stations to be "shoe-horned-in," and authorizing "low power" FM service.

The NAB also took issue with proposals for negotiated interference, where a station would accept interference in a deal with another station. "Negotiated interference also could lead us down the slippery slope toward the creation of new broadcast stations," the paper noted.

While some regulators may argue that economic and, in some instances, technical harm is not relevant to the FCC's and Congress's public interest determinations, NAB said it disagreed.

"Broadcasters are not afraid of competition," the paper concluded, "but are afraid of a marketplace so congested with stations that, for technical and economic reasons, no one can compete effectively."

For information on the White Paper, contact NAB public affairs at 202-429-5350.

NEWS BRIEFS

NRSC Rule Making

Washington DC ... A mandatory NRSC standard was on the FCC's agenda and was ready for a proposed rule making.

The FCC at press time was to consider the issue at its July meeting. The action is on a petition for a mandatory NRSC submitted by the NAB. Some confusion developed over which portion of the standard the FCC would include in the rule making.

The FCC rule making was expected to include a options for both the 75 μ sec preemphasis and 10 kHz stop-band audio standard (NRSC1) which was included in the NAB petition and the "RF Mask" transmission standard (NRSC2) which the NAB did not ask to make mandatory.

It was also expected to include an option to adopt either portion of the standard only.

FM Class A Power Hike

Washington DC ... New Jersey Class A FM Broadcasters may have an answer from the FCC on the group's request for an across-the-board power hike from 3 to 6 kW.

At press time, the Commission was scheduled to consider the petition at

a 20 July meeting.

Some of the largest broadcast group owners opposed the move citing technical flaws. The New Jersey group also failed to obtain support from the NAB for the across-the-board hike. The NAB would only back requests for individual power increases.

Undaunted, the New Jersey group claimed opponents raised unrealistic scenarios and challenged proposed remedies but not the basic premise of the proposed rule making.

The Commission was also expected to address the issue of establishing a Class C3 for Zone II FM stations.

Radio Campaign Approved

Washington DC ... A campaign designed to increase appreciation for radio has received the blessing of the NAB Radio Board of Directors.

The Board gave final approval to the national radio marketing campaign proposed by the joint NAB/Radio Advertising Bureau (RAB) Radio Futures Committee.

Developed by Warwick Advertising, New York, NY, the campaign is designed to increase awareness of radio's role among opinion leaders and the general public, to raise professional commitment

within the radio industry and increase radio's share of overall advertising dollars.

The radio committee plans to preview the campaign at NAB's Radio '88 that will be held here, 14-17 September. The kick-off is expected next winter.

Seed financing of \$600,000 has been provided in equal shares by NAB and RAB.

DASH Format

Tokyo Japan ... Three audio companies currently involved in DASH products voiced support for their common format and updated plans at a press conference here.

Involved are Sony Corp. of America, Studer Revox of America and TEAC Corp. of America.

The DASH format, originated by Sony, was proposed for worldwide tape interchange jointly with Willi Studer AG and Matsushita Electric Industries in 1982 when DASH multichannel recorders were introduced.

A competing digital format for multitrack recorders, PD (Pro-Digi) is supported by three other companies: Mitsubishi, Otari and AEG.

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NRBA Dissolves, Divides Funds

by Alan Carter

Washington DC ... The National Radio Broadcasters Association (NRBA) is no more.

What might be called the final step in the unification of the NAB and NRBA took place during the June NAB Joint Board of Directors meeting, when the NRBA executive committee voted unanimously to dissolve and to disburse its remaining funds.

The NRBA merged with NAB in 1986, but there was a two-year evaluation period before the corporate structure was disbanded.

Bill Clark, a former NRBA board chairman who is unification representative on the NAB executive committee, said he believed the vote by the NRBA executive committee was "a testimony" to the success of the merger.

NRBA funds, amounting to about \$150,000, will be equally divided between the All-Industry Radio Music License Committee and the Abe Voron Scholarship Award.

The committee will use the money to establish a permanent method of fundraising and to prepare for negotiations with the music licensing industry on agreements that come up for renewal in 1990. The Voron fund is in memory of the late founder and leader of the NRBA.

Support noted

Clark, of Shamrock Broadcasting, San Francisco, said the NRBA executive committee passed a resolution last year endorsing the unification and commending the NAB for its attention to radio is-

sues, a point of contention with some NRBA members during merger negotiations. Some felt NAB placed more emphasis on TV than radio.

As part of the unification, NAB and NRBA negotiated a 12-point agreement designed to change the organizational structure of NAB to assure radio an equal role "if it was guilty" of emphasizing television, Clark said.

"... a number of NRBA board members have run for and been elected to the NAB board ..."

Clark said.

Among those 12 points was the appointment of 12 NRBA members to the NAB board, one-third of which would expire each year for three years. The last four are currently finishing out their terms, including Clark.

"However, a number of NRBA board members have run for and been elected to the NAB board on their own," Clark pointed out. There are eight or nine former NRBA members on the NAB board, he said.

Other parts of the 12-point agreement that Clark noted was the change in NAB bylaws allowing the radio and television boards to act independently from one another if the joint board fails to agree on a motion after successive attempts.

The first test of this instance is pending, as the NAB Radio Board pushes for license renewal reform in Congress for

radio stations only.

Clark also said radio interests have been more successfully represented with the naming of radio point-persons in NAB's legal and government relations departments.

A final section of the 12-point agreement that Clark praised was the naming of a radio executive committee.

Not complete

"There is a lot of work that has to be done, but the organization (NAB) is committed to do that work, and it's committed to the concept," Clark said. "I think you might see radio-only efforts, in perhaps a variety of ways in the future, not just in terms of legislation but perhaps in terms of regulation."

Another NRBA member serving his last year on the NAB board, Carl Hirsch, president and CEO, Legacy Broadcasting, Los Angeles, praised the framework established within NAB for radio. But he held off a full-fledged endorsement of success.

"The only caution light is a lot of road yet has to be travelled," Hirsch said. "For me, I believe the jury is still out; however, I'm pleased with the progress thus far."

Hirsch said the success will be measured when a radio-television issue comes to head. He asked, "Is radio going to be well represented in the arenas **(continued on page 13)**"

Judge Exits From Kahn Patent Case

New York NY ... The judge assigned to hear a patent infringement suit by Leonard Kahn against General Motors has disqualified himself because his wife owns GM stock.

Judge Peter Leisure of the US District Court for the Southern District of New York withdrew from the case at the time of a 24 June conference, according to a court representative. The case will be reassigned.

Kahn filed suit 29 April against GM, accusing the automobile manufacturer of infringement on compatible AM stereophonic receivers, patent number 4,018,994. Kahn alleged that GM infringed on two claims of a patent with respect to single-system AM radio receivers that incorporate Delco part DM-235 or Motorola part number MC13020P integrated circuits.

He claimed that GM marketed AM stereo radio receivers using the DM-235, developed jointly with Motorola, in competition with a multisystem car radio.

Motorola's C-QUAM AM stereo, which is in competition with Kahn's **(continued on page 9)**



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Beatin' the Summertime Blues

by Judith Gross

Falls Church VA . . . It's that time of the season when everything comes to a screeching halt. The summer slowdown.

Lots of folks are away on vacation. Then there are those of us embroiled in the middle of the heatwave that wouldn't quit—temps in the triple digits.

Hope you're keeping that transmitter and those studios cool. If you can, put the station on automatic pilot, kick back with a cool one and put on the baseball game. Summer's gone before you know it.

August, and we're already gearing up

for the onslaught of fall trade shows. Radio '88 and the SBE Show are five days apart but so far that doesn't seem to be hurting either one. Exhibits and attendee registration are up for both.

Seems that some equipment companies which have stayed away from the NAB's fall show the past several years are showing up at this one. Reason? Well, we'd like to give NAB credit but actually it's the great location. The nation's capital is a good draw for east coast broadcasters.

Hope to see more engineers at Radio '88, too. There's the Directional Antenna seminar and one on the Digital Station. Check out the luncheon on that last one

where you'll get a chance to heckle me. I'll be speaking on "Radio Rediscovered: Back to the Future." Not too much heckling, now.

And the NAB plans to unveil the super radio, which it can no longer call that, at Radio '88. Seems Super Radio is a trademarked name of receiver made by GE. Richard Sequerra is the designer . . . they say, they could call it the Sequerra radio.

Or maybe come up with a catchy name like they do for cars. How about Stingray or Thunderbird? I bet Mustang would go over well with baby boomers.

By the way there will be three models, for three different AM stereo systems, one with a C-QUAM chip and two with the Sanyo chip. One of those two receives the Kahn system in stereo only, the other receives both systems in stereo. Now if they can just get a good AM signal into the Washington Convention Center . . .

☆☆☆

Fourth of July must have been pretty wild in Sierra Madre, CA. The Phantom of the airwaves, whom RW readers know as Jack Cheese of KCHZ Powercheese radio put his "experimental" FM station on the air broadcasting the town's parade and other activities, live.

He tells me he was in stereo over a pair of Sony F-1 digital PCM converters at either end of a 400 MHz RF link between the parade site and the main studio. Might be a first for a (and I use the word fondly) "pirate."

I've included Jack's photo so you can all see what a handsome devil he is. Hey that's no pirate, that's the station owner!

Speaking of stereo, KMOX, St. Louis which frequently sends out info on station's doings, wanted to let me know it started broadcasting 24 hours in (AM) stereo awhile back. Hope you remembered to tell the listeners, gang.

And there's growing concern about FMs that simulcast their AM stations. Seems some of you have not been identifying the stations separately and that's a no-no, according to the FCC rules.

Besides, it's bound to hurt the AM if you only ID the FM. Sure, it's nice to get a great book on the FM side of things, but not at the expense of your other property.

☆☆☆

I see where Fidelipac is giving away trips to Hamburg, Germany for the European AES in March to customers who purchase a Dynamax recorder and three players.

Germany, huh? Not bad. Is there any truth to the rumor that each trip includes an autographed picture of VP of Marketing Art Constantine dressed in Alpine short pants and holding his favorite beer stein?

From Al Peterson at WHEN/WRHP in beautiful Liverpool, NY (sure I know where that is, it's a suburb of Syracuse) comes a name for a producer who has transcended analog tape and become proficient in digital

editing. He says they used to call the terrific splicers "superblade," so for the digital rats, how about something loosely borrowed from the Fender guitar folks—"Stratotracker?"

Stations are trying all kinds of gimmicks to attract listeners these days. Most are zeroing in on some specialized area of interest, like "Money Radio."

Let's see, we've got radio for kids at KPAL, in Little Rock, and then there's the station that just said the heck with it and did away with DJs entirely. WLNZ calls itself America's first "Digital Hit Radio." The Lansing FM says it has no talk, no jocks. And if that's not enough, the station also calls itself "Lansing's Flamethrowing Terminator." Now there's a station I don't want to get in the way of.

There's motivation radio—WNN in West Palm Beach. There's also been macho radio, sexy radio and one I kind of like, WFMT in Chicago calling itself "Civilized Radio." OK, what are the rest of us, barbaric?

Then again, the dog days of summer haven't dulled the edges on station promotions any. Awhile back I told you about two DJs getting married on air, now from KIX radio in St. Louis

comes word on two listeners tying the knot on air in stereo, with air talent, including Reverend Mike, an actual minister, officiating, Frank O. Pinion witnessing and Wrangling Dick Dailey as flower girl.

But one of the better promotions came from KKGO, a jazz station in Los Angeles which wanted to let the world know that it was the official radio station of the Sixth Annual Southern California Garlic Festival (where else?).

The station kindly sent the press release along in an envelope filled with—you guessed it—fresh garlic. I knew the postman had arrived before he knocked on the door.

All I can say, KKGO, is I'm glad it wasn't a fish festival.

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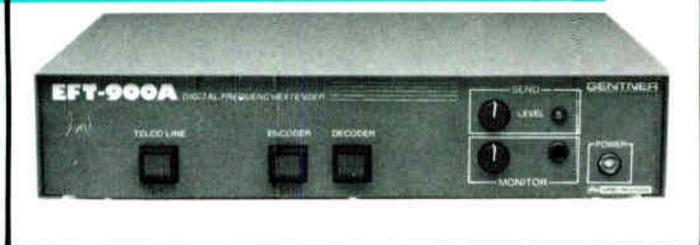
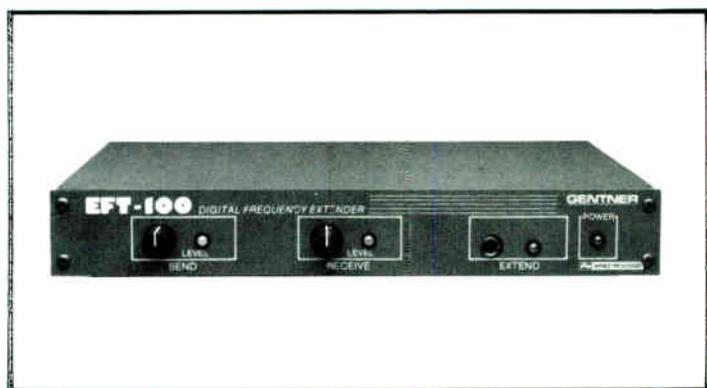
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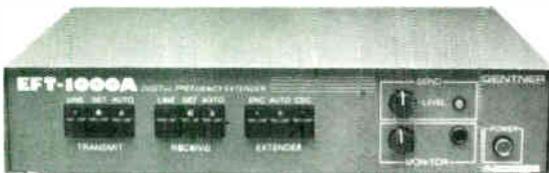
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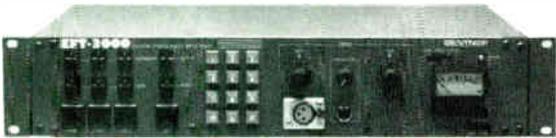
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OPINION

Readers' Forum

If you have comments for *Radio World*, call us at 800-336-3045 or send a letter to Readers' Forum (Radio World, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7772). All letters received become the property of Radio World, to be used at our discretion and as space permits.

More effective EBS

Dear RW:

Over the last few months there has been a lot of discussion about the EBS system and how it may be changed to be more effective.

To say the present system is less than effective is like saying Irving Berlin is getting a little old. Allow me to mention a few ideas that may help greatly in providing a more reliable alert system.

The NAB has proposed a shorter tone for tests; this is a mistake. Granted, the test is the biggest tune out factor on most stations. However, it is a good attention getter in the event of a real emergency.

One way to alleviate the tune out factor would be to have the secondary stations in any given area repeat the test as soon as feasible after the primary station sends it.

This way it will be all the stations at nearly the same time; in fact it will almost be a race to get it on the air. Besides, this is the way the system should work in the event of a real emergency.

The system should be used more than it is in the event of local emergencies such as severe weather, chemical spills, etc. This will make the public realize those annoying tones are made for a purpose. In fact, in my market there has not been a real EBS in over three years, although

there have been several good uses for it.

Unfortunately emergencies don't happen between 8:30 AM and local sunset on regular business days. I would be willing to bet if you talked to the overnight weekend operator in any given station chances are he wouldn't even know where the EBS receiver was. (My apologies to any chief engineers such as myself who make sure they do.)

My proposal would be to allow tests anytime day or night but structure them in such a way that they get in all dayparts—yes, even the program director's show.

One of the biggest factors attenuating the effectiveness of the system is the lack of working equipment. The phone call to the engineer across town saying, "I'm having a little trouble with my receiver, could you give me the times and dates of the tests for the last six months" is all too common.

Perhaps a daily required self-test would help keep the equipment working. In addition, the primary station in a lot of markets is the oldest AM in town
(continued on page 12)

The final dissolution of what was the National Radio Broadcasters Association speaks well of the organization's two-year marriage with NAB.

The fact that there was no apparent opposition to this last step proves that the unification has gone smoothly. When it was first proposed there were concerns about whether radio would be given equal priority with TV.

In the past two years NAB has strengthened its focus on radio issues, especially those of a technical nature. The NRSC standard and the FM transmission subcommittee are two examples of time and resources which have been directed toward helping radio broadcasters.

The fall radio show has benefitted from their combination as well. After some initial problems the number of all types of sessions has increased and there are more exhibits.

After the Merger

In addition, the ranks of NAB radio membership has continued to swell and a strong Radio Board has been able to persuade NAB to undertake its first radio-only lobbying efforts, on the comparative renewal question. But while NAB radio

members outnumber TV members in terms of pure numbers, TV members still exert a strong influence over the direction of future efforts.

The most obvious example is HDTV, where NAB is spending \$700,000—not originally included in its budget—to participate in an effort that is being driven mostly by the TV networks. Radio is more decentralized than TV and as such must put forth extra effort to speak with a unified voice. NAB radio members, especially in smaller markets, must realize they have a responsibility to insure that their needs are being met.

The NAB's Radio Board must continue its strong leadership and see that radio issues are separated from TV issues when warranted.

And NAB must not get so caught up in TV concerns that it neglects the pressing issues of the day for radio.

NAB should keep in mind the trust placed by the former members and leaders of the NRBA when the merger first took place. Now that broadcasters have a single voice it's important to everyone to keep that voice strong.
—RW

Is the NAB Really Helping AM?

by Lawrence Tighe

Hackettstown NJ . . . It is time to end the discussions about AM improvement. There aren't going to be any real improvements. At best you'll see cosmetics applied and more studies.

The major representative of broadcasters does not want a real solution to AM problems. The reason is simple . . . "The Class Bs and Cs are our big duespayers here at the NAB."

Another oft-quoted NAB'er said, "FM2 is a great idea, there is nothing wrong with it . . . but if I ever recommended FM2 to the Board, I'd lose my job!"

When you see the NAB drop \$700,000 of members' money into the development of HDTV because the TV industry perceives they're going to become "second class citizens" in the media world, one must start to wonder where the NAB's priorities are.

As it appears right now the "Blue Ribbon" committee for the study of ATV systems is going to recommend lots more spectrum for the TV constituents.

FM2 simply requests five MHz of spectrum for 25 channels to be distributed among AM broadcasters. This simple plan would have removed almost 50% of the AM stations now on the air and allowed the remaining stations to increase power and let out patterns.

There would be no increase in the number of commercial stations on the air! It first appeared as a win-win situation.

Larry Tighe is president of WRNJ-AM and FM2's leading proponent. He can be reached at 201-850-1000.

But wait a minute. Political reality comes into play. The NAB cannot support a plan that is going to make the "big dues payers" have to seriously contemplate competition from the former peanut whistle down the road!

No more competition

One group owner said, "I like the idea but I value my FMs more than I do my clear channels . . . I don't need any more competition!"

Guest Editorial

So there you have it. The average AM small or medium market station cannot afford toll calls, let alone bootstrap-up an organization to lobby for a mere 5 MHz more.

The existing lobby, through silence on the FM2 proposal, has determined that AM shall die at the expense of the "big dues payers'" fear of competition. One wonders if this doesn't look like a conspiracy to effect a constraint of trade.

As one of the NAB's pet consulting engineers said recently, not expecting to be quoted, "AMs make great malls and parking lots." He was absolutely right. And he had absolutely no concern for the loss to the public. Nor, does the NAB. NAB is a commercial lobby, not a public advocate!

When AM was the largest "dues-payer" it had a chance. Now it is at the bottom of the NAB's list and does not have a chance.

The cosmetics will continue, more

studies will tell what we already know and the NAB will send lists of their "accomplishments" to the AM community every year. But, nothing will happen to relieve the basic problem—overcrowding. No attempts for more spectrum will be made (HDTV, of course, is the exception).

More obstacles

A very large group owner, an NAB dues-payer, said of the FM2 proposal, "We're not going to let FM2 happen." And added "We'll never let the FCC consider it."

A spectrum specialist at the FCC suggested to me quite naively after confirming spectrum availability, "you have to get the NAB behind this if you want to solve the AM congestion problem."

What he failed to understand is that the NAB is run by the people from the biggest media firms not the little guys that it once represented. Ask the Class As what happened and where the "muscle" came from when they tried to improve their facilities.

So, if *Radio World* is going to persist in publishing articles about AM, you should understand that you are embellishing its epitaph.

That, short of additional, acceptable spectrum such as TV received to prevent them from becoming second class (like AM), there will be no improvement of the AM band. One sentence for 1605-1705: it's just more of the same splatter, squeals, skip and noise we've all come to know.

RW has done a great job of engineering coverage. However, I think you
(continued on page 14)

Radio World

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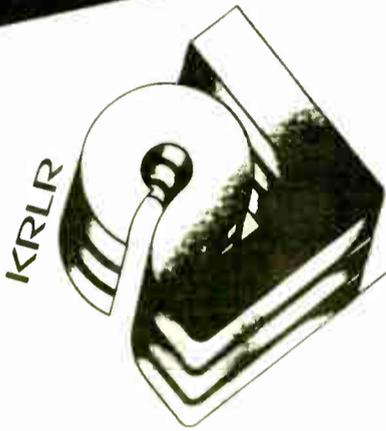
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ALLIED EMERGENCY SERVICE...



Las Vegas

May 11, 1988

Mr. Roy Ridge
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Dear Mr. Ridge:

Allied to the rescue! A statement that was put to the test on Sunday, May 1, here in Las Vegas.

Las Vegas is known for the N.A.B. and the dazzle of the casinos, but few people know that we get very high winds. In fact, during the weekend of April 30-May 1, recorded ground winds were at 60 miles per hour and up at two thousand feet where our transmitter is, the winds were much stronger.

KRLR TV-21 had its share of turned S.T.L. dishes and satellite support damage, but on the mountain, our S.T.L. antenna turned by the wind, stressed the transmission line clamps, and resulted in our waveguide snapping.

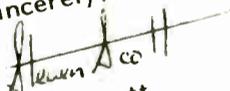
My first thought was give the Allied 24-hour emergency service number a try. I did and talked to Jerry Weddle in Richmond.

Within hours, I had new materials in hand and, best of all, the order was complete!

It has been exciting more than normal in Las Vegas. The same day we were installing the new waveguide on the mountain, a chemical plant exploded at the base of the mountain. No damage resulted to our equipment that I know of, but it's nice to know that Allied emergency service that works is just a telephone call away!

Thanks, Allied!

Sincerely,


Steve Scott
Chief Engineer

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\$145 Million Sale Part of 3-Way Deal

by Charles Taylor

New York NY . . . An intricate maze of broadcast transactions spurred by a broadcast entrepreneur here have resulted in the formation of a new radio group—in the most expensive purchase price ever paid for a single radio station—and in partner ownership of New York's WNEW-AM.

Within a three-way deal announced last month, the dotted lines primarily bear signatures representing the interests of Robert Sillerman, founder of Legacy Broadcasting in Los Angeles and buyer in April of Metropolitan Broadcasting in Los Angeles.

His recent transactions allow a retained equity interest in the various companies, while resolving cross-ownership problems involving two Los Angeles stations.

In the first leg of the deal, five stations owned by Metropolitan or Legacy were sold for \$145 million to Metropolitan President and CEO Carl Brazell Jr.

The two formed a new five-station

group, Command Communications. Brazell will retain all voting stock, while Sillerman will maintain a non-voting equity interest.

Big bucks

One of the five stations Brazell bought to form the new group is easy listening outlet KJOI-FM in Los Angeles, for which he paid Legacy a record-breaking \$79 million.

Legacy maintains ownership of KTWV-FM in Los Angeles, which resolves potential cross-ownership problems in that city.

Legacy will also acquire a 49% interest in Metropolitan, and will operate the company's two remaining stations, WNEW-FM in New York and WMMR-FM in Philadelphia.

Included in Brazell's five station purchase are KSYY-FM and KHOW-AM in Denver from Legacy for \$16 million; and KRLD-AM and the Texas State Networks (a programming company), both in Dallas, for \$50 million from Metropolitan.

Finally, Metropolitan, owner of

The Anatomy of a Deal

Former Structure

Legacy Broadcasting

- KDWB-AM/FM, Minneapolis-St. Paul
- KILT-FM, Houston
- WCXR-FM/WCPT-AM, Washington, DC
- WLLZ-FM, Detroit
- KJOI-FM, Los Angeles
- KHOW-AM/KSYY-FM, Denver

Metropolitan Broadcasting

- WNEW-AM/FM, New York
- WMMR-FM, Philadelphia
- KRLD-AM, Dallas
- Texas State Networks, Dallas
- KTWV-FM, Los Angeles

NEW STRUCTURE

Legacy Broadcasting

- KDWB-AM/FM, Minneapolis-St. Paul
- KILT-AM/FM, Houston
- WCPT-AM/WCXR-FM, Washington, DC
- WLLZ-FM, Detroit

Metropolitan Broadcasting

- WNEW-FM, New York
- WNEW-AM, New York (owned jointly with Westwood One)
- WMMR-FM, Philadelphia
- KTWV-FM, Los Angeles

Command Communications

- KRLD-AM, Dallas (from Metropolitan)
- Texas State Networks, Dallas (from Metropolitan)
- KJOI-FM, Los Angeles (from Legacy)
- KHOW-AM/KSYY-FM, Denver (from Legacy)

WNEW-AM in New York, has signed a partnership agreement with Westwood One for the purchase of a 50% interest in the station for \$11 million. Westwood One will operate WNEW-AM.

Westwood plans to sell WNEW's advertising time in combination with WYNY-FM, which the company recently agreed to buy from Emmis Broadcasting.

FCC Translator Changes Questioned

(continued from page 1)

make a bad situation even worse and would be more threatening to the fundamental principles of broadcast localism and spectrum integrity and efficiency."

"While the Commission's goal of providing FM service to areas and populations unable to receive satisfactory FM service . . . may be laudable, the method chosen to achieve this objective will result in critical impediments to the maintenance, creation and expansion of full service public radio . . ." NAB reiterated.

The FCC's stand that the ruling would allow underserved and unserved areas to gain access to NCE FM programming "does not withstand close scrutiny," the NAB added.

There are fewer and fewer such markets each day, the NAB maintained, adding that communities that have no licensed stations are served by nearby stations. The NAB also said the Commission should support actual issue-responsive programming service "that meets the needs of the community and not simply rebroadcasts from a distant market."

The NAB also raised the argument that the proposed rules will tax the Commission's limited administrative resources. "The doors would swing open for the Commission to be swamped with a barrage of new applications from would-be noncommercial broadcasters," it wrote.

Gold rush mentality

The Association for Broadcast Engineering Standards (ABES) also voiced concern that the current and proposed rule making will generate a massive number of applications for new satellite-fed FM translators.

"It is unwise, in light of the experience with Low Power Television Service, for the Commission to create another frenetic, gold rush mentality that will stimulate an avalanche of FM translator applications," reasoned ABES.

"The evils to result are the destruction of a valuable service, the overloading of

the Commission's limited processing facilities, with a resultant diversion of resources from more significant services, and the stimulation of unseemly application mills, phony applicants, phantom transmitter sites and a speculative frenzy wholly unrelated to the public interest."

Such a flood of applications also will produce the "strangulation" of legitimate translator applications, ABES said.

"If the Commission's actions in this proceeding should precipitate the kind of filing frenzy that has already occurred in the LPTV-TV Translator service, it will almost immediately affect adversely applicants for FM Translators on the nonreserved channels," the ABES maintained.

Salem Broadcasting Services, a Camarillo, CA-based owner of FM and AM stations nationwide, said in its comments that the FCC's rule making does nothing to guarantee that translators will be used to transmit to unserved or underserved regions, which is the ruling's primary purpose.

The company suggested that to insure service is being provided to areas with a need and to prevent further overcrowding of the FM band (translators require a frequency designation apart from the station's broadcasting frequency), permission for stations to use alternative signal delivery should be allowed only

(continued on page 14)

Keeping the format

Westwood officials said that WNEW's big band/MOR format will be maintained, with the addition of Mutual Broadcasting news and programming from the NBC Radio Networks, both divisions of Westwood One. Both WNEW and WYNY will move to Westwood's New York facilities.

"WNEW-AM will now have the programming and marketing resources it needs to realize its potential and once again become a force in the New York radio market," said Norman Pattiz, chairman and CEO of Westwood One.

The complex agreement, said Sillerman, is a "natural fit."

For additional information, contact The Sillerman Group at 212-980-4455.

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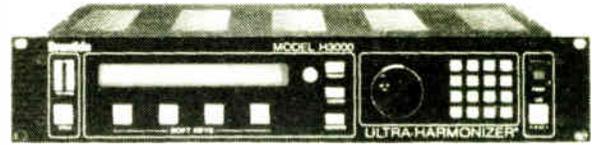
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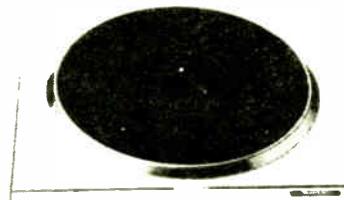
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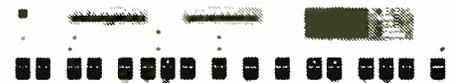
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Fatal Tower Failure Investigated

(continued from page 1)

"it immediately alerts our on-air person in the FM control room, and they push a button and switch over to the auxiliary transmitter"—located on site at the station's studios.

On the evening following the tower's collapse, station employees were able to move the main transmitter, the TSL and the STL equipment, which was undamaged, from the tower site to the station's transmitter building.

Reduced power

The transmitter then was patched to the station's 450' on-site AM antenna, which normally is used for sister station KIRX. The FM station operated on reduced power until the move was completed.

The cost of equipment destroyed by the tower collapse is \$250,000, according to Britz. A decision has not been made as to where the station will transmit from permanently.

Kahn Suit

(continued from page 3)

ISB AM stereo, is used in GM's Delco radios.

According to the court officials, GM has filed a motion to delay proceeding pending the outcome of a declaratory judgment filed 27 May by Motorola against Kahn and Hazeltine Research in Chicago. No rule on the motion is expected until a new judge is assigned.

Motorola filed the complaint 27 May in US District Court for the Northern District of Illinois in Chicago asking the court to resolve the patent dispute.

Hazeltine, based in Elmhurst, IL, owns exclusive right to the patent, but Kahn, who is the inventor, claims limited rights to enforce certain claims of the patent.

According to a court official in Chicago, Kahn has filed a motion to have the Motorola declaratory judgement case dismissed. A status hearing on that motion was scheduled for 28 July.

For information from Motorola, contact the corporate public relations department at 312-576-5304. Contact Leonard Kahn at 516-222-2221 and Hazeltine Corp. at 516-261-7000.

Meanwhile, investigations are continuing on a number of fronts to determine why the tower fell. None, as of yet, has revealed the cause.

"The investigation is continuing, but we don't have much progress to report," said Greg Wittland, controller at KTVO, which hired an engineer to investigate the accident. An official report isn't expected until September.

The engineer is looking at a number of factors, Wittland said, including defective bracing rods, defective equipment used in repairing the tower at the time of its collapse, and the possibility of human error.

"It wasn't installed defectively," Wittland said, "but some of the material on

the original (braces) was bad. They had defective welds, called thermal undercutting, which occurs at the time when the rods are fabricated."

The tower was built by Structural System Technology (SST) of McLean, VA, which employed the three men killed.

No conclusive evidence

"There are all kinds of possibilities here," said SST President Cabot Goudy in response to questions regarding the cause of the collapse. "No investigation has any conclusive evidence at this point."

Goudy said the company is conducting investigations of its own, though he declined to elaborate.

SST, which has been in business for 20 years and works on about 100 tower construction and reinforcement contracts a year, never has been involved in such an accident, a company official said.

Officials at LaBlanc and Royal, the Ontario-based manufacturer of the steel used to build the antenna, refused to comment while investigations are ensuing.

KTVO-TV hopes to begin construction of a replacement antenna by year end, depending on weather conditions. Wittland said that the clean-up operation, once it begins, will not affect the construction schedule.

"The hard part is the lead time on steel. There's quite a bit of lead time on new tower parts," he said.

For more information, contact Greg Wittland at 816-627-3333.

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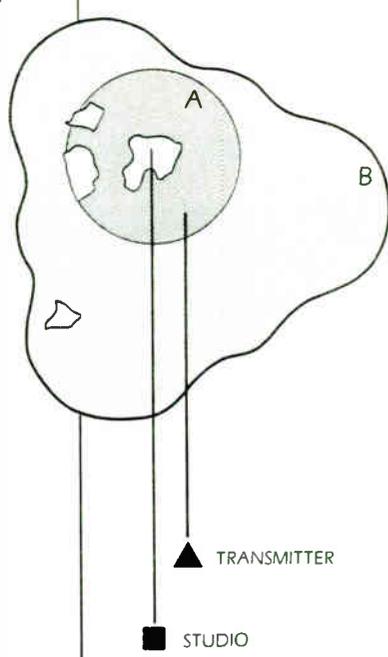
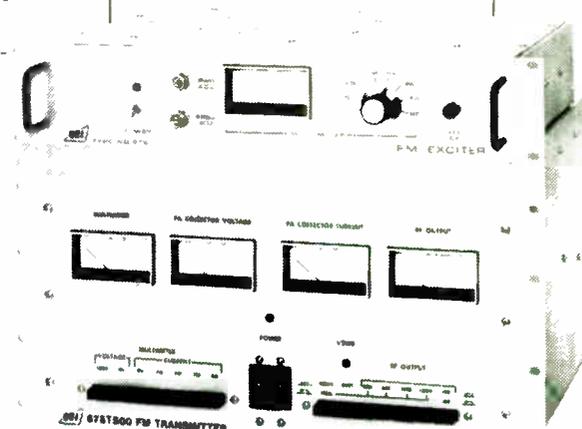
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Sync Transmission Aids WLLH

by Alan Carter

Lowell MA . . . For a little more than 50 years, WLLH-AM has been reaching from here to Lawrence, about 10 miles away, by synchronous transmission.

GM Mark Ericson described the setup as, at times, a technical nightmare. But neither he nor CE Jeff Merrow are discouraged enough to recommend that the operation be dismantled.

But Ericson and Merrow both maintain there are reasons for putting up with an

interference zone and continually looking for some technical maneuver to improve reception.

"It's the extra coverage area," said Ericson, who came to the station when new management took over in December 1987. "It's coverage area that, late at night, we wouldn't have at all. We wouldn't even have a prayer. And the area on the other side of Lawrence—that's coverage that even during the day, we wouldn't get. It's like having a second radio station."

The setup uses two, 1000 W transmitters calibrated with CTS Knight master oscillators. A Harris SX1 is the main transmitter here, and an older RCA unit is at Lawrence.

With the Knight oscillators, which are temperature controlled, Merrow said the station can keep the transmitters within the required 0.2 cycles per second. "At the moment, we're getting a beat about once a minute, which is real comfortable to receive," he said. "If we slowed down any further then we actually no-

tice that people lose reception in their houses and then it comes back if they're living right in the hash area."

Before WLLH installed Knight oscillators about two years ago, the station used another synchronizer, which Merrow said never really locked the transmitters.

"It would drift high, then it would notice that it was high and then start heading the other way," Merrow said. "It was a very, very open loop. There was a real bad hash area."



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Trying something else

The station has another plan in the works that Merrow hopes will improve the synchronization.

With the NRSC voluntary standard being used, WLLH has spare bandwidth at the top end of its STL. "And since we're a high end of the dial frequency, 1400, we're expecting to put a pilot tone on the STL to each of the transmitters and thereby be able to lock them in," Merrow explained.

"We want to keep a phase control (at one or both transmitters) so if somebody calls in and objects to the fact that we locked it against their house, we can shift it."

Merrow said a similar setup is on the drawing board for WORC, 1310, a station in Worcester owned by the same group. The FCC has granted it an experimental license to install a 500 W repeater to be used in coordination with the station's 5 kW day effective coverage. WORC is C-QUAM stereo, and Merrow said the

(continued on page 12)

AM Deadline Extension

(continued from page 1)

raised by the Fourth Notice."

Also, ABES noted that several other rule making and inquiry proceedings affecting the AM and FM broadcast services had been scheduled in July and August, including commercial and non-commercial FM translators, FM standards/IF separations, FM directional antennas and AM standards.

Support for ABES' request for extension was filed by the National Telecommunications and Information Administration (NTIA), which is responsible for the management of the federal government's use of the radio frequency spectrum.

"An extension of time is required for NTIA to coordinate the federal government's response to the Notice," the organization wrote.

The FCC, in granting the extension, conceded that "the issues are numerous and complex. Moreover, comments are due this summer in a number of radio broadcast proceedings."

In the NOI, the FCC asked questions addressing some 78 issues, including the implementation of "national licensing" which would allow a licensee to operate stations on a single frequency nationwide.

AM expansion is contained in Docket 84-467. For more information, see RW 15 July, or contact Wilson LaFollette at the FCC, 202-254-3394; or Wally Johnson at ABES, 202-824-5660.

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AM Sync Adds Coverage Area

(continued from page 10)

pilot tone will control the master oscillator before modulation.

At WLLH, the station loses about a two-mile wide area in the interference zone that affects the towns of Andover and North Andover, mostly residential areas. The severity depends on whether listeners are in their automobiles or in their houses, according to Ericson.

"If you are mobile, you can hear phase

shift," Ericson said. "You can hear the two transmitters battling it out on your receiver's detector. With every few feet you move, it changes."

Ericson also noted that at some points, the battling transmitters "will trick" an AM stereo receiver circuit into play.

"And if you're stationary," he continued, "you either get it or you don't."

In an attempt to help the situation, WLLH is using a microwave to get

the audio a little closer together, rather than a telco loop for the Lowell transmitter.

Helped the situation

"We helped the situation," Ericson said,

"but we're on a direct shoot to our Lowell transmitter, and it's still a two hop to our Lawrence transmitter."

Merrow said the goal was to get the audio closer so the station could install an audio delay to make up the difference to synchronize the audio as well as the transmitters.

With the microwave, Merrow said he can hear a lot more high end than he ever could off the phone lines, although the specifications were at 15 kHz.

Even with the interference, Ericson said listener complaints are rare. "I think most folks in this day and age, if they have problems receiving an AM station, they just assume that their radio is not right or they're too near a fluorescent light or toaster."

Not the best

WLLH's synchronous operation "is far from the ideal," Merrow acknowledged. Specifically, he said, the transmitters are too close to each other.

"Each synchronous that somebody wants to put in (today) is probably going to cover a pocket that they aren't covering at all," Merrow said, "and here during the daytime, our two transmitters are really battling at each other because they can hear each other."

He said he does not think stations considering implementing a synchronous setup will have the interference problems of WLLH because licensing would limit the power of the synchronous

transmitter and result in less crossover. Nevertheless, Merrow said WLLH is going to keep on improving its synchronous operation.

"To some people, (WLLH) is a Lowell radio station," Ericson said. "To some people, it's a Lawrence radio station. All they know is they can get it wherever they go."

"From a marketing standpoint between the two cities of Lowell and Lawrence, there are three AMs," he continued, "or if you really count it out by transmitters, there are four and I'm two of them. From competition and a sales standpoint, that puts me in a unique bargaining position."

Contact Mark Ericson and Jeff Merrow at 617-458-8486.

WLLH is using a microwave . . . rather than a telco loop for the Lowell transmitter.

Widmann Selected President, CBS Radio Division

New York NY . . . Nancy Widmann has been named president of the CBS radio division, effective at the beginning of the month.



Nancy Widmann

Her appointment marks the first time such a position has been held by a woman.

Widmann replaces Robert Hosking, who opted for CBS' early retirement offering, following 30 years of service

at the network. Hosking had been president of the radio division since 1981.

Widmann's promotion culminates 16 years experience with CBS, most recently as VP of CBS-owned radio stations. Before that, she was VP of CBS' AM-owned stations.

She is a member of the Board of Directors of the Radio Advertising Bureau and is a past chairman of the New York Market Radio Broadcasters Association. She also is a member of the New York State Broadcasters Association.

CBS also has named Larry Cooper VP of CBS News, Radio.

Cooper has been news director and executive producer of RadioRadio, the CBS radio division's young-adult-oriented radio network, since 1981. Cooper created the format and is responsible for all of its CBS news broadcasts.

CBS' radio division comprises two radio networks, 11 FM stations, seven AM stations, a syndicated programming service and a national radio representation firm.

For information contact CBS Radio public relations at 212-975-3771.

More Readers Forum

(continued from page 5)

and it probably has a ground system that needs work, and therefore a less than optimum signal.

The expanded use of FMs and possibly more than one primary station in a given city would be a great help.

I realize that restructuring the system would take years; however, with a little

work and a few changes it could become a lot more effective.

Joel Belik, CE
KIKX

Colorado Springs, CO

Motivational advice praised

Dear RW:

John Cummuta's article in the 15 May *Radio World* could not have been more timely. It coincided perfectly with and complemented very well the information about positive self-talk and talking to win that I recently studied in a book titled *Talking to Win* by Dr. Lillian Glass.

I have been reading RW about four years and consider it one of my best technically related publications. I feel fortunate to read Mr. Cummuta's articles regularly and consider him a prized contributor to an already outstanding organization.

Thank you RW and John Cummuta for helping me grow professionally.

James L. Atkinson
Maintenance Technician
WCFC-TV
Chicago II.

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Origin of FCC Operator Rules

by Harold Hallikainen

San Luis Obispo . . . Thanks for all the calls regarding this series of articles. I've gotten calls about conflicting opinions regarding the rules.

Of course, what I say here is only opinion.

I recently received a call that another publication said you need not log EBS tests received from wire services, yet 73.961 appears to require the logging of such tests.

Another caller said that an FCC Field Office told him that no FCC license or permit is required to operate a broadcast transmitter, yet 73.1860(a) says a license of permit is required.

I'd suggest going by what's published in the FCC Rules, not just by what I (or another publication) may say.

Unattended translators

With the Commission's recently allowing NCE FM translators to use any link to carry the program from the station to the translator, it becomes an interesting problem to determine whether what we used to call a "translator" (which, if receiving a direct audio or video feed, no longer does any "translating") is indeed rebroadcasting another broadcast station.

Which station is rebroadcasting which when the program is fed directly to each of them? Are directly fed "translators" or "boosters" still rebroadcasting the signals of a broadcast station, allowing the licensed operator requirement of section 318 of the Communications Act of 1934 to be waived?

Rule 73.1860(a) requires each AM, FM or TV station to have at least one person holding a commercial radio operator license or permit (any class, unless otherwise endorsed) on duty in charge of the transmitter during all periods of broadcast operation.

There are no exceptions for any sta-

NRBA Ends

(continued from page 3)

of comparative renewal and situations such as what happened once before when radio was swept in with television when we lost tobacco advertising? Is radio going to be separated from television in those areas that will be advantageous to our industry?"

Other issues Hirsch named where radio and TV concerns should be separated are the fairness doctrine and questions surrounding broadcasters' licenses.

Hirsch said the NAB board "has spoken loudly," and NAB President and CEO Eddie Fritts "is now doing a very capable job of carrying the message." Hirsch noted the recent naming of James May as NAB's chief lobbyist.

"There are a lot of moves that have positioned the organization in the direction that is in concert, I think, with most people in the (radio) industry," Hirsch continued.

He added, however, that if the radio industry ever has a reason to form a separate association, it will.

For information on the NAB/NRBA unification, contact NAB public affairs at 202-429-5350.

tions licensed under part 73 (translators, boosters and LPTVs are licensed under part 74).

This rule places two requirements on a station. An operator must be present at the transmitter, a remote control point, ATS monitor/ alarm point or an extension meter point. And second, that operator must be licensed (or permitted).

Operator license requirements

Rule 73.1860(a) requires the transmitter operator to have a commercial radio

operator license (any class not endorsed to prohibit broadcast operation).

This allows the use of the First, Second or Third Class Radiotelegraph Certificate, or the Restricted Radiotelephone Operator Permit. It disallows the use of Marine Radio Operator Permits and General Radiotelephone Operator Licenses issued after early 1985.

Marine Permits are specifically endorsed to prohibit operation of broadcast stations. Recent General Radiotelephone Licenses are specifically endorsed to only permit the operation, repair and maintenance of aviation, maritime and international fixed public stations (13.77).

Effective 7 February 1979, the FCC

reduced the operator requirement for most broadcast stations from the "broadcast endorsed Third Class license" (which required an exam) to the "restricted radiotelephone operator permit" (which requires no exam).

However it does require certification by the operator that the operator is familiar with the treaties, laws, rules and regulations governing the authority granted under the permit (Federal Register, 8 January 1979, page 1733).

Designated CO

Stations operating with more than 10 kW (AM) or 25 kW (FM) or with direc- (continued on page 15)

Insight on Rules

RADIO Classics

What makes a *Radio Classic*? Timeless design, flawless performance, outstanding value, and above all — bullet-proof reliability. Because, in radio, we don't coddle our classics.

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Translator Rules Stir Debate

(continued from page 7)

when it was authorized before 31 May, 1988 or if the station is providing first-time or second-time NCE FM service to a majority of the area it would serve.

In further support of insuring that translators are used for local fill-in and not long-distance coverage, Salem advocated policies favoring local broadcasters, both through a filing window priority period or some form of competitive preference, as the FCC has suggested.

Destruction of localism

The Intercollegiate Broadcasting System (IBS), reiterating a view it presented following the motion for stay denial, also argued that the use of alternative signal delivery by NCE FM translators would potentially destroy localism.

"The proposed further extension of alternative delivery to NCE-translators, regardless of ownership, is yet a further retreat from any semblance of localism and the original reasons for the establishment of FM translators," IBS wrote.

National Public Radio (NPR) agreed that localism deserves the spotlight in considering translator rule changes.

"Any revision of the FM translator rules should be based on the established regulatory framework and should adhere to the important principle of localism," NPR said. "The alternative signal delivery rule for NCE FM translators un-

ties control over the NCE FM spectrum from the important policy of localism and is unsound management of the spectrum."

NPR urged the Commission to impose distance limitations permitting the use of alternative signal delivery by NCE FM stations only if the translator is located within the 1 mV/m contour of the primary station; the translator is within a specified distance of the primary station; or if the translator applicant shows that the area to be served is not currently served by an NCE FM station, nor is it likely to be within the next five years.

Consolidate the issues

The organization also suggested that the FCC consolidate its proceedings regarding translators for noncommercial translators and commercial FM translators (contained in MM Docket 88-120).

"In addition to being unreasonable, separate consideration of NCE FM translator issues is inefficient and lends itself to inconsistent and irrational results," NPR reasoned.

NPR also criticized the Further Notice proposal that would allow the operation and ownership of translators by non-primary station owners.

"The proposed ownership eligibility extension . . . magnifies the likelihood of interference problems," the organization claimed. "Resolving complaints of

interference will become particularly cumbersome in instances where there are long-distance owners and where there are multiple potential sources of interference."

In its comments, the Association of Maximum Service Telecasters (MST) rekindled earlier concerns that the licensing of translators is likely to interfere with Channel 6 TV stations. The

greater spectrum efficiency and allow stations a flexible and less costly alternative signal delivery method for sending broadcast signals to FM translators."

Perhaps appropriate

Such a ruling "would be appropriate under certain conditions which limit the frequencies available and otherwise maintain the primary status of broadcast services," NPR said.

The NAB said it "vehemently" opposed the proposal. The use of inter-city relay microwave facilities by translators

" . . . separate consideration of NCE FM translator issues is inefficient and lends itself to inconsistent and irrational results."

FCC, in its June Notice of Inquiry, asked for comments on whether further restrictions should be adopted on NCE FM translator stations operating close to channel 6 TV stations.

Study standards first

In previous filings MST had urged a specific minimum processing standard that it said would prevent most interfering translators from being licensed. The organization's main concern is that the Commission will begin processing translator applications before these standards are given consideration.

"In the past, applicants for translator frequencies have flooded the Commission with applications in anticipation of eased-restrictions translators," MST wrote. "These applications would be submitted before the Commission could consider processing standards as part of the wider inquiry on FM translator policy. Most of the new FM translators could be licensed before the standards ever took effect."

MST asked the FCC to withhold approval of its proposed amendment until it can "consider and adopt an appropriate processing standard to protect the public's reception of channel 6" from translator interference.

A second issue

Included in the Commission's Further Notice was a request for comments on an issue aside from its proposed amendment. The FCC also inquired about whether intercity relay microwave facilities should be allowed to deliver signals to noncommercial translators.

Radio stations use such facilities for a number of functions, including studio-to-transmitter links (STLs) and inter-city relay links (ICRs) ultimately allowing the transmission of live programming. These facilities use a range of frequencies for operation.

Four of the six groups that filed comments discussed the issue, with only NPR lending it any substantial degree of support.

While the organization cautioned that, in some areas, existing broadcast auxiliary channels are congested and broadcast stations are seeking other frequencies to carry on the STL and ICR functions, it conceded that "there may be localities where the upper range of frequencies are not currently in use or fully utilized.

"The Commission's proposal to allow the secondary, noninterfering use on these upper range channels to deliver signals to translators could result in

could prevent full-service FM stations from using the facilities, thus diminishing locally oriented programming, the organization wrote.

Salem opposed the measure because of frequency congestion, particularly in large markets. If such service is permitted, however, channels should only be permitted to deliver signals to noncommercial translators where such would not interfere with full-service station channels, Salem said.

IBS also opposed the proposal because of the potential for congestion. "Encouraging this use by permitting it can only worsen the situation," it said. If such use is permitted, however, IBS, like Salem, encouraged that it be on a secondary basis.

The next step for Docket 86-112 was a Reply to Oppositions to Petitions for Reconsideration, due 15 July. In it, interested parties were given the opportunity to respond to comments from Moody Bible Institute and two other organizations opposing the motion for stay filed in May.

At press time, NPR, MST, NAB and Salem were among the organizations expected to file comments within the Reply to Oppositions, according to an NPR official.

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

Does NAB Help AM?

(continued from page 5)

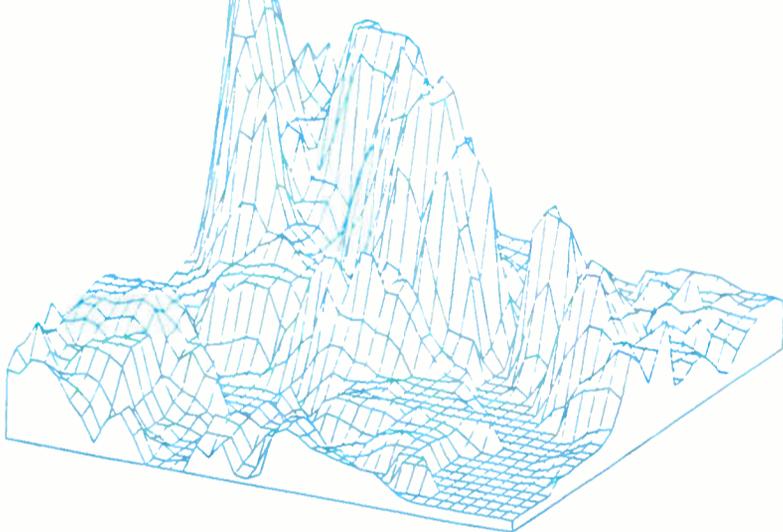
missed the boat, politically. If you'd like to catch up, ask (NAB Science & Technology VP) Michael Rau what "problems" the NAB has with FM2 (You may remember, that was his response to your interviewer's question when asked about the idea several months ago.)

Ask why NAB has moved with rocket speed into the HDTV arena with a definitive approach and yet they still run studies on "AM's problems."

Remember, there has never been a study on HDTV, let alone a public demand for it! At this point there is no indication that the public is interested and yet the spectrum AM needs is being doled out to TV.

The most quotable quote comes from a Washington attorney: "AM is on the mat and the NAB is going to see that it stays there." The solution? An independent AM broadcaster association.

FM BOOSTERS



On September 21, 1987, the Federal Communications Commission issued a rulemaking of great significance to the FM broadcaster. That ruling allows the use of multiple high powered transmitters on the same frequency by a single station. Previously shadowed areas in your market can now receive superior signal quality.

You may have considered installation of an FM translator in your market. Translators are limited in power, and require that the listener tune to another place on the dial. In many cases, a booster can better provide the signal coverage you need to compete. And boosters are not affected by the current FCC freeze on translator applications.

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To learn more about FM boosters and how you can fill the holes in your licensed market, call Marty Hadfield at RF Services.



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Circle Reader Service 31 on Page 24

Techniques in Troubleshooting

by Jim Somich

New York NY . . . Welcome to the first of a series of new articles on broadcast maintenance. The Broadcast Maintenance Notebook will be a nuts-and-bolts column dedicated to helping you troubleshoot and maintain your equipment.

While not as glamorous as new studios or fancy remote units, broadcast troubleshooting and maintenance is truly the cornerstone of industry.

The first and most basic rule in troubleshooting is that you must know how a piece of equipment functions when operating normally in order to repair it when it is not.

This knowledge should include both internal observation and measurements as well as simple "front panel milking" of the equipment. It is important that you become familiar with all of the equipment in your plant when it is operating correctly.

Since little time is left today for preventive maintenance you must make time to observe the various elements of your

plant in normal operation.

If there are meter readings keep a record of the range of normal readings. Also make a note of control settings and switch positions for future reference.

Sophisticated gear

Today's microprocessor-based equipment is getting more and more complicated to operate and by the time you are

Maintenance Notebook

called into the loop, the unit in question may be so totally out of adjustment that it wouldn't work even if nothing were wrong with it!

This especially holds true for contract engineers who often are not called in until someone has tried to repair something first and often only made matters worse. Learn to operate the equipment you are charged with.

The second rule of maintenance and repair is that most problems are usually caused by simple failures. This is true no

matter how bizarre the symptoms.

It is our nature as engineers to suspect the worst, the most exotic and the most complex, but the simple truth is that, barring operator error, most failures are caused by the failure of a single component and certain components are much more prone to failure than others.

With complex equipment and inexperienced operators pilot error accounts for a substantial number of "equipment out" reports. This is why it's important to understand the fine points of operation. Of the remainder more than half are caused by simple component failures.

Everyone gets one of those exotic multiple failures every so often, but day-to-day troubleshooting usually turns up blown fuses, burned components, defective chips, open caps and most of these failures are caused by only one failure. Multiple failures or catastrophic melt downs are truly the exception.

Now armed with these two simple rules, let's attack a typical piece of equipment that has been reported faulty. It's not important, for this illustration, if it is a cart machine or a compressor . . . the initial techniques are the same.

Toolbox

Exotic tools and test equipment are not usually necessary even when troubleshooting exotic equipment. But a certain

minimum tool complement is necessary to insure your success.

Most troubleshooting can be accomplished with a multimeter (analog or digital), oscilloscope, frequency counter, signal generator and a set of basic hand tools. Every broadcast plant no matter how small must provide these basic tools.

If contract engineers are employed at a station the owners often feel that the engineer should supply the necessary test equipment. But in those operations that employ a technician either full or part time the owner must be willing to invest in a decent set of tools and basic test equipment.

Step by step

A good engineer will approach a troubleshooting opportunity using a certain methodology.

The first step is to ascertain that, indeed, the equipment is not functioning as it should be. It's best not to take the word of an announcer or other technician but to see for yourself.

If the problem is intermittent you can try to force it to happen through the application of stress, heat and cold to the circuitry.

If you determine that a problem does indeed exist you should next try to determine if the gear is being operated properly.

While this may be obvious with a cart deck or turntable it is a bit more complex when a digital reverb unit or exotic *(continued on page 18)*

FCC Operating Criteria

(continued from page 13)

tional antenna systems could also use "lesser grade operators," but were required to have at least one "First phone" "readily available at all times" (in full time employment or part time on a written contract).

This was the beginning of the "designated chief operator requirement." Stations with "critical arrays" (loop current ratio tolerance of less than 5% or loop phase angle tolerance of less than 3°) were required to use First phone operators during critical array operation.

With this rulemaking the FCC required a First phone to make any adjustments (other than carrier on/off, power trim, power/pattern change) on the transmitter (Second phone for stations running 1 kW or less).

Effective 18 December 1979 (Federal

Register, 21 November 1979, page 66816) the FCC authorized all broadcast stations to use restricted permit operators for routine transmitter operation, if the station designates one First phone as the chief operator.

Since then the FCC has eliminated the First, Second and Third phone licenses, combining them into the General Radio Telephone Operator License.

As mentioned before, recently issued Generals prohibit their use in the operation of broadcast stations. The FCC does not want to test someone working with broadcast equipment!

"Til next time, keep it legal."

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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"Keeps Playing"

"I can't let another day go by . . ."

"...without telling you about my Harris SX-5A AM Transmitter," writes R. Dale Gehman, partner and chief engineer of WASG AM Stereo 55 in Atmore, Alabama.

"We got prompt action on our order. Your shipping people followed it through. I was very pleased with the manual, the construction (Built Tough!), the hook-up procedures and the initial turn-on performance. The final numbers were beyond my wildest dreams! Imagine 0.3% distortion, 0.2% intermod, 3% IPM . . . I never dreamed I'd see any AM transmitter turn out numbers like these!

"But let me tell you what surprised me most: WASG is located in a lightning belt—more strikes than anywhere in America. Our 511-foot tower has been popping with static many times, but your solid-state SX-5A just sits there and keeps on playing! We haven't been off the air once. THANKS!"

Harris' SX-5A is your best bet for a rugged, reliable and efficient 5 kilowatt AM transmitter, and it's available for single or triple phase hook-up. There also are 1 and 2.5 kW SX models. SunWatch™ automatic PSA/PSSA and C-QUAM® AM Stereo are options. Standard-setting Harris training and service top off the features.

Call today for your SX brochure, 1-800-4-HARRIS, Ext. 3006. Or write: Harris Radio Sales, P.O. Box 4290, Quincy, IL 62305-4290.



Radio '88: Focus on Technology

NAB's Fall Radio Convention Promises New Seminars, New Broadcast Gear

by Stan Salek and Janet Elliott

Washington DC ... Radio engineers will find everything they're looking for and more at Radio '88, 13-17 September at the Washington Convention Center here.

Three consecutive full length seminars (at special Radio '88 rates) begin on Tuesday 13 September and there are special sessions throughout the convention on both AM and FM improvement, with reports and papers on the latest in technology.

Five technical panels, including the ever popular FCC Engineers' Forum, round out Radio '88 engineering events.

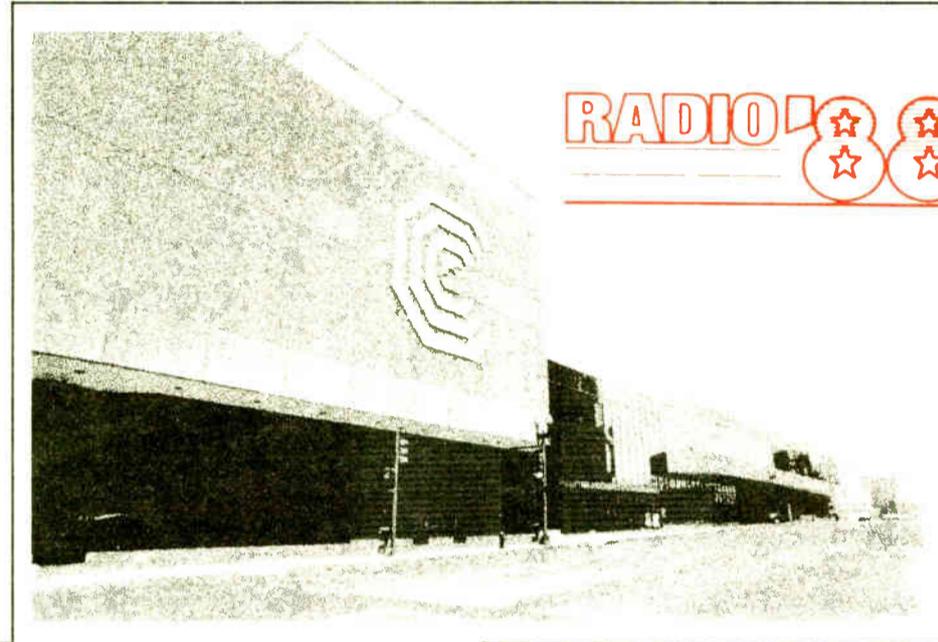
Our 20th Directional Antenna Seminar begins the engineering sessions. Any engineer who is responsible for the proper installation, maintenance and operation of an AM directional antenna system will find this seminar valuable.

The two-day course will cover direc-

tion and Associates; Barry Umansky, NAB Deputy General Counsel and Ralph Justus, NAB Director of Engineering, Regulatory and International Affairs.

and Associates; Jules Cohen, P.E., Jules Cohen and Associates; Rick Tell, Rick Tell

Participants include Dr. Robert Cleveland, FCC Office of Engineering and Technology; Jules Cohen, P.E., Jules Cohen and Associates; Rick Tell, Rick Tell



The Washington Convention Center

Radio '88 will also be the first public presentation of the results of a comprehensive series of listening tests conducted by B. Angell & Associates, in which the public was asked to evaluate a variety of AM interference levels.

Find out how the average listener feels about AM interference and what specific levels of interference may be considered acceptable in the AM listening environment.

& Investigations, provides a candid exchange between radio station engineers and FCC engineers.

Participants will cover issues of mutual concern—from application processing, allocations and rule changes to FCC inspections. Learn how to do it right from those who know.

Best of the rest

There will be several other important panels. "PCs for Engineering Applications" will be an examination of the use of personal computers by broadcast engineers and how they can accomplish technical and management tasks more efficiently.

"FM Directional Antennas" will be a presentation of the design, implementation, use and regulation of FM directional antennas by expert FM antenna designers, consultants, and FCC and industry officials.

And "EBS—What's old, what's new and what's changing" will include top FEMA, FCC and National Weather Service representatives who will present the current policy and respond to broadcasters questions.

The exhibit hall opens Thursday, 15 September, with more than 120 companies set to display their latest products and services. NAB engineering will also

Among the innovations at Radio '88 will be the premier showing of the "ultimate" radio receiver . . .

tional antenna theory, operation, maintenance and applicable FCC policy and rules. It was created by AM antenna expert Carl Smith of Smith Electronics, who will be an instructor.

The seminar is an opportunity for engineers to discuss their individual directional antenna problems with the country's leading authorities on this topic.

These will include John Sadler, FCC Mass Media Bureau; Al Gearing, Jules Cohen & Associates; Karl Lahm, Karl D. Lahm & Associates; Steve Kramer, Steve Kramer Consulting Engineers and Ron Rackley, du Treil, Lundin & Rackley.

Brand new seminar

New for '88 is the Digital Radio Station Seminar—a day-long look at the major broadcast technologies used in converting to and producing in digital.

Industry experts will cover such topics as sampled-data theory, digital audio storage, digital AM and FM modulation and transmission techniques and DAT/CD technology.

There will be an expanded session on editing, production and effects generation using an all-digital production facility, plus a presentation on digital audio interconnection techniques.

Representatives of Audio Precision, Broadcast Electronics, Harris Corporation, Digital RF Solutions, Concept Productions, New England Digital and others will be participating.

On Friday, 16 September, NAB will host the third RF Radiation Compliance

and Associates; Barry Umansky, NAB Deputy General Counsel and Ralph Justus, NAB Director of Engineering, Regulatory and International Affairs.

"Super" radio

Among the innovations at Radio '88 will be the premier showing of the "ultimate" radio receiver prototype. NAB consultant Richard Sequerra will demonstrate the design and implementation of this high-technology AM/FM receiver.

The AM section of the receiver contains very sophisticated noise blanking, a tunable AM antenna, AM stereo (Motorola C-QUAM, Kahn and dual-system) and NRSC bandwidth and deemphasis.

The FM section contains FMX™ technology and very high quality RF and IF circuitry. The receiver is digitally controlled and can tune continuously from AM to FM.

For AM engineers there will be a report on a recently released NAB AM technical study by Harrison Klein of Hammett & Edison that shows why AM broadcasters face so much interference.

Learn how AM stations are allocated and what can be done to improve signal quality and reduce interference levels. Current FCC policies, the industry's views on those policies and the prospects and likelihood for change will be examined.

NAB project updates

Ogden Prestholdt, PE, will report on the progress of the NAB antenna project. The first phase is intended to test ways to achieve separate control of groundwave and skywave interference, leading to increased flexibility for daytimers and other classes of stations to improve coverage.

Engineering Sessions Schedule

Tuesday, September 13

12:00 noon - 6:00 PM Directional Antenna Seminar

Wednesday, September 14

8:00 AM - 6:30 PM Directional Antenna Seminar

Thursday, September 15

8:30 AM - 4:00 PM Digital Radio Station Seminar
5:00 PM - 6:15 PM Interference: Its Causes & Cures

Friday, September 16

8:00 AM - 1:00 PM RF Radiation Regulation Compliance Seminar
2:45 PM - 4:00 PM FM Improvement

Saturday, September 17

9:45 AM - 11:00 AM AM Technical Improvement Part I
11:15 AM - 12:30 PM AM Technical Improvement Part II
12:45 PM - 2:00 PM FM Directional Antennas
2:15 PM - 3:30 PM PCs for Engineering Applications
EBS—What's Old, What's New and What's Changing
3:45 PM - 5:00 PM FCC's Engineers Forum

For FM improvement, there will be a report on FM boosters—a look at the implementation experiences to date of FM booster stations with emphasis on whether they solve coverage problems or increase interference.

There will also be a presentation on reducing multipath and the effects of AM synchronous noise in the FM transmission system.

Among the most popular features of the radio convention are the special engineering panels.

The FCC Engineers Forum, with the engineers from the branches of the FCC which handle AM, FM, Auxiliary Services, Engineering Policy, and Inspections

have a booth with demonstrations of the NRSC standards and FMX. The booth will be staffed by NAB engineers ready to discuss any of your technical questions.

If you are an NAB member your station has already received information on how to register for Radio '88 and the three seminars. You must register by 5 August to take advantage of the lower registration fees.

Stan Salek is an NAB staff engineer and Janet Elliott is in charge of special projects for the NAB. If you need more information or have questions, please call NAB Science and Technology at 202-429-5346.

A Selectable Headphone Amp

by Fred Baumgartner

Aurora CO ... From my first remote with tube gear and equalized lines to the present, one item has remained constant. Someone will complain about the headphones.

I have concluded that if you meet the following criteria, the complaints will be reduced to a minimum and will probably be idiotic.

First, each headset must be able to produce sound pressure levels from the barely audible to just beyond the threshold of pain. Rock DJs and (far worse) old sports announcers often require sound levels far in excess of OSHA standards.

Each headset must also be individually adjustable and each port must be able to drive any headphone impedance from four ohms to infinity and live forever shorted or open.

Mono and stereo headsets must work equally well. Each headset must be individually assignable with program, air, IFB, spotters and the like being selectable.

Finally, the headphone must be user friendly.

Individual amps

All too often the headphone system is a radio or amplifier with a daisy chain of 1/4" jacks. A mono plug will short out the right channel or a low Z phone drags down all of the levels. Even with the addition of pots or L pads, getting the levels right is tough.

A better approach is to use individual amps for each side of each headphone.

Figure 1 is just such a headphone amp. Building it around an op amp allows some neat things to happen.

Used as a summing amp each side allows for three inputs (though you could add more or use less).

In this design a menu of six inputs allows each user to custom select the audio heard in each ear. The op amp also allows for high impedance inputs. In this design 120K means that driving the amps is not likely to be much of a problem.

The op amp alone would do a decent job except for the relatively limited power output of even the beefier versions.

The output of the transistor "final" section is routed back to the inverting input of the op amp.

The op amp easily compares the feedback signal with the input feed to the headset and thus its output compensates for some of the nonlinearity involved with the transistors and the load.

The result is a very low distortion—less than 1/2% for most headsets.

No transformers

The design involves no transformers, although that might be wise upstream for isolation and conversion from balanced to the ground referenced unbalanced required for this amp.

There are also no coupling capacitors. The frequency response is for most purposes flat from DC to blue light.

Care must then be taken to prevent DC and RF at the input as the amplifier will pass it faithfully.

A 0.1 uf capacitor at this input impedance makes a good blocking capacitor.

The DC coupling does result in some DC on the phones themselves at all time.

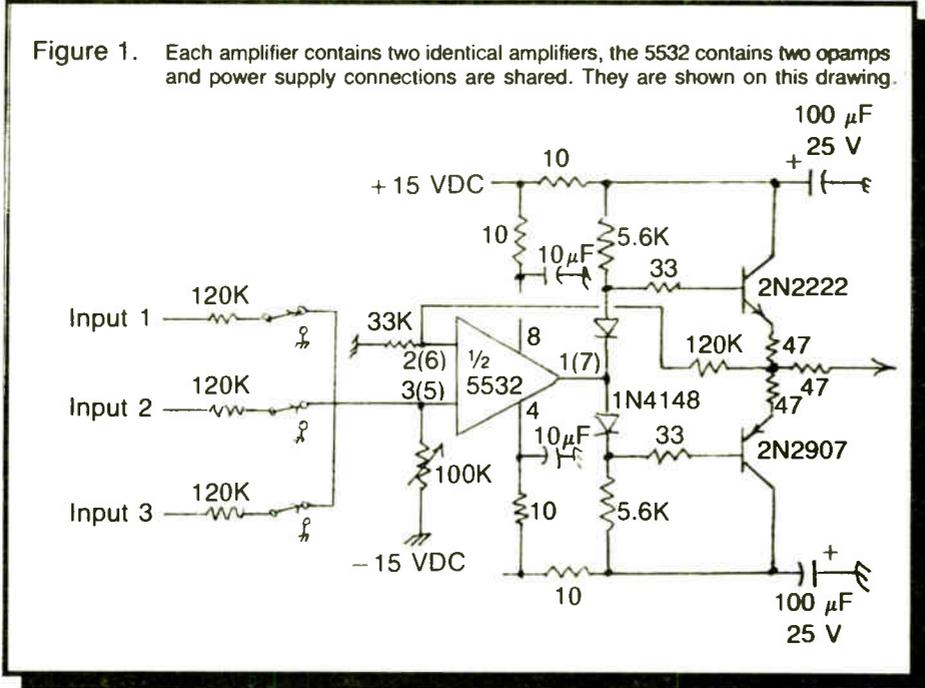


Figure 1. Each amplifier contains two identical amplifiers, the 5532 contains two opamps and power supply connections are shared. They are shown on this drawing.

But with care in selecting input resistors and avoiding DC on the input the DC steady state current through the headphones should be just a subtle click on insertion.

Supplying power

The desired power supply is +/- 15 V, although lower voltages will work with loss of headroom.

There is no practical way to use a single supply voltage. Regulation is not required, but cleanliness is. Plan on 250 to 500 mA each.

The obvious question is, why not use one of those neat little mounts on a heat sink, add all the outboard components and feed it 12 V amps used in car radios and sold as replacements at Radio Shack?

First, the supporting parts count for those amps is really rather high, as is the distortion.

Second, the voltage swing can deliver a lot of power into a four ohm load but isn't enough to do the job into a 600 ohm headset.

Construction

I like a PC Board and I use the six toggle switches to panel-mount or box-mount the device. The volume control pots are mounted separately as are the headphone jacks.

I like to mount both a 1/4 and 1/8" stereo jack for each amp (those mini jack disposable headsets sure make handing out half a dozen headsets a bit cheaper).

A mono headphone shorts out the right channel feed, which isn't a problem (unless the input you want is on the right side only). I think it is user-unfriendly to have a stereo-mono switch for an operator who may not know the difference.

The 47 ohm build-out on each headphone is not mounted on the PC board and is optional. Without it a short will do damage to the amplifier in time. If the load is assured, as in a small speaker, it serves only to add to losses.

I select the feedback resistors (see asterisk on Figure 1), which sets the gain of the amp, to bring peaks of audio to the power rails well past the point of bleeding ears. This is set to the lowest level input and all other inputs are padded to match.

The input level controls (100K) serve to provide an alternate current path to

ground. While feedback control is desirable from a noise point of view, unity gain may prove to be too much.

Switch selectable

Although it is not necessary to use SPDT switches, the fact that when a line is not selected it is routed to ground does provide a constant load, which may or may not be important in a particular ap-

plication.

The values selected reflect an IHF input, which with the high load impedance means an IHF input can drive a number of these amplifiers.

A six-inch rack panel can hold six of these plus a power supply comfortably. The original design, however, was to be used along with a mic-to-line-level amp in a 4x4x1 box for remote purposes.

Each box receives power and headphone feeds and returns audio to the mixer box on a thin multistrand unshielded cable.

In any case, this is another board to add to the collection of "black boxes" to solve particular problems. Each board runs about \$25 to build, which is high, but I know of no device on the market that can do what it does.

Parts density on the layout is high and 1/8 W input and feedback resistors are recommended though 1/4 W will fit everywhere. Do not stand components on end as this will prevent you from mounting the amp with the switch shafts.

Fred Baumgartner is engineering manager at Legacy Broadcasting's Denver stations KHOW/KSYX. He was formerly CE at WIBA, Madison, WI, and ACE at KWGN-TV, Denver. He can be reached at 303-694-6300.

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Production Enters a "New Age"

by Bill Anderson

Hollywood CA ... Last February The Wave, 94.7 FM here, celebrated its first year on the Los Angeles entertainment scene. But it was more than just a birthday.

The Wave was the first new age format station to boast the complete absence of disc jockeys and a high fidelity sound quality that has become the envy of many other stations around.

In its first year the station overcame widespread criticism of its format to become one of L.A.'s hottest new stations, and The Wave now enjoys nationwide syndication through a joint agreement with the Satellite Music Network.

The new age format of The Wave was developed by PD Frank Cody, production director Paul Goldstein, consultant Owen Leach and two east coast producers in order to boost the ratings of KMET-FM, an AOR station whose popularity was sagging.

The new format includes rock, light jazz and melodic "new age" music and has been adopted by many other stations since it was first pioneered here.

Environmental sounds, time check sketches, "theater of the mind" dialogues and artist promos are produced in-house to fold in with the music.

These and commercials stylized to fit The Wave's format are produced in two custom-designed facilities.

Extensive production

"Producing a radio station without DJs means that everything you hear has to be pre-recorded," explains CE Steve Keating. "The time checks, celebrity endorsements, sketches and many commercials are recorded and mastered in the two studios."

Voice recording is done in Studio 2 and the tracks are mastered in Studio 3, using a Tascam ATR-60/8 eight-track recorder. Two Tascam ATR-60/2T center track mastering decks, a Tascam 122 MKII cassette player, Pacific Recorders & Engineering ABX-34 multitrack console

and PR & E Micromax cart machines round out the custom-designed studios.

Outboard gear includes a Tascam AQ-65 auto-locator, Tascam DX 8DS dbx Type-1 noise reduction, Yamaha SPX 90



With no DJs, The Wave must be entirely pre-recorded.

and Rev 7 effects, Orban 424 A compressor/limiter, Orban 622 Parametric Equalizer and Eventide Harmonizer.

"When we went shopping for a center track mastering deck, we found out we could purchase two Tascam decks for less than the price of another well-known brand," Keating says. He adds

Troubleshooting Studio Equipment

(continued from page 15)

equalizer is described as defective. Check all control settings ... refer to the operators' manual if necessary.

The experienced troubleshooter will next check for primary power to the unit in question and will clear the patch bay of all patches before passing judgement. Remember to expect the obvious and you will be right about half the time.

Getting to the problem

Isolate the equipment as much as you can. Very often a piece of gear that is malfunctioning has been misconnected to another piece, rendering both units inoperative.

that the station was impressed with the proof of performance Tascam ran and decided on the decks even though they were relatively new in the field.

He said another reason for choosing a center track time code machine was to allow The Wave to expand into a fully automated SMPTE-based production studio.

"With SMPTE-based time code controlling the production parameters, synchronizing cart machine dubs, making punch-ins, edits and overdubs will be easier and more accurate than ever," notes Keating. He says he plans to turn the studios over to SMPTE time code by January 1989.

Little black box

Producing a new age format station without any DJs presented Keating with other special problems. "The immediate challenge was to retain a competitive loudness factor without sacrificing the dynamic range of the music," Keating says.

To solve the problem he designed a

"black box" with custom electronics specifically for the new format.

"Basically, we had 12 weeks to design the system and two weekends to install it," Keating explains. "When KMET was here we compressed and re-compressed the signal to obtain the density and loudness necessary to compete with neighboring rock station KLOS-FM."

Although Keating is reluctant to discuss The Wave's proprietary "black box" in detail, he explained that it employs an extremely sharp, digitally-based band-pass filter in conjunction with a chain of other commercially available audio processing equipment.

"We've had people from all over Southern California asking us how we achieved the sound quality," Keating says.

Satellite delivery

To keep the format current, new material is reviewed and categorized by characteristics such as predominant instrumental theme, vocals or artist.

The music is then put into a computer which sorts it so that, for instance, no two David Sanborne songs play back to back.

The playlist is forwarded to Satellite Music Network which broadcasts the program nationally leaving spaces for local stations to plug in their own time (continued on page 29)

Milk the front panel for information and clues. It is truly amazing how often the answer is staring you right in the face ... if you will just look and see.

Experienced technicians also use their senses to determine if all is well. Use the sense of smell to check for a burned or overheated component and the sense of touch to check for overheating or a control that feels bad.

Question the operator if possible. What were the symptoms at the time of failure? What was the setup being used. Were there any unusual smells or noises at the time of failure?

Very often a non-technician operator will not know what is important to re-

port and what is not, so ask!

If our experienced troubleshooter has been unable to return the equipment to service after applying these three steps, it's usually time to seriously consider pulling the equipment into the shop for a closer look.

Pulling the equipment gets you out of the way, and if the gear was not critical to the job, it gets things rolling again as quickly as possible. Back in the shop you can pull up the manual and a cup of coffee and study the matter in greater depth.

Updated resources

Every operation must maintain an up-to-date file of manuals for all equipment in service. Many pieces of gear in general use today were not designed specifically for professional applications and only come with simple operators' manuals.

Make it a point to order service manuals for each piece of equipment you are responsible for. The best source for these manuals is the service department of the manufacturer.

Keep your own maintenance notes with each manual describing each failure and what was done to correct it. Also list any modifications made to the equipment.

It is amazing how quickly you can forget what you have done ... especially if you are responsible for a number of facilities.

The best troubleshooters seem to have a "sixth sense" that guides them past the false indications and clues right to the component that has failed.

But if you watch these natural born technicians carefully, you will see that their success is less magic than good sound engineering practices.

Jim Somich has been in broadcasting for over 20 years and has served as CE for a number of stations. Currently he is CE at New York's Z-100 (WHTZ-FM) and president of Major Market Engineering. He can be reached at 201-867-5000.

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CPR in the Transmitter Room:

by John "Q" Shepler

Rockford IL . . . It was a beastly hot August afternoon. Juan Lopez fanned his face with a clipboard as he leaned the porch chair back. "Too hot to even draw these wiring diagrams," he thought, fanning harder.

Juan was a radio engineer through and through. Even on his day off, he was thinking radio on his back porch. He didn't just work at being CE—he lived it.

Juan reached down beside the chair and flicked on a portable radio. He thought the country music would be relaxing, but it only made him think more about the station. "At least Bud has things running smoothly," he thought.

A real old-timer

Bud McCormick was a real old-timer. He built his first cat-whisker radio from a piece of galena and an oatmeal box back in the 20's. From there he grew up with the industry. Now, some 50 years of radio to his credit, Bud still has the radio bug. Retirement? Never! Not as long as there are transmitters to fix and country songs to spin.

Juan rolled the pencil in his teeth. The more he looked at the diagram, the more it made sense to run a multiple-pair cable between the production studios. He was just starting to sketch it in when the pretty twang in the background changed to a buzzing noise. Juan jumped! They were off the air.

The seconds seemed like hours. "Come on, Bud, punch it back on."

Five minutes was enough. Juan was

out of his chair and on the phone. No answer. That was strange. Bud must be working on the transmitter and ignoring the phone. Juan bounded out to his car.

As he sped to the station, Juan mentally ran through the possibilities. Power failure? The phone light and buzzer would also be dead. No way anybody would know a call was coming in. Final Tube? Wow, they just put a new one in

a cold, faint feeling. He reached an arm toward the lifeless body, stopping mid-reach to make sure Bud wasn't in contact with anything electrical. He shook Bud's arm. No response.

Juan's composure returned rapidly, but his mind was racing. What should he do first? What was that first step?

Check for breathing. Juan could almost hear a voice say the words to him.

The big AM transmitter was completely shut down. The silence was eerie. There was Bud . . . face down, on the floor.

last month. Power supply? Maybe. Phasor? Oh, hopefully not that.

Juan's car screeched to a stop at the front door to the station. He fumbled with his keys a second. Okay, there was the right one. Inside now. Lights are on. Where was Bud?

Juan checked the main studio. No Bud. Transmitter room? No sign of Bud. No blower noise either.

The big AM transmitter was completely shut down. The silence was eerie. Juan looked at the inactive meter panel and then walked around to the back of the transmitter. The back doors were swung open. There was Bud . . . face down, on the floor.

For a second, Juan was overcome with

Yes, that was right.

Juan rolled the unconscious man over on his back. He was completely limp. Kneeling over him, Juan placed one hand on Bud's forehead and the fingers of the other hand under his chin. Quickly, he tilted the head back.

Juan put his ear over the man's mouth and nose and listened carefully for any sign of breathing. Even in the quiet of a shut-down transmitter room, he couldn't hear anything.

Juan slid his fingers down Bud's neck and felt for a pulse. Nothing. He checked again. No pulse *and* no breathing.

Juan glanced up at the open transmitter doors. "Must have been shocked by the high voltage," he thought.

His next instinct was to run to the phone and call for help, but there were precious few seconds to lose.

Juan figured that the best chance for Bud was for him to administer CPR. If he had detected a pulse or breathing, CPR would be a risky move. He might actually do more harm than good. But with no pulse he had to move fast.

Training in action

Juan had a vivid picture in his mind. It was a picture of himself doing this before. He could hear the nurse's voice telling him to feel for the breast bone, as he moved his fingers up Bud's chest.

Juan was thankful now that he had taken that course. Only a couple of months ago, his wife had shown him a newspaper ad for a Red Cross course in CPR and other lifesaving techniques. At first he scoffed.

He didn't really expect to use any such training and besides, the whole subject made him feel very uncomfortable. Now he was glad that he had given in to his wife's insistence and taken the training.

Juan could feel a tremble in his hands as he rushed to save a man's life. It wasn't a feeling of panic, though. He made the moves correctly . . . one hand on top of the other, arms straight. He made the moves just like he had done on the practice dummy. Only this time it was for real.

Juan performed the regimen of chest compressions alternated with rescue breathing for several minutes. He was sweating profusely. His fingers trembled as he pushed on Bud's neck to check

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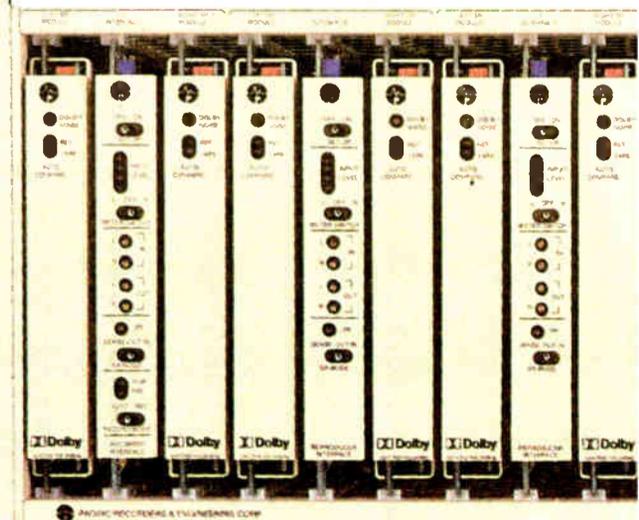
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Averting a Medical Emergency

again for a pulse. Was there a pulse? No, no pulse. He swallowed hard, and then bolted for the phone on the wall of the transmitter room. His shaky fingers slammed into the buttons—a nine and two ones.

It took only one ring to get an answer. Juan shouted for help into the mouthpiece. "And I'm administering CPR without any response," he yelled, hoping they might have an alternative.

"Keep at it until we get there," was the reply. Juan left the phone and hurried back to Bud, still unconscious on the floor. He restarted the CPR cycles. He vowed not to stop until the paramedics arrived. "God, make it quick."

Help at last

Juan's arms were aching. His back hurt. He wasn't even sure his efforts were doing any good. But he kept going just the same. Finally he heard a siren in the distance. It must have taken them an hour!

He glanced at the clock visible above the control board. It had moved only five minutes since he got off the phone. Juan shook his head and kept going.

Two emergency medical technicians burst into the transmitter room with a suitcase full of equipment and a stretcher. Juan eased back as they flew into action. He buried his head in his hands and sat down against the studio wall.

He could hear people moving and various communications over their walkie-talkies. Juan didn't see any of this. The stress had caught up with him. A mo-

ment later, he blacked out.

The next thing Juan remembered was someone pulling his sleeve. "Are you all right? Are you all right?"

Juan looked up slowly as he came back. A police officer was staring down at him. She looked concerned. "I'm okay, just give me a second . . ."

He jumped slightly as he looked at the empty floor behind the transmitter.

lock switches should have discharged the high voltage. But did they?

Slowly and carefully, Juan unclipped the shorting stick and touched it to various terminals. When he got to the capacitor for the bias supply, there was a loud Snnnaaaapppp . . . sparks flew!

Juan looked closely at the schematic laminated in plastic and hanging on the wall. The bias supply was supposed to

tube—the filament just opened up for no apparent reason.

Juan replaced the tube and took a couple of minutes extra to replace the faulty bias bleeder resistor before reapplying high voltage to the transmitter. They were back on the air.

It was several weeks before the old timer made it back to the station. He had some notebook papers in his hand. "Young fellow, I've set you up to say a few words at the SBE meeting about how dangerous those sneaky bleeder resistors can be."

Juan glanced back with a "thanks-a-lot" look.

"Oh, I'm gonna make a little speech myself. Part I is about how careful you need to be inside transmitters. Part II is how important it is to have somebody like you around who has taken that CPR training."

With that the older man turned to leave the engineering shop. He stopped just short of the door and added: ". . . probably get the whole bunch of them to sign up for the next course."

Postscript: Last fall, my wife and I took the American Red Cross Adult CPR course. It cost us \$5 each and three hours on a Saturday morning. The training has given us a lot of peace of mind to know that we can save a life, if need be. Why not call the Red Cross chapter in your area and ask how you can learn CPR?

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

Two emergency medical technicians burst into the transmitter room with a suitcase full of equipment and a stretcher. Juan eased back as they flew into action.

"What . . . What happened to the man who was there?"

"He's fine. They got his heart started in the ambulance, but you're the one who saved his life. It was your CPR that made the difference."

The officer smiled at Juan. Juan smiled back and accepted a hand to get on his feet. He went to the sink in the utility room to run cold water on his head. It helped. Then the reality set in that they were still off the air.

Getting back on

Juan approached the transmitter carefully. There was something dangerous, but what? The main breaker was off. The doors were open. That meant the inter-

be discharged through a large wire-wound bleeder resistor.

He went back to the transmitter and aimed the trouble light at the resistor in question. There was a large crack in the middle. "Who knows how long it's been like that," he thought, "maybe that happened during the lightning storm last week."

Juan thoroughly discharged the bias supply with the grounding stick and made another round of discharging all of the high voltage points, just to be sure. He left the grounding stick hanging on the hot terminal of the bias supply capacitor.

He then proceeded with his troubleshooting and found a bad final

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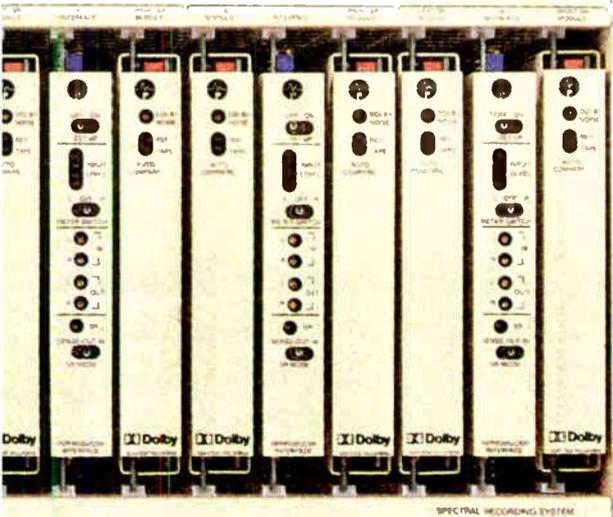


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DIGITAL DOMAIN

Trends in Digital Audio Storage

by Skip Pizzi

Washington DC ... Although digital audio will play a large part in our future there are several areas that we should be exploring for immediate implementation. Others warrant serious study for the near future.

We've talked about the broadcast CD player previously and this is of course the first area of application at most radio stations. It is certainly not a purchasing decision to be taken lightly (See *Digital Domain* 15 April RW).

The next hardware segments to be converted are recording devices and non-broadcast transmission paths, as you've also probably heard before.

Keeping up with the technology in all of these areas, even after you've implemented a system, is a true challenge to the broadcast engineer.

The transition to digital is more *evolutionary* than revolutionary, and will continue in various fits and starts for the foreseeable future, as format replaces format, with updates upon updates and "breakthrough" after "breakthrough."

In an attempt at guidance through these rough waters, here's a look at the latest on the next area we need to work with—recordable storage media.

DAT to date

The NAB show this year indicated an interesting direction in DAT hardware. The situation has changed a bit even since then. Pro-DAT hardware has

definitely been stunted in its development by the continuing brouhaha in the consumer sector.

It should come as no surprise that the critical mass driving this format is indeed on the consumer side, and until

simple storage/retrieval systems.

By the latter I refer to a recording system which is primarily designed for recording and playback as a whole with little or no need for heavy alteration in production.

The trends for broadcast applications so far appear to be heading in two directions—cart machine replacement ... and simple storage/retrieval systems.

the floodgates are opened there the pro-hardware will continue to suffer from the tentative R&D and marketing efforts (and the corresponding lack of extensive hardware choices) we have seen up to this point.

If this keeps up for too much longer, the entire format will be in jeopardy.

This would indeed be unfortunate, because even with the minimal hardware and service availability, what is out there shows great promise, in terms of impeccable audio quality, as well as appropriateness, ease of use and other advantages over analog for certain broadcast applications.

Digital trends

The trends for broadcast applications so far appear to be heading in two directions—cart machine replacement (as forecast in this column last fall!) and

dating is required might be another good application for DAT at the station, as well as some high-quality logging or airchecking uses.

DAT hardware for RENG (radio electronic news gathering) is not quite there yet, although Panasonic plans to release a radio version (no SMPTE time code). It's a very small, professional (XLR balanced mic/line inputs) portable unit with a \$4,000 list price tag (Panasonic SV-250).

Consumer portables

At least two other units are on the way, but time code implementation problems are holding them up. Release dates are therefore unknown, but expect a \$7,000 list price on one of them (Sony PCM-2000).

At least three consumer portables are currently available through grey market dealers (hope you can read the Japanese manuals). If you've already conquered your well-justified fear of unbalanced inputs, these run from \$1,500 to \$3,000 (models from Casio, Technics and Sony).

The biggest problem I've found with these so far is battery life on some—a sin-

(continued on page 31)

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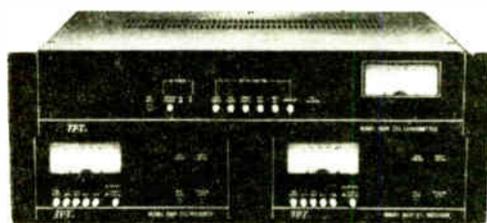
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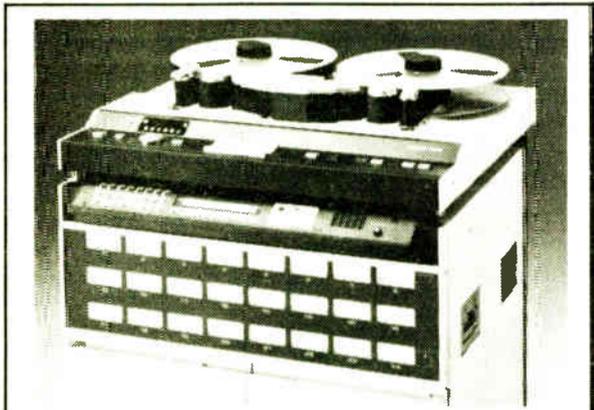


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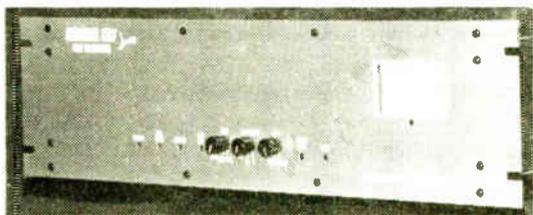


Mastering recorder

The Otari MTR-100A is a digitally controlled, pinchrollerless analog 24-track mastering recorder.

It features fully automated alignment of all record and reproduce parameters including level, bias, HF, MF and LF record EQ.

For more information, contact David Roudebush at 415-341-5900, or circle Reader Service 51.



SCA generator

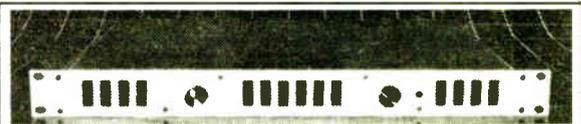
New from Applied Micro Technology is the Channel Cat SCA generator.

The audio model receives standard audio or audio FSK from a direct phone connection or RS-232 data at up to 1200 baud. The Channel Cat converts RS-232 data to Bell Standard 202 FSK encoded audio before transmission.

Front panel controls allow the user to switch inputs without readjusting modulation or injection levels.

The digital version of Applied Micro Technology's SCA generator accepts RS-232 data at up to 2400 baud and uses direct FSK.

For more information, contact Steve Hathaway at 913-362-9422, or circle Reader Service 57.



Stereo audio monitor

Wohler Technologies has introduced the AMP-1, a self-powered stereo monitor speaker system in a single rack space package.

The bi-amp design uses four 10 W power amps to drive three speakers, with each channel's bass region combined into a center channel. Response extends below 100 Hz and above 10 kHz.

The AMP-1 unit also has a maximum SPL of 102 dB at 2'.

Only three connections are required for the AMP-1: two line-level audio feeds (via XLR 3-Fs) and an AC power pack, which may be plugged into a 115 V outlet.

The AMP-1's options include a second set of inputs with a selector switch and RCA phono or other alternate type input jacks.

For more information, contact Will Wohler at 415-285-5462, or circle Reader Service 59.



FM stereo modulation processor

CRL Systems is now shipping the new Digital Friendly FM Stereo Modulation Processor Model 850.

The Model 850, designed to work as a standalone system, offers a dual-band input compressor and a newly designed transfer function limiter, which maintains a loud, clean sound with brightness and transparency.

A stereo enhance circuit improves separation of the left and right channels without producing undesired side effects.

Technical specifications for CRL's Model 850 modulation processor include distortion less than 0.15% and frequency response of 50 to 15 kHz, ± 1 dB.

For more information contact Bob Richards at 602-438-0888, or circle Reader Service 52.



Central controller system

New from Monroe Electronics is the Model 6006 central controller system, which permits automatic polling or direct access control of antenna stations and transmitter sites.

Remote units provide eight contact closure inputs, eight analog inputs, eight control relays and a 60-event timer and callback alarm autodialing.

For more information contact Eugene Fuller at 716-765-9330, or circle Reader Service 56.



Parametric equalizer

New from Orban Associates is the Model 642B Parametric Equalizer/Notch Filter.

The 642B features dual four-band or mono eight-band configurations, selectable by a front-panel Cascade switch.

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The signal path has no coupling capacitors.

For more information, contact Howard Mullinack at 415-957-1070, or circle Reader Service 58.

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Touring Radio's Problems by Car

by George Riggins

Long Beach CA ... I wonder what became of ... automotive receivers with decent sensitivity and selectivity ... clean symmetrical modulation, the 100% type ... programming that an over-the-hill senior citizen can accept. And the wonderment list could go on.

Perhaps an explanation as to why the wonders caught up with me is in order. My other half and I recently took the time to visit several stations and contract engineers in outlying areas.

While travelling, I scan the AM and FM bands for "my kind" of programming. In most directions signals from the Los Angeles basin are gone at about 200 miles, so the scanning begins.

This time I found a program that was acceptable (a baseball game) but was intermittently "covered" by splatter from a signal 10 kHz lower in frequency.

When the offending signal was absent I could hear the ball game; when the music was playing the splatter was there.

After giving up on the game I took a listen to all signals strong enough to stop the scanner, and then checked 10 kHz lower and 10 kHz higher. (My automotive receiver is very convenient in the respect that it tunes the AM band in 10 kHz steps and FM band in 200 kHz steps.)

Amazing how many stations were spluttering. In all cases the heavy positive peak modulated signal was not "my kind" of programming.

Over the mountains

How about receiving any signal when the location is at least an hour in two directions from the nearest town with any stations, and much further from stations in the other cardinal directions, with mountain ranges in the way?

By day there were a couple of weak AM signals, two marginal and one solid

FM signal; but nothing at nighttime except a great big mixed-up mess of too many signals.

If I wake up at 2 AM with insomnia, out comes the little Panasonic RF-085 five-band receiver to hear what is happening.

I have always been able to get WWV on 5, 10 or 15 MHz and lots of international stations. Now, there's nothing but a pot full of QRM on the AM band.

Recently, about 1200 miles north of LA, I could listen to New Orleans, Los Angeles, Denver, Chicago and a few

other power houses, but nothing local—and nothing but noise in the upper half of the AM band.

Also, no FM due to location and the fact that the one good signal goes off the air at midnight. Lots of talk, some news, a little music, but no music that was acceptable to me.

Same old sound

In scanning the AM and FM bands I do not find much to choose from in the way of diversity of programming. If one station in a market had a good commercial log, every other station in the market had the same music and format.

What happened to originality and

creativity? Of course copying is the sincerest form of flattery, I'm told. Format and programming differ slightly from community to community, for the most part.

Several years ago the staff at a station in a medium-sized market was complaining that the new GM was never around. He was always out. In fact he was almost invisible for about three months.

After becoming active in the station during the normal daylight hours, it took this particular GM about 45 days to have the station sold out 24 hours a day, seven days a week.

The manager had taken the time and effort to find who listened when, and then searched the market for advertisers suitable for the listeners. The manager did a good market survey.

(continued on page 27)



BSW

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Amazing Isn't It?

The world is filled with puzzling contradictions. Did you know that a CD as small as 4.7 inches in diameter can hold 270,000 pages of information? That's equivalent to a set of Encyclopedias, only a heck of a lot easier to carry around.

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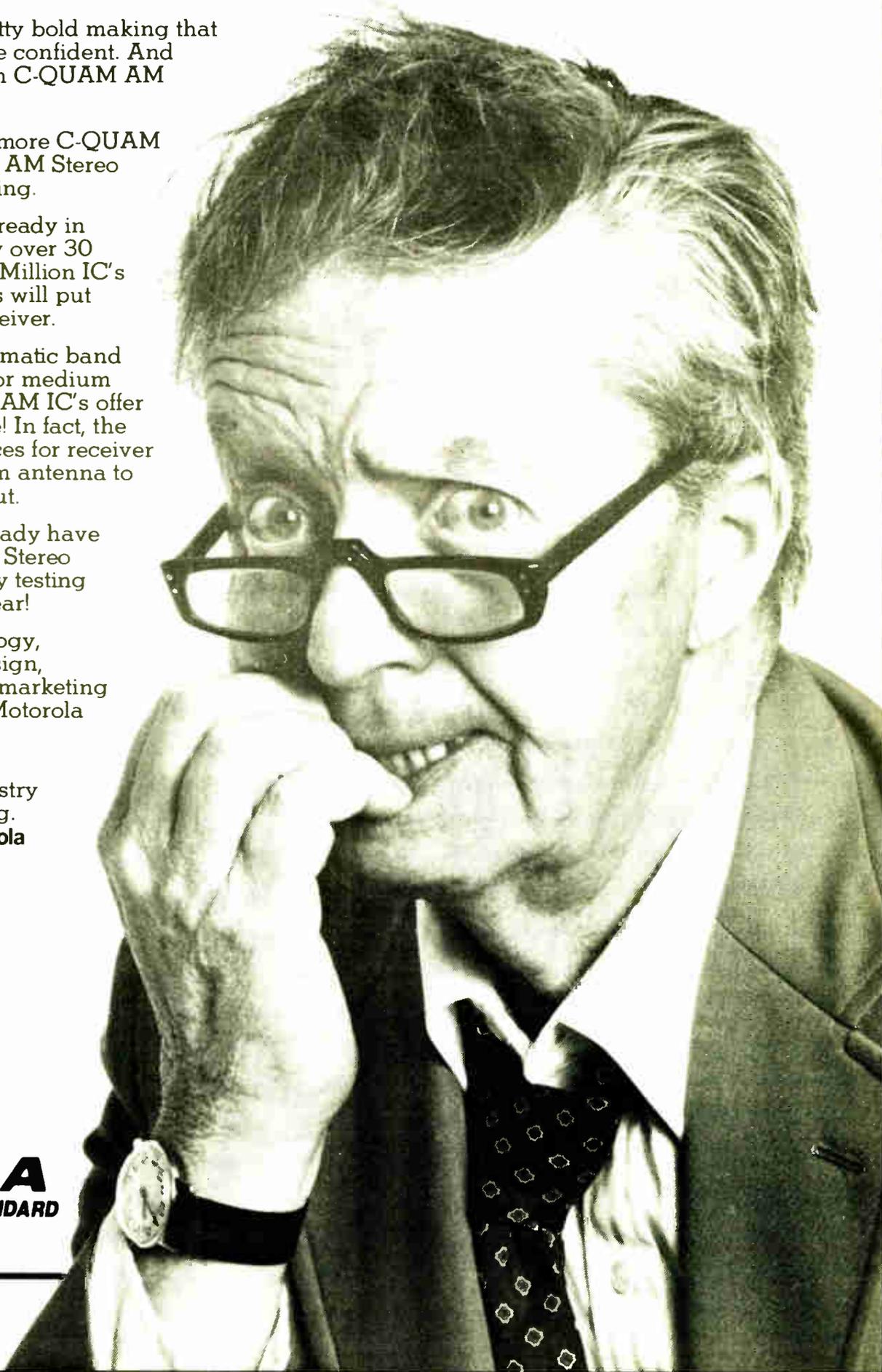
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An Automotive Tour of Radio's Failings

(continued from page 25)

Another pet peeve: the lack of consistency between audio sources in many stations.

I can tell when the station is on auto pilot and being fed from the bird in the sky, when the local turntable, cart machine or local broadcast loop (i.e. Farm News Network, Stockyard, etc.) is feeding the transmitter.

The audio quality and levels are not consistent. Oh yes, the station is loud and there are plenty of positive peaks, but no low end and/or no high end to the local commercials and weather announcements.

What happened to proper termination of lines, padding and line splitting? I wonder how many of the newer studio technicians ever heard about back loading of patch bays, relays or switches.

Or how about the young engineer who called one day to inquire about the availability of an "un-stuffed" pre-amp board for a popular brand of console?

When told that the manufacturer did not normally supply blank boards, and then asked why he needed one, the reply was to the effect that he "had too much level from the turntable pre-amp and could not get rid of the distortion."

When asked about the low frequency response from the TT, he acknowledged that the audio was "thin" and lacked low frequency content.

A terminating resistor and a 10 or 15 dB pad was suggested for insertion between the TT pre-amp and the mixing

console.

After values of resistors for the pad were discussed the final straw was, "where do I terminate the pre-amp, how do I make a pad and where do I put it!"

Scanning the states

By the time this is in print, the wife and I will have travelled about 10,000 miles in these United States.

Most of our time will be spent east of the Rockies and south of the Mason Dixon Line.

We will get about three-quarters of the way to the Atlantic Ocean. Perhaps your station will be one of those scanned and noted—either good or bad. No call signs to be mentioned, but you will probably be able to recognize any comments when the shoe fits.

Of course my words will probably fall on deaf ears at the fountain of good thinking.

I hear the prevailing idea is to put as many stations on the air as possible.

Keep adding stations until no station can take in enough money to stay on the air. Then and only then will the market be saturated.

Something for everyone, and nothing for all. I wonder . . .

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

57 Years Ago in RW

Editor's note: The RW of today and the RW of old fortuitously share the same name. The RW of old was printed for a period of time in the 1920s and 1930's, when radio was first becoming popular. The current version of RW that you hold in your hands has been around (in various forms and names) for over ten years.

WLWL and WPG Cited in Dispute Over Time

Washington. WLWL, the Paulist broadcasting station in New York City, and WPG at Atlantic City, of the Columbia System, have been cited for a hearing by the Federal Radio Commission for failure to arrive at a time-sharing agreement. Temporary licenses were granted them.

John W. Jones of Newburgh, N. Y., has applied for a new station of 100 watts on the 1210 kc channel with unlimited time. The application requests the facilities of WCOH at Yonkers, WMRJ at Jamaica, WLIC at Ithaca, or WGBB at Freeport. The application was set for hearing.

More Exchanges by U.S.-Britain

London. More frequent exchange of radio programs between England and America will take place in the future, said Sir John Reith, director general of the British Broadcasting Corporation, when he returned from a visit to the United States and Canada, where he has been studying radio conditions.

"Negotiations are proceeding along these lines," he said. "America is very keen to have more broadcasts from England."

The broadcasting of American football games with their organized cheering and of the singing of Negro spirituals, it is thought, would be enjoyed by the English listeners while the Americans would like to hear such ceremonies as the delivering of the keys at the Tower of London.

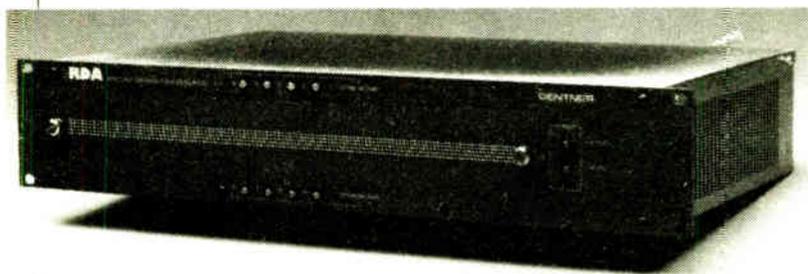
Pointed Opinions

J. W. CASWELL, secretary-treasurer, Caswell-Runyon Company: "Women are the principal determining factors in the purchase of radio sets. When it comes to buying a radio women first consider the furniture which encases the chassis. Beauty is their chief consideration, for they assume that the mechanism will produce music and other programs. Console cabinets have the preference in some 75 per cent of all selections. This situation has been sensed by radio cabinet manufacturers and they are constantly striving to meet the demand for beauty. Period designs are quite popular, but in the main the women prefer the better American designs."

BEADS ARE VETOED

National Broadcasting Company engineers discourage the wearing of beaded dresses around studios. The beads rattle and crackle, and might well give the effect of machine guns or booming cannon over the microphone.

Reprinted from Radio World, July 1931



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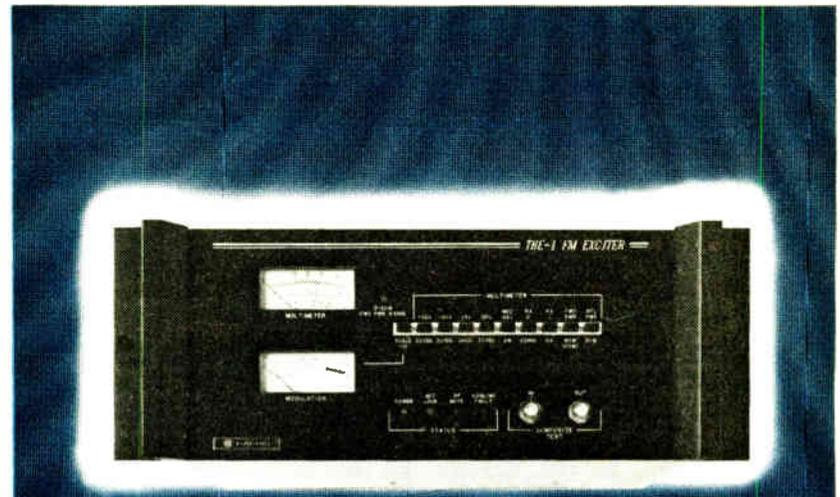
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DDP NEWSletter #1

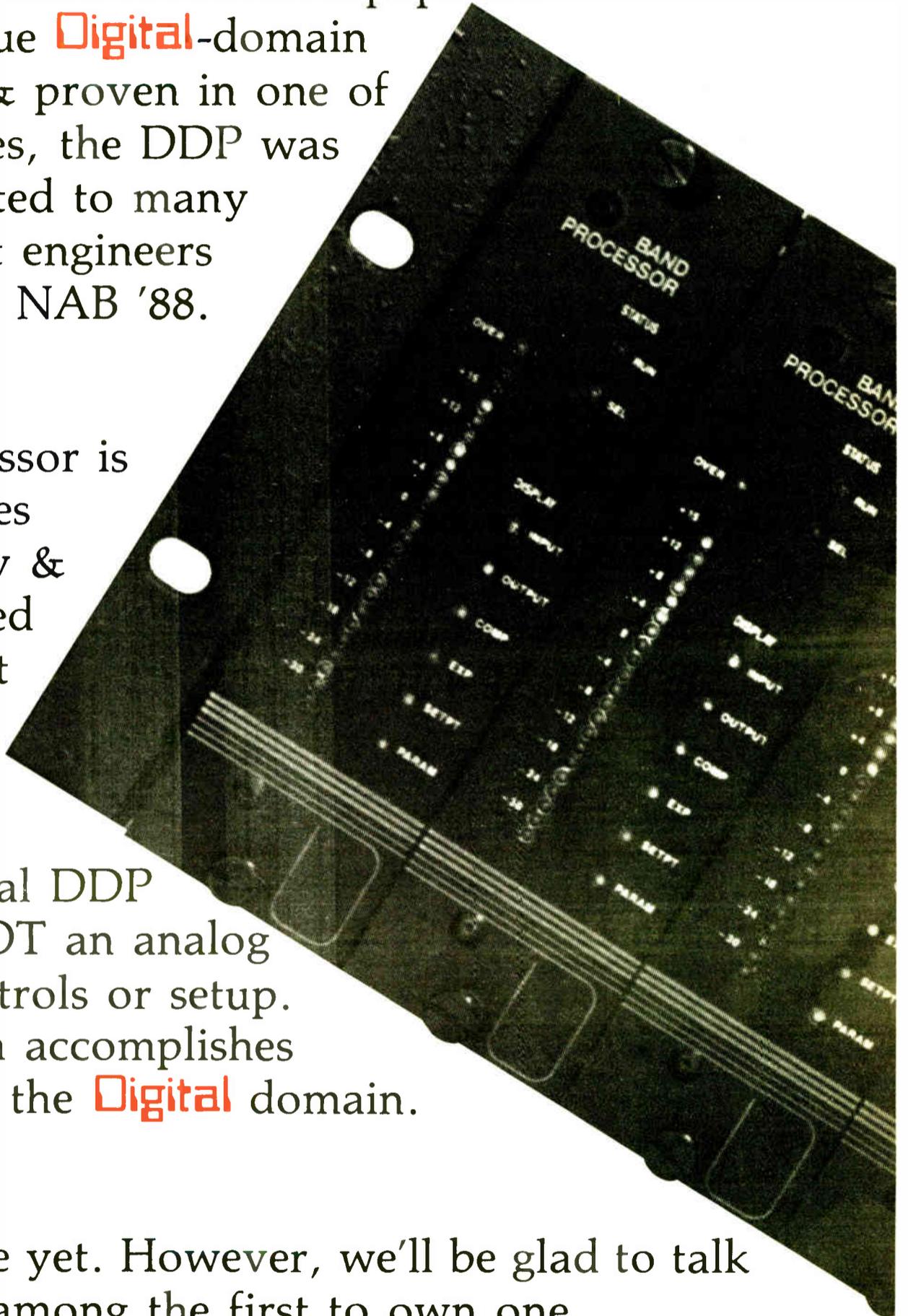
"To process you right into the '90s"

Valley International & Allied Broadcast Equipment proudly announce a true **Digital**-domain processor. Conceived & proven in one of audio's best laboratories, the DDP was successfully demonstrated to many enthusiastic top-market engineers & programmers during NAB '88.

This true **Digital** processor is now in Beta testing sites throughout the country & is expected to be offered for sale within the next four months.

The Valley International DDP **Digital** processor is NOT an analog device with digital controls or setup. It IS a processor which accomplishes precision processing in the **Digital** domain.

The DDP is not for sale yet. However, we'll be glad to talk with you about being among the first to own one.



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High-Altitude Tower Installation

by Tim McCartney

Boise ID ... While broadcast equipment used on mountaintop RF sites is generally the same as in other locations, mile-high installations vary significantly.

Some design considerations at the 7,000' Deer Point mountain near Boise address problems such as extreme power surges, wind gusts, ice, lightning and soil with poor ground conductivity.

Power companies frequently find it difficult to provide the necessary caliber of "clean" electricity to remote areas such as mountaintops.

Varying levels of consumer and business demands result when thousands of air conditioners are powered and then ski lifts are repeatedly turned on and off.

Recent years have seen considerable improvement, however. It used to be that there was just one power run to the mountain, and the lines were supported from aboveground poles.

Imagine how many times the wires must have broken under the weight of snow and ice at 7,000'. Now there are two underground lines from different sides of the mountain.

Power surges

The primary problem faced at this mountain site is the impact of large voltage surges following an outage. While other more minor variances can also be troublesome, the dreaded major surge is the most damaging.

The usual approach to preparing for such surges includes the traditional use of an AC line surge protector but some engineers take protection one step further.

Since power company voltages do not immediately return to normal levels after an outage it makes sense to keep these wild voltages out of the transmitter power supply where they will be stepped up from 208 V to perhaps 5.6 kV. A secondary step-up ratio of 27:1 from a wild surge means certain trouble in the power supply.

KBSU's new FM transmitter lost all six diode stacks after being on the air less than two months. Since nothing in the transmitter checked out as the culprit, the manufacturer theorized that a severe power surge was to blame. The mountain's power history bears this theory out.

Transmitter strategy

Thus, the strategy is to *wait longer* before applying high voltage to the tube, hopefully long enough to allow the power line voltages to stabilize.

With most transmitters this can be accomplished simply by extending the filament warm-up time beyond the normal short cycle intended to quickly return a station to air after an outage.

In KBSU's case the manufacturer's 12-second filament warm-up time was consequently extended to 60 seconds. Other stations have had success with giving up this amount of air time in favor of sav-

ing power supply systems.

Another expensive problem is a notoriously high fatality rate for plate transformers. In fact the mountain is home to a sort of portable spare transformer which sees occasional use by various stations. And one TV station goes so far as to regularly stock its own spare.

The primary problem (is) large voltage surges . . . following an outage.

It's not clear that power company surges are the only reason that these large transformers suffer from insulation breakdown, resulting in shorted coils. Another theory blames lightning for such trouble, even if the transformer is not wired to anything!

And on the topic of surges, the recent entrance to the units has offered yet another route for surges to enter equipment: through the telephone line itself.

It may be that the more traditional dedicated line remote control units also had the same problem, but recent history on the mountain suggests otherwise.

Last February a lightning storm consisting of six direct hits to the Deer Point site damaged nearly all of the 11 FM and five TV transmitter plants.

KBSU lost its dial-up remote control unit; the main circuitry was destroyed beyond reasonable repair. After replacing the board, the manufacturer recommended a surge protector for both AC and telephone line surges. Better late than never!

Since it was still ski season after this storm, I was walking down the mountain to the ski lift carrying the defective unit and met another engineer on his way up carrying a loaner of the exact same model.

His station had lost its dial-up unit the same night. Fortunately, the manufacturer did not say "that's never happened before with this unit."

Wind gusts

Effective transmitter air exhaust is critical on the mountain. Not only do the traditional arguments about proper final tube heat removal apply, but gear of back-pressure from a wind storm is added to the list of concerns.

Thus, even if the transmitter is properly ventilated it's necessary to consider the likely results of 70 mph wind gusts blowing back inside the sheet metal exhaust system.

Prevention of such problems requires an exhaust system design which includes a fan to guard against such back-pressure. Two out of the three FM transmitters in our half of the building use half-horsepower motors to drive their fans.

And the one with years of use has experienced greater tube life than the non-protected transmitter. KBSU's system is too new to offer any conclusions, however.

If nothing else, the fan will prevent birds and rodents from blocking air flow through the RF cavity. Stations not on the air 24 hours per day have undoubtedly found such surprises, even if the exhaust system is covered by a screen.

Another benefit of the fan is that if sufficient air intake is unavailable it will provide at least somewhat more cooling of the final tube. Does it sound as if the design considerations listed so far add up to lots of dollars? No question. But then, the site is 7,000' up with just a 220' tower!

The dollars saved by a short tower on a mountain top are certainly lost in the proper design and maintenance of the RF system. The trade-off in mountain areas is not really seriously questioned—it's the only practical option.

Tim McCartney is director of engineering and operations at KBSU, Boise State University. He is an SBE broadcast engineer, a former GM and has a masters degree in human resources development. He can be reached at 208-385-3760.

A "New Age" for Radio

(continued from page 18)
checks and commercials.

Affiliates refer to the playlist to identify the placement of local messages. Time checks are produced by the Los Angeles station and forwarded to SMN on ¼" reel. SMN dubs the checks onto carts and provides them to local affiliates.

California stretch

To reach Southern California airwaves, The Wave is transmitted from Metromedia studios via 890-950 MHz bandwidth to Mount Wilson, the highest point in the region. The program is broadcast at 58 kW (horizontal and vertical) and can be heard from Santa Barbara to San Diego.

A PCM encoded equalized telephone transmission backs up the microwave. According to Keating the multiplex phone link has only become available in the last two years and is the most inexpensive high quality digital transmission available.

Based on the results of testing now underway, Keating feels the multiplex phone link may eclipse microwave transmission as The Wave's primary feed to Mt. Wilson.

The only potential problem he foresees is in having to rely on an outside source to provide the service. "There's something to be said for having direct control over your signal," says Keating.

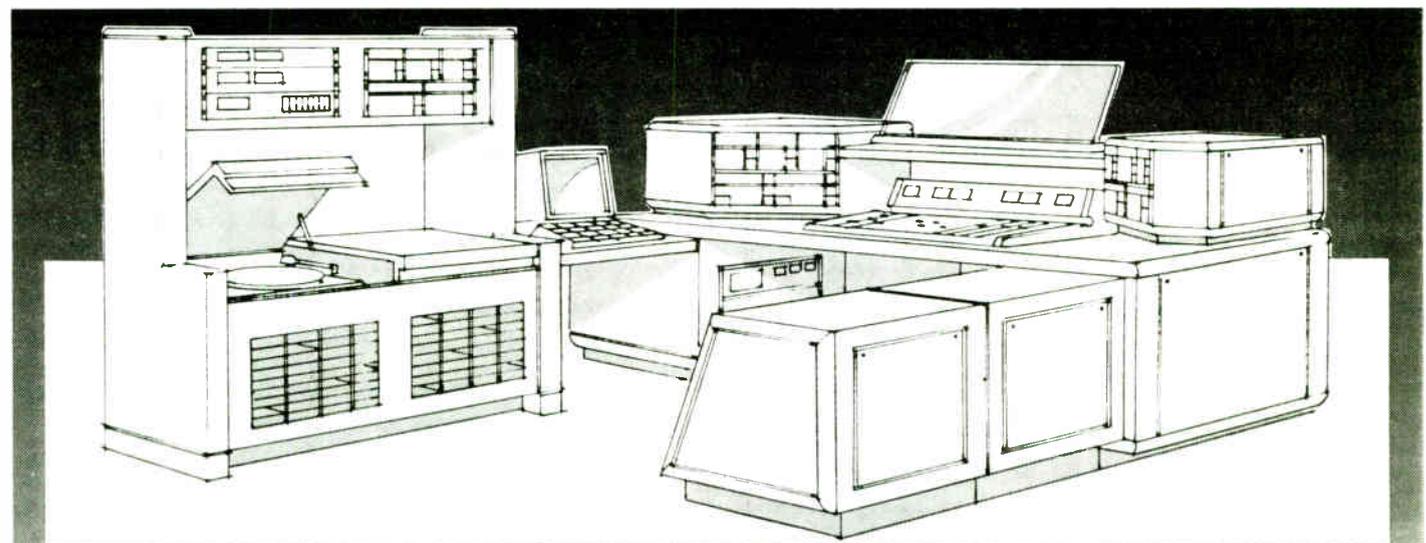
Meanwhile production scheduling at The Wave has been heavy. "The equipment has been in use 14-16 hours a day since the studio opened," Keating notes.

"At first we were uncertain as to how the decks would hold up, but we haven't had a single problem with mechanical performance to date," he adds.

Earlier this year, The Wave pulled a 2.6

ratings in the quarterly Arbitrons for the 25-54 age group. That, plus the addition of more affiliates makes it likely that many more happy birthdays are in store for The Wave.

Bill Anderson is an account executive with Hakuodo Advertising, which handles the Tascam account. He can be reached at 213-388-5200.



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been supplying direct-drive transcription turntables to NHK, Japan's national broadcast network, since 1939.

With NHK, they did the trail-blazing research into digital recording. And in 1972, they built the world's first digital recorder good enough for commercial record production. Today, the influence of the original Denon PCM digital recorder is reflected in nearly every compact disc player, regardless of brand. But most of all, in the Denon CD Cart Player—the one that took only 49 years to build.

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A Look at Digital Audio Storage

(continued from page 23)

gle DAT cassette outlasts the battery charge!

Compactness and audio quality are truly outstanding, however, even on the consumer units. This may ultimately become DAT's strongest and longest lasting application for broadcasters.

Open reel digital

DAT is not the only digital tape format available, of course. Two formats of open-reel systems exist, as well: DASH (Digital Audio Stationary Head) and PD ("ProDigi").

Both use specially formulated 1/4" tape in their two-track incarnations, and a variety of tape widths and speeds in their several multitrack formats. The two are incompatible, with each vying to become a "standard."

While the multitrack formats have been well established and seem appropriate for recording studio use for the present time, they are beyond the realm of the typical broadcast operation in both price and capability.

The two-track formats would seem more suitable to stations' needs but run beyond the general price range of such hardware in all but a very few broadcast operations (most units list at around \$20,000).

Tape costs are also a bit steep (\$40-\$60/hr), although this is not that much more than top quality analog and these are spliceable formats.

More importantly, though, these formats may be in danger of being surpassed soon by other, non-tape-based formats. That fact, coupled with their cost, makes the formats a relatively unattractive proposition for most broadcasters.

And they are far from being in very wide use, so exchange of tapes outside one's own facility isn't particularly likely, either.

Recordable recommendations

So where does that leave us, stuck as we are in the present tense?

Look at DAT for possible near-term use in time-shifting, remote (non-ENG) recording and simple production applications.

Consider the appropriate models for cart machine replacement, or for use in automation systems. Look at the upcoming portable DATs much more seriously for longer-term ENG uses.

If and when the consumer DAT imbroglio is settled (anybody's guess—Congress has asked the Office of Technology Assessment for yet another study of the effects of home taping), look at pro-DAT again.

More hardware offerings would be likely at that time and thereafter. Otherwise, forget tape as a means of storage for digital audio.

DAT is likely to be the last tape format in audio recording's history. In fact, it may be the last magnetic storage medium, too, as recordable/erasable optical recording technology is established and gains acceptance.

Skip Pizzi is the training coordinator for National Public Radio's Program Engineering Department. He can be reached at 202-822-2483.

US-Soviet Satellite Link Established

by Charles Taylor

Los Angeles CA ... IDB Communications Group Inc. and Cosmicheskia Sviiaz, a profit-making arm of the USSR's Ministry of Posts and Telecommunications, have agreed to place a permanent International Business Service satellite earth station facility in the Soviet Union.

The facility, signed for a five-year agreement, will be used for direct digital communications services between the US and the USSR.

At press time, service was scheduled to be available by the end of July.

The US media most likely will be the

primary user for now, said Bill Wisniewski, IDB's director of telecommunications services, but "other entities are also showing a great deal of interest in the permanent link."

It will enable US users to have direct connections for telephones, digital transmission of FAX, program-quality audio, computer data, photographs and compressed video, according to the company.

Currently, 11 dedicated lines exist for telephone communications between the US and Soviet Union. Such scarcity often can make a placing a telephone call a multi-hour ordeal, IDB said.

The two-way, full-time 9.6 kbps data

circuit is available for as low as \$11,500 a month. Radio broadcasters will be able to transmit 15 kHz stereo audio from the Soviet Union to the US for \$22 a minute.

Last August, IDB became the first non-Soviet carrier to use its own transmission facilities in the USSR when it took its Ku-band portable earth station to Leningrad to transmit Billy Joel's concert back to radio stations in the US.

IDB also provided audio, video and data/voice services for US media covering the Reagan/Gorbachev summit in May 1988.

For more information, call IDB at 213-870-9000.

Splatter matters.

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

That's why routine monitoring of your station's RF spectrum is a must. But it doesn't mean you'll have to bust your budget on a spectrum analyzer. It just means you need the rugged SM-1 AM Splatter Monitor from Delta Electronics.

For just \$2,150 you can now accurately measure your transmitter's spectral output, monitor transmitter IPM levels and make adjustments to improve clarity. An external audio input helps identify splatter sources.

The Splatter Monitor's unique offset feature tunes spectral segments for closer examination 10 kHz to

100 kHz away from the carrier. Unlike a spectrum analyzer, you can listen to the front panel speaker or your own headphones as you measure splatter levels on the front panel meter. The Splatter Monitor also has an alarm output to drive your remote control.

In this day and age where splatter matters, monitoring it doesn't have to cost you a fortune.

To find out more about the new Delta Splatter Monitor, call (703) 354-3350, or write Delta Electronics, Inc., 5730 General Washington Drive, P.O. Box 11268, Alexandria, VA 22312.

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AMPLIFIERS

Want to Sell

Bogen 100 W amp, solid-state. \$200; Bogen 50 W amp, tube-type. \$50. N Bealy, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Shure FP11 mic to line amp, excel cond. \$125. C Butler, Butler Bdcg Srvs, 1775 Bartlett, Orange Pk FL 32073. 904-264-8169.

Ampex 620 speaker amp, \$100; Gates Stay Level limiter amp M5167, \$175. L Oliver, 304 W 89th St #2A, NY NY 10024. 212-874-0274.

RCA BA-34 B & C 10 W program/speaker amps (15), not working, gd for parts. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

RCA BA-31 mic preamps (11), cond unknown; RCA rack shelves (6). M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Hill Audio 1000A (2), 2 yrs old, \$2500 ea; Crest 3001, \$750. B Rappleye, Bob Steele Prod, 4013 Postgate Terr Ste 701, Silver Spring MD 20906. 301-871-0132.

Sansui G-7700 stereo receiver, 120 W/chnl, digital tuner w/lots of inputs, \$300. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Healthkit audio amps, Williamson design, Altec-Peerless output transformers, pair of KT-66 tubes, pair 5881 tubes, used. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

PR&E SDA-8, new rack mnt stereo 2 x 16 audio dist amp w/manuals (4), BO; Dyma Eng, new rack mnt stereo 2 x 16 audio dist amp w/manual, BO B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Want to Buy

RCA amps, BA-14 series & up; 82-87 series & up. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

ANTENNAS & TOWERS

Want to Sell

Jennings vacuum coax switch, 3-1/8" 50 ohm SPDT, \$1200 ea; 6-1/8" 50 ohm bullets, \$30 ea. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Dielectric 50,000D RF control switch, never used, \$1500. E Gorman, 11250 Longhill Dr, Pinellas Park FL 34666. 813-546-6996.

Collins G5C PM-4E 4 bay FM, 102.3 MHz, 1-5/8" fittings, \$3000; ERI 403 isocoupler, completely rebuilt, 102.3 MHz, \$700. D Morrison, kWKK, POB 89, Dardanelle AR 72834. 501-229-4949.

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Andrew 40525A dehydrator, basic unit, gd cond, 6 yrs old, w/manual, partial overhaul 6/88, BO, J Gober, WCOK, 236 Goodwin Crest Dr, Birmingham AL 35209. 205-945-4646.

Zenith automatic transfer switch, 25 kW, K Dicks, WVVA, Box 1930, Bluefield WV 24701. 304-323-5487.

Harris FM44, 4 bay HP, 91.9 MHz, excel cond, 3 yrs old, \$300. H Gibbs, College of Wooster, Wooster OH 44691. 216-263-2000.

Shively 6813NP-3, 3-bay CP antenna w/radomes on 91-1Hz, can be re-tuned, 1 yr old, \$3500. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

RCA 20' rigid section, 3-1/8 line w/RF load & wattmeter, 50 ohm rated at 10 kW for UHF TV, \$750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TFU-24DM UHF TV antenna on chnl 41, \$1500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Electro-Impulse CPTN-3000 (3) dummy loads, new 3 kW, DC to 1 GHz, oil filled, air cooled w/manual, \$875 ea/BO, C Waltman, KSAN, POB 910, Oakland CA 94607. 415-836-0910.

Utility 540 tower, 500', 42", on ground, recently painted, w/lighting kit & guy wires; also 375' used Andrew JF-50 3" coax, whangers & end fittings, just taken down & in gd cond, BO, T Wortmann, WJAG/KEXL, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

Andrew 1-5/8" & 3-1/8" coaxial elbows, reducers & bullets, 120' LDF4-50 transmission line 1/2" Helix (new) & new connectors/splices for same, BO, B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Andrew HJ9-50 200' 5" Helix xmsn line, new on original reel, G Westerberg, KRXY, 7075 W Hampden Ave, Denver CO 80227. 303-989-1075.

Gates 5 bay, HP, 97.7 MHz, \$1000. G Kenney, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

ERI 11 bay center fed 100.3 MHz, T Dewitt, WDIZ, 2699 Lee Rd Ste 470, Winter Park FL 32789. 407-648-1802.

Rohn SSV self supporting tower, 85' at base, 2' at top, J Stevens, WLAU, POB 5, Laurel MS. 601-649-1840.

CP cavity type broadband panel antenna, multi-system application, omni or directional pattern, 88-108 MHz, high power, excel axial ratios, radomes, A Warmus, 216-659-4440.

HTPG3500 (3), Philystan guy assemblies, gd cond, BO, E Goetsch, WXPR, 303 W Prospect, Rhineclander WI 54501. 715-362-6000.

Scala FMO 4 bay FM antenna, complete system, \$1000/BO, S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Want to Buy

Guyed or self support tower, 250' min, for LPTV antenna & (4) STL dishes, AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

Waveguide transition, WR229 to type N; also equatorial \$100 controller, dish, LNR & waveguide, J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

LPTV antenna, Ch 64 UHF, AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

Educ FM antenna, 1 bay, 91.1 MHz, J Burton, Solid Soul Records, 18019 Homestead Ct, Miami FL 33157. 305-253-8786.

Tower, 325' min, handle 3 bay class A antenna, strong enough to support 4' STL dish, pipe or solid rod, G Gaut, United AM Bdcg, 3515 Clairmont Ave, Ind, MO 64052. 816-254-5267.

Low band, tuneable to Ch 3: (2) high band VHF, tuneable to Chs 10 or 12, J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Scala TVO Series translator antennas for VHF chnl 3, 10, 12; Bogner, B Series or LPS; Scala SL-8 or Parapanel or Lindsey line; any UHF TV chnl thru chnl 70, J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

AUDIO PROD. (OTHER)

Want to Sell

Eventide BD995 digital delay, BO, J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Audio/Digital TC-4 digital 6 8 sec 15 kHz time delay, 9 mos old, H Kneller Jr, WKIL, 813-639-1112.

Tapco full octave stereo EQ, \$75. N Bealy, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Valley People Dynamite 2 chnl comp/limiter/de-esser, vgc, \$250. S Syarto, MJI Bdcg, 666 5th, NY NY 10103. 212-245-5010.

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Howe Phase Chasers (2), stereo, \$800/both, C Keith, ALI Bdcg, 9 Roxbury St, Keene NH 03431. 603-352-8460.

Paper leader tape, 1/2", (3) nearly full rolls; 1/2" Editorial splicing block, \$30. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

CRL FM subcarrier gen, new cond, \$675; Zetron paging terminal, \$975. Mr Mudge, Datacel, 8577 Sandy Crest Dr, Union Lake MI 48085. 313-698-2336.

Fairchild 664 passive EQs (4), no cases, \$25 ea or \$75/all; Langevin EQ 251-B EQ, like new, \$40. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

UREI 31 band graphic EQ, \$400. J Jarjoura, WCIB, POB C, Falmouth MA 02541. 617-548-3102.

ABG custom dubbing ctr, excel cond, \$2000. J Salov, WJGS, 517-366-5364.

Yamaha SPX90 signal processor, nearly new, \$550. G Kelley Jr, WGMK, POB 87, Donalsonville GA 31746. 912-524-5123.

Yamaha SPX90 digital reverb, \$450; ART DR2A reverb, \$300. W Wawro, WFAA, Comm Ctr, Dallas TX 75202. 214-977-6260.

dbx II-122 NR system (2), \$75 ea; dbx 222 tape NR system, \$125. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Dubbing system, TT to cart, call for details. J Salov, Northlands Comm, 3431 W Houghton Lake Dr, Houghton Lake MI 48629. 517-366-5364.

Eventide 949 Harmonizer, \$1500. P Dickson, KLSY, 12011 NE 1st St, Bellevue WA 98005. 206-454-1540.

McMartin TG-2 EBS generator, gd cond, w/manual, \$100; Realistic TM-152 AM stereo receiver, gd cond, not a scratch, \$20; Elgin ERC telephone to board interface, gd cond, \$100; McMartin EBS-2/FMR-1, gd cond, w/manual, \$100. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

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PR&E DT-2 digital up timer, new in rosewood case, also ESE console mount digital up timer & (5) BG Eng BGE-1T digital up timers for retrofit into ITC cart machines, B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Dyma Eng custom circular lazy susan 210 space wood cart rack (2); (2) 212 space wood wall mnt cart racks; BO, Dorrough 40-A loudness meters in cases (3); BO, B Royster, KQM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

ABC MRP-1 cue command decoder w/print-er cable, \$500. N Kling, KMA, Shenandoah IA 51601. 712-246-5270.

Patch bays, 52 jacks, 3 card, normaling, 19" A-1 cond, \$35 plus shpg, N Carroll, So Bdcg Svcs, 108 Washington Ct, Hendersonville TN 37075.

Eventide H949 Harmonizer w/the deglitch circuit, mint cond, \$1500. B Umberger, WNL, 51 S Main, Clearwater FL 34625. 813-446-0957.

Numarck DM 1550; EXR SPI exciters; Alesis XT digital reverb; Eventide H190; Delta-Lab DL4; Loft delay line/flanger; Eventide phaser; UREI 9 band stereo graphic EQ, & much more, write for details & prices. P Costa, Eastern Snd & Video, 462 Merrimack, Methuen MA 01844.

Orban 111B reverb; CRL SPP800 stereo preparation processor; DAP 310 audio processors; McMartin B110R stereo gen; McMartin TG2 EBS tone gen; McMartin EBS-2 EBS decoder, all BO, J Hicks, KAYI, 7030 S Yale Ste 700, Tulsa OK 74136. 918-492-2020.

Want to Buy

Production room & control equip, need gd used gear, R Hughes, Team Bdcg, 561 Golden Ave, Mobile AL 36617. 205-456-1362.

KLH TNE7000A transient noise eliminator; Burwin Research DNF1201A dynamic noise filter; J Robinson, WVRQ, Rt 4, Viroqua WI 54665. 608-637-7200.

AUTOMATION EQUIP.

Want to Sell

IGM Instacart 48 tray, mono, late mdl w/black panel & LED's, vgc, \$6000 or trade for cart machines. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Schafer 903 System complete or w/o R-R, BO; UREI 31 band graphic EQ, BO; road case for equip 22" front rack space, top removes for additional rack space or mixer, w/handles, BO, J Jarjoura, WCIB, POB C, Falmouth MA 02541. 508-548-3102.

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SMC ESP-1 automation controller w/4) 350RS Carousels, (3) PR199 Revox, remote control unit, Extel printer, gd working cond, \$11,000 complete. K Hollingsworth, WCSP, 214 E Georgetown St, Crystal Springs MS 39059. 601-592-3000.

IGM Instacart, late mdl, 48 tray, mono, excel cond, factory refurb, never unpacked, \$12,000 plus ship. M Lucas, WVNO, 2900 Park Ave W, Mansfield OH 44906. 219-529-5900.

Cetec System 7000, w/real time clock, printed log option, 2 terminals, 2 encode ctrs, 3 R-R, 3 Insta-carts, Audiophile 2A, well maintained, \$26,300/BO. B Troy, KSOP, 1285 W 2320 South Salt Lake City UT 84119. 801-972-1043.

Control Design CD25G tone gen, never used, \$100. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

SMC ESF-1 w/many extras, complete, less reels & carts, \$2300/BO. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548

Harris 90C1 computer for automation, excel cond. Brain w/keyboard, terminal screen & printer, 5 yrs old. BO: SMC 252 Carousels (2), need: repair, stereo heads, BO: SMC Carousels, interfaces (2), uses BCD to link up SMC automation computer to Carousels, excel cond, BO. P Stover, WJYJ. 703-582-5371.

Automation System: (3) mounted racks, (2) Schaefer, (2) Gates Carousel, complete system. T Harrison, KXTD, 301 N Walnut, Broken Arrow OK 74012. 918-258-1000

SMC Carousels (3), w/controllers, MEI programmer & brain, (4) 25 Hz tone sensors, cables - must sell, space needed. S McDaniel, WIOZ Southern Pines NC. 919-483-9565

SMC ESP-1 gd cond, working, \$3500/BO. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548

IGM 504 3 chnl, w/manual, BO. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

ABC network alert decoders (2), \$200: ABC Talk Radio cue command decoder, \$500. 25 Hz automation encoder, unused, \$250. J Ashby, WIBX, POB 950, Utica NY 13503. 315-736-9313.

Gates: 250, gd cond; Gates Stack 55, gd cond. Gates Criterion, gd cond; Gates RA-5, gd cond, all recently taken out of service, BO on each. A Sweat, Clear Logic Comm, 618 Community Dr, Waycross GA 31502. 912-285-5822

Music satellite prog system, SMC MSP1 computer programmer w/DT5 data terminal, CFT screen, text decoder & Xtel printer, (4) SMC 352RSB Carousels & SMC 452 Carousel, ready to go on-air, performs flawlessly. S Carroll, WABK, POB 1280, Gardiner ME 04345. 207-582-3303.

SMC 250-RS new stereo Carousel wired for RS spare SMC modules, parts, heads, BO; many new automatic electric plug-in telco type relays for Schaefer 800 automation systems, have silence sense, etc, BO. B Royster, KOM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Want to Buy

Schaefer 800 T or S tube or stereo, any cond; SMC 250, need (3) Carousels. B Van Poyen, WYGR, 1055 28th SW, Wyoming NJ 49509. 616-532-1168.

SMC ESP1 or ESP2 automation system. (4) reels, (4) single play carts, time announce & remote control, \$10-15K. F White, WLOR, POB 45, Thomasville GA 31799. 912-226-7911.

Allison Research Gain Brain 700 card. K Smith, Smith Eng, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

Encoder 25 Hz, J Vukelich, 4551 Flag Ave, N Mpls MN. 612-537-1431.

CAMERAS (VIDEO)

Want to Sell

Sony DXC 1640 like new, in case w/all access, \$700. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Hitachi mdl FP1212B w/control units & cables (2), (2) pedestals, ITE tripod, (2) RCA color cameras, 404-458-0828.

Hitachi FP400 w/Canon zoom lens & access, BO over \$1000. M Glaser, MRG Prod, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Sony DXC-3000 (3) CCD cameras, lens, viewfinder, case, cable, etc, LN, \$4500; AC supply, rack mount, CCU & 100' cable also avail. B Dombrowski, Whirlwind Prod, 10356 W Warren, Dearborn MI 48126. 313-584-4038.

Miller fluid head, \$400; NCE fluid head, \$400; O'Conner 30 fluid head, \$700; Akley gyro head, \$7700; Arriflex gyro head, \$300; ITC hydro head, \$500. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

Norelco PCP-90 plumbicon color camera, \$500; Houston Fearless studio pedestals, \$350; RCA PK-701 color studio camera, \$995; Norelco PC-70 color studio cameras (4) as is, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

GE PE250 (2) w/RCU's, cables, manual & some used plumbicons, needs work, BO/you ship. D Driessen, WGBA, POB 19094, Green Bay WI 54307. 414-494-2626.

Hitachi FP1010 studio camera w/zoom lens (2), \$1000 ea; also rolling tripod for Hitachi FP1000, \$500 ea. B Lakey, KBJ Cable, 733 N Main, Covington TN 38019. 901-476-8644.

Want to Buy

Dumont cameras, monitors & associated equip; also RCA TK-11, TK-31, TK-41 camera chains; camera tripods also. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Sony M3A or M2. V Stover, Stover Photo Svcs, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

CART MACHINES

Want to Sell

Tapecasters & Spotmasters (7), \$200-\$500. J Phillips, All Star Bdcg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Hall Electronics Quality Used Equipment 30 Day Guarantee!

| | |
|--------------------------------|------------|
| ITC 3 deck stereo | \$1,995.00 |
| ITC R/P delay mono | 1,295.00 |
| BE-2000 R/P mono w/150 Hz tone | 495.00 |
| Tapecaster 700-RP mono | 395.00 |
| Tapecaster 700-RP stereo | 495.00 |

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Tapecaster, Spotmaster machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7722

Audi-Cord, Models S-26 R/P stereo, \$1,250; Twin stereo play TDS-6 (2), \$1095 ea. All unit factory rebuilt, mint cond, 1984 vintage. Kidd Communications, 4096 Bridge St., Ste 4, Fair Oaks CA 95628. 916-961-5433.

Criterion 80 stereo record amp, desk mount, very clean. H Kneller Jr, WKIL, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

Cue cards, 150 Hz (2) for Harris Criterion 3-deck 992-3800, \$50 ea. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

BE 3100 play stereo, ultra mint cond, original heads, w/manuals, \$1700 firm; BE 3200 R/P stereo, mint cond, original heads, w/manuals, \$2750 firm. R Kaufman, PAMS Prods, POB 462247, Garland TX 75046. 214-271-7625

Tapecaster 700P stereo, \$200; also 700RP stereo, \$300. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

BE5304 stereo triple deck, new heads, new motor, all tones, gd cond, \$1500; ITC RP mono, excel cond, \$900. B Mountjoy, Custom AV Svcs, POB 1240, Elizabethton TN 37644. 615-543-5849.

Fidelipac Dynamax CTR 124 R/P stereo cart machines (5), \$2400 ea/BO; (6) Dynamax CTR 112 play only stereo, \$1300 ea/BO. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

ITC PD2, like new PB only, \$1000. R Hunnicutt, WMTZ, POB 11594, Augusta GA 90907. 404-860-0943.

SMC S21, gd cond, \$550; ITC Omega Stereo, perfect cond, \$1250/BO; Gates Criterion 80 stereo, gd cond, no cover, \$650/BO. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

ITC Delta stereo play units, 2 yrs old, excel cond (4), \$1300 ea; cart racks, 500 slot wood cart racks, wall mount, excel cond, BO. J Salov, WJGS. 517-366-5364.

Spotmaster 2000 mono, excel cond, 5 yrs old, secondary tone, R/P, low hrs, used as backup, BO; Collins 212-E Twincart, stereo, fair cond, rack mountable, BO. P Stover, WJYJ. 703-582-5371.

Spotmaster 3200, 5300, one R/P mono, one triple play only, gd cond, \$1000/both. B Huges, KNET, POB 649, Palestine TX 75801. 214-723-2417, aft 7 PM central.

ITC FB-1 phone interface unit (4), \$100 ea or all for \$300. D Murray, POB 5715, Kingsport TN 37663. 615-239-4745.

Spotmaster 2000 mono R/P, \$500. B Bundgaard, KLKS, POB 300, Breezy Pt MN 56472. 218-562-4884.

Tapecaster 700RP, stereo, 700RP mono: 700P mono, all units gd for parts only, buy all three & get one or two working. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Ampex 351, mono, \$200; Tapecaster 700 RP mono cart machine, w/2 tones, gd cond, \$350. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

PR&E Tomcat recorder & (3) reproducers, new ITC Series 99A stereo recorder w/ELSA & (2) 99A stereo 3 tone PBs, new; also spare modules, rack mounts & record amp for Harris Criterion 80, BO. B Royster, KOM Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Spotmaster 605B (2). L Pirallo, WAEL, POB 1370, Mayaguez PR 00709. 809-832-0600.

BE 5304 stereo triple deck, new heads, new motor, all tones, gd cond, \$1500; ITC RP mono, excel cond, \$900. B Mountjoy, Custom AV Svcs, POB 1240, Elizabethton TN 37644. 615-543-4849.

Tapecaster 700RP, gd cond, \$225; LPB RC6A AM xmir for carrier current, tube type, \$1000; Tapecaster 700P, \$150. J Ryan, KSMR, POB 29, St Marys College, Winona MN 55987. 507-457-1613.

Sparta 800C R/P unit, gd cond, \$375. K Gordon, Remington Agency, 10622 SW 100th St, Miami FL 33176. 305-271-1671.

UMC Beucart II R/P, like new, \$750. P Laffan, Emerald Prods, 757 Congdon St, Middletown CT 06457. 203-346-4080.

ITC Delta Series triple deck PB, stereo; ITC Delta Series stereo R/P machine. S Jay, WWUF, POB 1867, Waycross GA 31502. 912-283-2229.

Fidelipac CTR 124 R/P units, stereo (5); Fidelipac CTR 112 (4) stereo play units. J Lackness, KRIA, 3407 NE Parkway, San Antonio TX 78218. 512-828-3737.

ITC FM1 phone interface unit (4), \$100 ea or all for \$300. D Murray, POB 5715, Kingsport TN 37663. 615-239-4745.

Want to Buy

Stereo recorders & players in gd cond, perfect ITC Premium line or Audicord, reasonably priced. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

BE 3000 & 2100 cart machines wanted. Exporter needs 90 used machines, working cond, not more than 6 yrs old, reasonable price avail. Send particulars to: RW, POB 1214, Falls Church VA 22041. Attn: Box 1-1.

Gates CPD2 record elect or entire machine. T Driggers, Driggers Bdcg, 818 Quail Ct, Helandburg CA 95448. 707-437-9370

Tapecaster mono R/P, \$200 or less. H Iko, WBZBQW, 16 Lillian Pl, New Windsor NY 12550. 914-446-7747

ITC 3D stereo cart machine. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Cart rewriter, D Wiltala, WLOR, 118 S Union, Traverse City MI 49684. 616-947-3220

ITC PD2 cart machine. B Bundgaard, KLKS, POB 300, Breezy Pt MN 56472. 218-562-4884.

Recent ITC or BE stereo R/P in gd cond. EE McCoy, KZEN, Box 100, Central City NE 68826. 308-946-3816

Single play cart decks (2), mono w/1 kHz cue tone. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686

150 Hz tone sensor board for Harris Criterion 90-3, may purchase complete machine. R Rocks, KEMC, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

ITC 3D mono. J Vukelich, 4551 Flag Ave. N Mpls MN. 612-537-1431.

Eraser/splice locator. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Otari ARS1000, 6 mos old, \$1000. J Kennedy, Chnl 9 TV, RD 1 Box 460, Cogan Station PA 17728. 717-998-9999.

ITC 850 Series stereo deck in roll around cabinet, vgc w/book. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

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Scully 280 Series, 12 trk head Assy w/spec sheet from JRF, \$500; Ampex 354 stereo elect w/manual, \$150; Ampex PR-10 (2) mono elect, \$100/both. B Sgambati, SGAM Rec, 747 Saddle River Rd, Monsey NY 10952. 914-356-6553 aft 6 PM.

Alpha 21 & (3) 22, mono audio voice-quality duplicators, cassette-cassette, 1 master to 7 dubbing positions, \$395 for all. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

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Sony ORM-10, CCP-13B & (2) CCP-04B, gd cond, new heads, 1/4" or cassette master to 11 dubbing positions, stereo duplicator, \$12,000 for all. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Ampex 4 trk w/set sync, \$525; Ampex 3 trk, \$425; Ampex 2 trk (2), \$375 ea; Ampex FT in cases, \$325 & console cabinet w/wheels, \$100. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

Metrotech 500 logging recorder, FT mono, one pass, 15/16 ips & some other higher speed, missing power cord & book, otherwise vgc. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

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Los Gatos, CA 95032
(408) 356-3232

Scully 270 play only decks (2), stereo w/new heads, vgc; (2) more avail soon, excel automation decks, all w/books. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331

Ampex AG350 solid state R/P rack mount, vgc, \$850/BO or trade. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336.

AKAI GX-650D 3 motor/dual capstan semi-pro deck, very nice unbalanced in/out, stereo. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Nagra III, (9) as is cond, \$789 ea. B Cook, Cook Assoc, POB 4390, Wood Land Park CO 80866. 719-594-9464.

Telex 300 high speed duplicator w/(2) R-R & (3) slaves in rack, excel cond, w/manuals, low use, \$800; Scully 280B 2-trk R-R w/varispeed in Ruslang cabinets, mint cond, \$1200. B Carr, Carr Comm, POB 167815, Toledo OH 43616. 419-874-1118

3M background music player w/(2) 24-hour tapes, like new, \$400/BO. R Zimmer, Arizona Audio, 3055 N Tyndall Ste 22, Tucson AZ 85719. 602-823-2933.

Ampex 351 refurbished deck, constant tension, 2 trk w/Inovonics 375 elect, gd heads, \$1150 or trade. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336

Ampex 300-8 8 trk 1" vintage tube machine, excel cond, BO; Ampex 351 tube elect (8), excel cond, BO. R Kaufman, PAMS Prods, POB 462247, Garland TX 75046. 214-271-7625.

Ampex 354 2 trk stereo, tube type, \$800; Ampex AG-600 FT solid-state, \$500. N Beaty, WSVL, N Morrinstown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Ampex AG440B R/P, excel cond in custom or portable console, \$1350/BO or trade for U47 mic. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336.

Tascam 80-B w/dbx & new RP head, \$1900. C Lawson, L&N Eng, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Otari MX5050 Mark III-B 1/2" 8 trk, full function remote control, also 8 chnl of rack-mount dbx NR, \$3950/pkg. J Block, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Scully 280B-2 stereo deck in Ruslang cabinet, vgc. J Seaman, WWSA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Revox A77 hi-speed, 7.5-15 ips, 1/2 trk, no head wear, spares & manual, \$500. M Heleznik, Milwaukee Snd Sids, 610 N Water # 100, Milwaukee WI 53201. 414-272-7085.

Ampex AG-440-C-1 FT mono, stored for past 5 yrs, motion sensing, new cond, \$1500. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

ITC 750s (4), w/(4) MW Persons tone processors, \$2000 (might break up package). L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

Otari MX5050 2 trk, fairly old but very reliable, gd cond, 7.5-15 ips, 2 trk record 1/2 trk & 1/4 trk PB, \$550. J Block, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Otari 5050 BII R-R, \$1800. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

AVM Ferrograph Series 8 R/P reel deck, \$1800/BO. M Bannon, WATH, POB Drawer C, Athens OH 45701. 614-594-5102.

Studer A80 MKII slim body, spare remote, gd cond, \$12000. A Milano, Home Base Recdg, 147 W 84th St, NY NY 10011. 212-691-7674.

Ampex 600, FT mono, \$200. M Saady, 1st City Recd, 141-60 84th Rd Apt 3E, Briarwood NY 11435. 718-846-2062



Broadcast Equipment Exchange

MICROPHONES . . . WTS

Edcor PM-5 wireless mic w/ST-3B receiver. \$250. G Barnett KWKY, Bdct Ctr, Palm Springs CA 92262 619-328-1104.

Want to Buy

Altec yoke for Altec 639 mic. L Beigel, On-Cue Recdg, POE 85042, LA CA 90072. 213-456-3595.

RCA mics, 44s any mdl working or not & 77s any mdl working or not. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Old mics for WMOP museum. J Kirk, WMOP, POE 1136 Ocala FL 32678. 904-732-2010.

MISCELLANEOUS

Want to Sell

Scott FM 311-C tuner, \$180; Neumann U47 w/pwr supply \$1775; disc cutting lead screws, 224/104/160 lines/in, \$150/all; also 104/224/120 at \$50 ea; Capps disc cutting needles w/pigtails for hot stylus, \$7 ea; hot stylus units (2 w/meters for heating needles for disc cutting, \$25 ea. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274

Video-Audio equip sale. Hundreds of low hour, mint items. Private studio, not a broker. Call for new first offer list 615-226-1122.

Plate transformer, 3 phase, primary 220 V, sec 4000 V/1 A, \$450 S Strettenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000

RFI filter Sprague F-1135/G JN17-3300B1 250 VAC 10A, single or 3 phase use on 208 or 240 V, \$600 & \$700; double throw safety switch, 3 pole 240 V 400 A, \$800, 600 V 100 A fuse, \$350. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only

Harris rack cabinets (2), 78" tall w/AC outlet strips & interior equip supports, less side panels, \$100 ea. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

Heath/Zenith 89 computer, 3 serial ports, 64K memory, KDOS & CP/M systems, Basic w/compiler, about 100 spare disks, some w/games & other programs, \$250. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

Epson RX-80 printer, like new cond, \$150. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Telex CS61 headset w/mic, BO. C Springer, KLMM, POB 890, Lamar CO 81052. 719-336-2206.

Peter Dahl Co modulation reactor, 190 henry, 250 mA, new, \$75 R DeNert, NEZT, 755 Quincy Ave, Bronx NY 10465. 212-931-6202

Catalogs, 50 yrs worth, inc RCA Bdct News, Radio Masters, GR, HP, Tek, Dumont, Cameradio, McGee, Burstein-Applebee, 36 pg list for 45¢ SASE. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Staco variable auto transformer, new, 3 A type 291, 120 VAC in, 1-120 VAC out, \$20; (5) RCA patch bays, 2 row, 24 x 1/4" sleeve/tp normalised jax per row, \$15 ea/\$50 all. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

PR&E, ADC unwired TRS mono & stereo dbi row patch bays w/cords (5); many mono & TRS patch cords; (2) wired, normalised stereo dbi row patch bays to Xmas trees, also punch blocks. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Bud 6' equip racks w/back doors (4); Stanton TV rack w/rear rails & back door, (2) Bud 7' telco type racks; many new alum & hamertone grey blank rack panels & rack screws. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Splicefinder LEL SF101B, factory checked, \$75; Jennings MC1-1000 15 kV vacuum; (2) CDE CM-91 .0013 MFD, 25 kV mica 18 amp, 2 CDE CM93 .0012 MFD, 25 kV mica, all new, half price; Rust remote control type 108 for parts. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

Sola 500 VA; (2) 750 VA & one 100 VA harmonic neutralized regulating transformers; Wilkinson single phase line surge protector in outdoor case; also many extender cards for SMC ITC, Optomod, McMartin, UREI Mod One console, Criterion 80 cart equip. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Bird 3127, gd cond, \$100; Sola, great for computers, console & other susceptible equip, \$125; Elgin ERC telco coupler, \$75. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

Data Book set, latest 3 vols, Nat'l Semi, Linear IC books & applications manual & seminar text, \$60. J Lipski, Ind Eng, POB 1456, Lompoc CA 93438. 805-865-5497

Tandy computer, 48K w/2 disk drives, monitor w/program diskettes for record/music library files, free shipping, \$275. J Shepard, Globe Prod, POB 20465, Roanoke VA 24018. 703-344-3283

IBM System 34 mod E35 mag reader, 128K RAM 128 M hard, 5211 printer, 2 work stations, \$2000. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Zenith 3 phase automatic transformer switch 25 kW, \$500. K Dick, WVVA, Route 460 Bypass, Bluefield WV 24701. 304-325-5487

Sennheiser replacement corals, pads & elements for HD-414/424 headphones, new replacement MZW-421 windscreens; Luxo & Tensimount mike spring arm, black & tensimount for 421/U; Atlas desk stands; RE-20 shock mount & lowpass in-line filters, Atlas floor stands. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413

Excalibur, Switchcraft 6, 10 & 20 dB H pads; many new Switchcraft A3M, A3F XLR connectors; new Sony ECM-30 mic in case, lavaler electret condenser mike. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Want to Buy

Old radio & TV gear, pre 1950's TV & pre 1940's radio. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265

RCA disc recorders, 72DX, 72D, 73B, etc. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Old On-Air sign, vintage if possible. J Evans, Evans Assoc, 2301 Totem Tr, Minnetonka MN 55343. 612-544-1104

NAB 7th edition Engineering Handbook for Radio & Television. K Meades, POB 71098, LA CA 90071. 213-666-9570.

Capacitor for RCA BTF5D, 2 µF at 6 kV, paper, ± 10%. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Tibbs & Johnstone freq mod R Meyers, Benchmark Comm, 4704 SW 75th Ave, Miami FL 33155. 305-376-1717/305-264-5963.

MONITORS

Want to Sell

Belar AMM-2A AM mod mon, gd cond, 1340 kHz, w/manuals, 2 yrs old, BO. G Stonebraker, KMYO, POB 1330, Aztec NM 87410. 505-632-3402.

McMartin TBM400 FM mod mon, great cond w/main chnl & SCA functions, \$150/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Nems Clarke 108E three tower antenna monitor, GR AM mod mon, spares. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387

McMartin TBM400 FM mod monitor, tube type, tuned to 89.3 MHz, \$100. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Want to Buy

Belar FMM Series, mod mon set, w/manuals. G Stonebraker, KMYO, POB 1330, Aztec NM 87410. 505-532-3402.

FM mod monitor, Belar pref S Roach, KARY. 509-882-3500

Cash for AM mod mon w/0-100% positive peaks, prefer GR 1931-A, but will consider any workable monitor. D Lee, 202 Baker Dr, Florence AL 35630.

MOVIE PROD. EQUIP.

Want to Sell

Arriflex ARRI-S, 5 prime lenses, 12-120 zoom, 2 mag, battery, case & access, 16mm camera, \$2500. C Crawford, POB 722, Princeton Jct NJ 08550. 609-799-3377 (PM).

Want to Buy

Century 3.5mm lens, wide angle, Arrimount or C-mount. C Crawford, POB 722, Princeton Jct NJ 08550. 609-799-3377 (PM).

RECEIVERS & TRANSCEIVERS

Want to Sell

Military R-901 0.5-30 MHz shortwave receiver, \$150/BO. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265

Johnson/McMartin SCA receivers (2), \$20 ea. N Bealy, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

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Hallicrafters SX-115, mint stored in original carton 25 yrs, also matching xmit HT-32A stored with it. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Motorola HT-200 VHF handheld transceivers (2) w/charger, \$200/lot. N Bealy, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255

GE mobile phone, ET-74E, ER-48C, head EC 79A13, 7 chnl, like new, \$750; GE MVP series, 1 base, 2 mobiles, 1 hand held portable, 466.225 TX, 461.225 RX, gd cond. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

Want to Buy

Motorola Motac CB transceivers, 2000 or 4000 series in gd working cond. K Linden, Multiphase, 3605 Michael Court, Annandale VA 22003. 703-698-9449.

REMOTE & MICROWAVE EQUIP.

Want to Sell

S-A 7300, for major networks w/book & crystals, excel cond, \$7600. T Crockett, Hot Tracks Recdg, POB 10501, Blacksburg VA 24060. 703-953-0222.

Fairchild 360 sat receiver for Transtar adult contemp format, complete system in excel operating cond, \$2500. R Reich, WIBZ, POB 686, Sumter SC 29151. 803-773-1859.

Elgin 20721, has 20 listen line couplers, new cond, in boxes, \$100 ea. C Ortome, KMPC, 5858 Sunset Blvd, Hollywood CA 90028. 213-460-5651

Microdyne 1100 SCPC satellite receiver/demod (2), \$3000 ea/BO. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737

Gentner SPH 3 telephone interface (3), \$325. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737

Moseley PCL 303C 951.5 MHz composite STL system, great cond, \$1750/BO. I Epstein, KJAZ, 1131 Harbor Bay Pkwy, Alameda CA 94501. 415-769-4800.

Wegener satellite receiver for SMN Stardust format, convertible to nearly all SMN formats, 1 yr old, vgc, avail approx 9-1-88. PR subaudible metering cards for Moseley TRC-15. H Kneiler Jr, WKIL, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

Motorola, one base unit & two mobiles on 154.515 MHz, 100 W output, works great, base is partially transistorized, tubes for finals only, mobiles are solid state, \$500/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892

M/A-Com MA-4001 satellite receiver, 3.7-4.2 GHz input, freq agile, outputs, baseband, video & audio, \$500. S Strettenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000

Marti MR30/150 RPU receiver, 161.73 MHz, \$100. M Ripley, KOZE, POB 936, Lewiston ID 82501. 208-743-2502

Comtech/Fairchild RCV-360 Transtar A/C config, new cond, w/down converter, sell or trade for flanger or ? BO. D Mussell, WIFX, Hwy 23, Jenks KY 41537. 606-832-4655

Microwave Assoc MA6G & MA6GW, 8 xmtrs & 12 rcvrs, w/dishes, power supplies, common carrier 6 GHz, working system, gd cond, 8 yrs old, \$55,000 complete. L Rafford, County Microwave, 5 Burnell Dr, Ayrmouth ME 04096. 207-846-3462

Moseley MRC 1600 STL subcarrier control, 92 kHz SCA telemetry return, \$2500. B Harm KIYS, 821 Vista, Boise ID 83702. 208-343-5991

S-A 15 kHz dual audio card, will trade for 7.5 kHz audio card. D Grant, WLAV, 50 Louis NW, 3rd Fl Trade Ctr #333, Grand Rapids MI 49503. 616-456-5461.

Fairchild DART 384 digital satellite receiver w/dual 15 kHz audio card & down converter, \$4500, Comtech 3.8 m dish antenna w/AZ/EL mount, feedhorn & 90° LNA, \$1950 plus \$125 crating fee. G Jones, POB 231, Uvalde TX 78802. 512-278-1102

Gabriel 2-8' dual polarized, high perf dishes on freq 6425-7125 & Cablewave 8' dish orig 13 GHz, feed horn damaged. L Mintzmyer, KOOD Bunker Hill KS 67626. 913-483-6990

Gentner Microtel 1, almost new, telco line mixer, \$150. H Sheldon, Sheldon Ent, 6577 E Camino Cista #4, Anaheim Hills CA 92807. 714-974-6841

Mobile telephones & 2-way radios great for news, Johnson Fleetcom 528 & Fleetcom II T Harrison, KXTD, 301 N Walnut, Broken Arrow OK 74012. 918-258-1000

Moseley TRC15 w/subaud metering relay int for 110 V xmit control. D Fearn, WKSZ, 1001 Baltimore Pike, Media PA 19063. 215-565-8900

Marti 450 tube type receiver, \$150. G Kenney, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440

Symetrix 108 telco hybrid interface system w/2 controller consoles, used only 5 months \$1200. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250

ABC Network 32 pulse receiver, \$250. R Ness, WCSJ, POB 270, Morris IL 60450. 815-942-0022

Moseley ICU-1 isocoupler, for the 940 to 960 MHz STL band, gd cond, \$125. N Bealy, 3438 Galeston Ave, Indianapolis IN 46236. 317-897-6255

Moseley SCG-8, TAU-2, SCS-2, etc. BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413

TFT 7610, 7615, 7630 remote control 30 chnl, \$3000. T Toenges, Rte 1 Box 149, St Marys KS 66536. 913-437-6549

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Comrex TLX, rack mounted freq extender encoder. J Vukelich, Bdct Services, 4551 N Flag Ave, Mpls MN. 612-537-1431.

Microdyne PCDRS SCPC demod. M Wilson, WGRK, POB 246, Greensburg KY 47243. 502-932-7402.

Wegener set up for SMN, any format. D Stebbins, KZZN, Box 192, Littlefield TX 79339. 806-385-4474.

STATIONS

Want to Sell

LPTV, Santa Barbara, help build for share or buy for \$50,000. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

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FM CP, Illinois, small market. P Martin, PMA Mktg, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

Want to Buy

Looking for AM, FM or CP in east for right price/terms. H Kozlowski, 703-631-0197.

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Moseley SCG9, works great, \$1000/BO. A McCarthy, KUIC 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

Harris 994-6533-001, new, excel cond. \$150/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

CRL stereo gen (4) separate units work together, excel cond. \$3500. A Munro, WKTZ, Jacksonville FL 32211. 904-743-2400.

Stereo gen for Gates TE-3 exciter, also 15 W RCA exciter & Gates M-6095 exciter. J Cramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

Harris TE-3 gd cond, stereo gen portion only. \$100. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548

CRL 300A 67 kHz subcarrier gen, audio or data mod w/built in limiting, excel sound. \$1200. R Malone, WCRN, POB 6336, East Rochester NH 03867. 603-335-2005.

Harris MS 15R, will trade even for Optimod 8000 or \$1500 cash. B Umberger, WNL, 51 South Main, Clearwater FL 34625. 813-446-0957.

Orban 8000A, & Moseley SCG-9. B Royster, KQM Broadtg, 1019 Cordova Street, San Diego CA 92107. 619-223-3413.

Harris MSP95 limiter/stereo gen, excel condition, rack mount with manual, BO or trade for ARS1000/PR99 decks; CCA SG-10, fair cond, needs some work. BO or trade for studio equip. F Morton, KMGZ, POB 7953, Lawton OK 73504. 405-536-9530.

SWITCHERS (VIDEO)

Want to Sell

Panasonic WJ5000T w/sync gen, \$350. R Larson, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-848-3172.

ISI 904 switcher, gd cond, 2M/Es, 10 inputs, chroma key, wipes, fades. \$3995. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Archer 15-1274, w/diagonal or horizontal wipes, auto or manual, perfect cond, \$50. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Javelin HSS-40VP 4 pos video switcher w/phase indicator, \$25. L James, Best Elec, 611 N Greer Blvd, Diasburgh TX 75686. 214-856-2892.

Want to Buy

Dynair VSX, 12x12A or similar routing switcher. D Sis, St Johns Univ, Collegeville MN 56321. 612-363-3378

Video switcher. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

TAPES, CARTS & REELS

Want to Sell

AA3 Audiopaks (15), (94) Aristocarts, cleaned, w/o tape or pads. \$75. B Boyer, WMOP, POB 1136, Ocala FL 32678. 904-732-2010.

NAB reels, 105" metal 1/4", all in gd cond, 1-10, \$1.50 ea. 11-100, \$1.25 ea, 100+, \$1 ea. Falk Recd Svcs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

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Eng student desiring donation of old bdcrt equip (anything) in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Stereo gen, stereo mon, stereo console. R Shearer, KNBU, Baker Univer, Baldwin City KS 66006. 913-594-6451

FM RPU for new school, prefer Marti working or repairable cond, will pay all shipping. R Dezzulolo, WGAO, 99 Main, Franklin MA 02038. 617-528-4210.

Stereo gen, proc equipment, R-R recorders, FM exciter at 91.5 for tax deduct donation, working cond or not. D Chapman, WJCC, Jamestown Comm College, 525 Falconer St, Jamestown NY 14701. 716-483-0302.

Educ non-profit FM seeks donation of useable R-R PB, 5-8 chnl audio console & automation equip. M Gaunt, WHCB, POB 2061, Bristol TN 37621. 615-878-6279.

Educ FM looking for equip donations, prefer operational equip but anything repairable will be accepted, xmtr, console, cart carousel, etc. Mr. Harvey, Bccl Learning Ctr, POB 1610, Delray NJ 08075. 215-279-9000.

AM xmtr, 250 W for missionary station in South America. J Cunningham, YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

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Tek 146 video test signal gen, excel cond, \$1200. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

TS-27 line fault test set, \$25. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Tek 454 portable, \$600; Tek R454. \$700; HP 183C scope w/1830 A & 1840 A, \$250. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Potomac SD/RX-31 synthesizer/detector, excel cond, \$1500; Delta OIB-1 operating bridge, excel cond, \$1500. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

GR 916-A RF bridge, \$350; Potomac FIM-41 field intensity meter, \$1500; Delta OIB-3 impedance bridge, \$1500. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 after 5 PM.

Klark Teknik DN60 spectrum analyzer, 31 band w/peak & average hold, 3 memories, cal mc, \$1300. J Jarjoura, WCIB, POB C, Falmouth MA 02541. 617-548-3102.

H-P 400-D AC voltmeter, \$30; GR 1422ME variable standard capacitor, \$300; GR 1650-A RCL bridge, \$200; B&W 410 noise & dist meter, \$50. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 aft 5 PM.

CBS Audimax (2) 440A, \$350 ea. T McGinley, WPGC, POB 10239, Wash DC 20018. 301-441-3500.

Tek 527 tube type waveform monitors, \$150 as is. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

TRANSMITTERS

Want to Sell

LPB AM100 100 W pre & post xmtr, almost new, type approved, \$2000. B Mountjoy, WIDD, POB 1240, Elizabethton TN 37644. 615-543-5849.

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214-226-8967

Continental 316-S 10 kW, excel cond, avail soon. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Power Pak 40 W field selectable broadband stereo exciter, \$2000. J Phillips, All Star Bldg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Harris FM1H 1 kW FM, 230 V single phase, spare fan blower, (2) spare 4CX1000A tubes; Gates FMA-4 300G FM antenna, 96.7, 4 bays hor, 2 bays vert, in use, \$3400. KFXV, POB 1430, Morgan City LA 70381. 504-384-1430.

RCA BX250 GAM, gd cond, BO/trade. T Thomas, WDNV, 129 Main, Dansville NY 14437. 716-335-2273.

Harris BC500GY, 500 W, 220 V single phase w/some spare tubes, now in use, \$2750. KMRC, POB 1430, Morgan City LA 70381. 504-384-1430.

Collins 310Z-2 FM exciter, 20 W, 88-108 MHz freq range, power source 117/234 IPH 50/60 Hz, \$2000. KFXV, POB 1430, Morgan City LA 70381. 504-384-1430.

Collins 830D, 1.2 kW FM, 1970 vintage, well maintained, 310Z-2 exciter 94.3 MHz, recent tubes & filament xmtr, avail Fall '88, BO. GC Kincer, WIFX, Box 312, Jenkins KY 41537. 606-832-4655.

Collins 820D, 1 kW, 250 W AM, perf cond, recent plate xmtr, Canadian mod modif 1 kHz, avail Fall '88, BO. GC Kincer, WIFX, Box 312, Jenkins KY 41537. 606-832-4655.

FM 1 kW 20 yrs old & 2.5 kW 4 yrs old, just removes from service. J Cramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

TTC MA-TVF-10, 10 W VHF Chan 11 xmtr w/RCA CTM-10 modulator. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

QEI 775 ATS system, automatic xmtr control w/alarm point control, excel cond, 4 yrs old, FCC approved for walk-away, BO, RCA BTF-5B 5 kW FM, solid state exciter, new final & driver, spares, needs some repair. BO. P Stover, WJYJ. 703-582-5371.

Gates HFL3000, 3 kW linear amp, 2-30 MHz, front panel tunable, excel cond, J Pagano, Pagano Ent, 1234 Southampton Rd, Philadelphia PA 19116. 215-464-3157.



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Collins 250 W AM, gd oper cond, \$1200. RCA BTE-15 exciter, low hrs, like new, \$850. J Krautz, KJKL TV, 183 Jane Dr, Syracuse NY 13219.

Harris FM 25K driver modules plus many other parts, \$300 ea. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181

RCA BTA-5SS solid state 5 kW AM, some damaged output transistors, BO. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

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ACTION-GRAM

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Help Wanted: Any company or station can run "Help Wanted" ads at the flat rate of \$18 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.

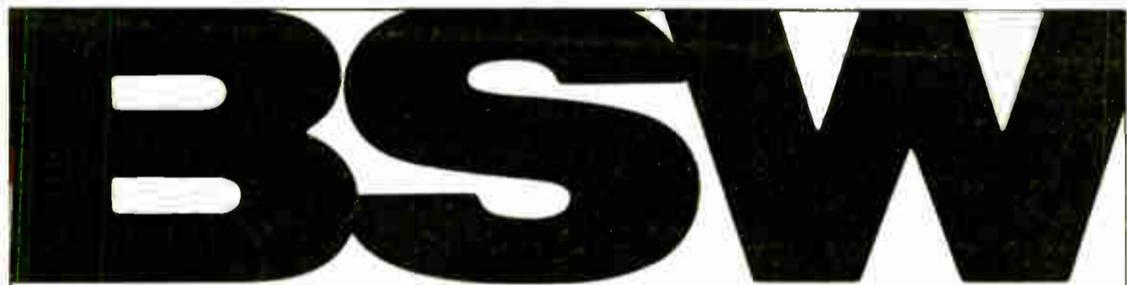
Positions Wanted: Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (**there will be no invoicing**). Responses will be forwarded to the listee, unopened.

Check as appropriate:
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 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____
Company/Station _____
Address _____
City _____ State _____ Zip _____
Telephone _____

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Broadcast Equipment Exchange

TRANSMITTERS . . . WTS

Motorola C-QUAM AM stereo system, inc (2) stereo gen & mod mon, perfect cond, \$6000. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

TTC/Wilkinson FM25000E 25 kW FM xmtr on 100.5 MHz, 4 yrs old, removed 4/88 in gd cond, has FME10 exciter. J Sands, KMZQ, 2880 E Flamingo #F, Las Vegas NV 89121. 702-731-5100.

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Gates 250GY in service, excel cond. B Pirle, KTER, Box 190, Terrell TX 75160. 214-563-2646.

Versa Count V322 10 W FM exciter, w/stereo gen, \$900. J Anuzzi, Randolph Skill Ctr, 551 Foxborough Ave, Phila PA 19128. 215-483-9402.

GE XT1A, 1 kW AM, 1300 kHz, great for back-up or spares, complete w/manuals, BO. P Hunn, WZZZ, 705 W 4th, Westpoint GA 31833. 315-593-1313.

Radio station equip: GE 4BT1A 250 W FM xmtr & exciter; GE 3000 W FM amp & pwr supply; Moseley SCG3T stereo gen; SEA5700 stereo mixer; (2) Channel Master 6652 TTs; Akai 200D & Teac AR60 R-R's; dual ring antennas & filters; Teac cass deck, all for \$14,000 or will part out. D Bryant, POB 821, Elgin OR 97827. 503-437-0990/0301.

Gates FM-1C, 1 kW in gd cond; Gates FMSB 5 kW FM, working cond. W Carnes, KIRT, POB 8234, Jacksonville TX 75766. 214-586-2162.

RCA TTU-12 12 kW UHF TV, filterplexer, cooling system, transmission line, \$12,500; Dage 15 input station switcher, \$2000. C Geifendorfer, WTJR, Box 7112, Quincy IL 62303. 217-228-1275.

Gates BC5 plate transformer, gd cond, trade or BO. C Freinwald, KBSG, POB 5200, Tacoma WA 98405. 206-383-9700.

GE 4BT1B1, 1 kW FM, unknown cond, w/manual, \$600. J Morton, KIUP, PO Drawer P, Durango CO 81302. 303-247-4464.

Halicrafters HT-32A, mint cond, stored in original carton 25 yrs, w/matching rcvr SX-115, also in original carton. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Gates 1 kW FM1H (M6573) 230 V single phase, spare fan blower, 2 spare 4CX1000A tubes; Gates FMA-4, 300G FM antenna, 96.7, 4 bays hor, 2 bays vert, now in use, bdcig 24 hrs/day, covers about 60 mi radius, \$3400. Tri-City Bdcig, POB 1430, Morgan City LA 70381. 504-384-1430.

Gates 500 W, BC500GY xmtr, 220 V single phase w/some spare tubes, now in operation, \$2750. Tri-City Bdcig, POB 1430, Morgan City LA 70381. 504-384-1430.

Gates BC250L AM on 740 kHz, for parts, most assemblies intact and usable, BO. A Redd, WLVG, 1972 Moss Ave, Cambridge MA 02410. 617-576-2895.

Gates FM250G, gd cond, full set manuals, 91.9 MHz, w/spares, 20 yrs old, \$3500. H Gibbs, College of Wooster, Wooster OH 44691. 216-263-2000 X2767.

Teletronics 3.0 kW, needs work, gd for spare parts or aux xmtr, w/manuals, BO. T McCollugh, KFOX, 213-374-9796.

RCA TTU-12 UHF TV xmtr, 12 kW, no exciter (2), one for parts w/heat exchange & 2 diplexers, as is, \$5000. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Want to Buy

Plate xfrmer, single phase 220 V w/sec at 4K, AC at 3 A. J Pagano, Pagano Enter, 1234 Southampton Rd, Phila. PA 19116. 215-464-3157.

Will buy any new or used xmtr, top dollar. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

LPTV 1 kW, any make. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

Parts for RCA BTA-1M. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Harris BC5H binary divider for low AM freq, used in RF exciter of BC5H/BC10H AM. D Williams, KLLV, 14780 Kwy 140, Breen CO 81326. 303-259-5558.

Misc parts for RCA BTA-1M xmtr. J Cunningham, WSDA, Rt 2 Box 113-B, Stonewall OK 74871. 405-265-4496.

Harris or Continental, 20 kW or better FM xmtr. D Agnew, Sante Fe Bdcig, 825 Calle Mejia #1234, Santa Fe NM 87501. 505-983-1638.

FM xmtrs, (2) 1-3 kW, about 91.9 & 107.3 MHz solid state pref. B Seier, KZKX, 4435 O St, Lincoln NE 68510. 402-488-9601.

Low power carrier xmtrs, 10-25 W, any cond. K Sleeman, WOL, 400 H St NE, Wash DC 20002. 202-675-4800.

TV xmtr, low band VHF tuneable to Ch 3 & high band VHF tuneable to Chs 10 or 12. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

RCA BTA1-5 1 kW AM, for standby. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

CCA FM 10 DST, T Stevens, WHSN. 207-947-3987.

Continental 816R-2 20 kW FM. L Blakeney, WBBN, Rt 2 Box 273B, Taylorsville MS 39168. 601-729-8100.

GE 100 W UHF TV driver, either TT-24A or TT-55A/B; also need spare parts & tubes. J Powley, WIM TV, 1536 Logan Ave, Altoona PA 16602. 814-944-8571 aft 1 PM.

RCA TTU-2A UHF TV xmtr/parts, new/used needed for damaged xmtr; RCA TTU-1B UHF TV xmtr or parts. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

TUBES

Want to Sell

807 Tubes, new, \$5.95 ea. N Carlson, Mobile Snd Group, POB 148794, Chicago IL 60614. 312-871-7459.

Want to Buy

RCA 6181 & RCA 8501 tubes. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Aluminum sockets for 833A tubes for Gates BC-1G or equiv. E Riedelbach, KIGO, Box 609, St Anthony ID 83445. 208-624-4451.

TURNTABLES

Want to Sell

Denon DP600 direct drive, w/base, dust-cover, Fidelity Research tone arms *No64S, excel cond, \$400. F Sinjuscki, Saraphin Comm, 1568 Eutis, St Paul MN 55108. 612-645-9173.

Sparta GT-12 (2) w/1 for parts, 2 arms included, \$220/package. A McCarthy, KUIJ, 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

QRK 12-C (2) in new cond w/Micro-Trak arms & QRK stereo Alpha preamps, \$250 ea. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

Gates CB-500 16" TTs (2) w/tonearms & preamp, \$60 ea; (3) QRK 12" TTs, \$50 ea. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

Sparta TEP-3 (2) stereo TT preamps, very clean. H Kneller Jr, WKII, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

Gates 16" (2) transcription TTs w/Micro-Trak tonearm, \$225 for both. C Lawson, L&N Eng, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Rek-O-Kut 16" tone arm w/Shure cartridge, no stylus, fair cond, \$15. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Technics SL1200 MKII, excel cond, low hrs, comes w/ATI P100 preamp, BO. P Stover, WJYJ, 703-582-5371.

Russco Studio Pro, new, \$300. B Marshall, WT Studios, 2025 S 900 East, Salt Lake City UT 84105. 801-486-4877.

Technics SL1400 MKII, digital speed control, base dust cover, arm & cartridge, \$209. D Solinske, WSYR, 2 Clinton Sq, Syracuse NY 13202. 315-472-9797.

Gates TTs w/tone arms, need some work. T Driggers, Driggers Bdcig, 818 Quail Court, Healdsburg CA 95448. 707-433-9370.

RCA BA-36A stereo TT preamps (2), vgc, \$45 ea or \$70/both; Shure M64 stereo TT preamp, vgc, \$35. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Shure M64 phono preamp, BO. P Sibley, 138 E 78th, NY NY 10016. 212-986-2219.

Russco RT-700 (2), direct drive, \$200 ea. M Ripley, KOZE, POB 936, Lewiston ID 82501. 208-743-2502.

Want to Buy

RCA 16" transcription TTs, lateral/vertical filters, universal arms. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

VIDEO PROD. EQUIP.

Want to Sell

Sony BVH 500 portable 1" type C, excel cond, \$10,000; Sony TC1000, excel, \$2500; Shintron TC 690ET, excel, \$2500. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

Showtime Showmaster SEG, audio & video switcher, wipes, cuts, dissolves, colorizes images, generates patterns, keys, etc, 4 RF inputs, \$700. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

3M 6220 image enhancer decoder, excel cond, \$350. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Vital 11410X w/audio follow & RGB chroma keyer, \$6000/BO; Duhel Optics w/16mm, 8mm & super 8mm, \$4000; BTX audio interlock system w/8 trk & (2) 2 trk audio machines, \$6500. T Judge, TAG Comm, 75 Weaver Rd, W Milford NJ 07480. 201-697-8454.

Convergence ECS103 editor & TCR100 time code interface & SW110 switcher interface, gd cond, w/5000 series cards, \$1995. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Old Ecco time code generator, works fine, \$400; Companion character inserter positioner & different size characters, \$400, both fit side by side in 19" rack kit, both w/rack kit, \$750. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

Chyron VPZ Plus character gen w/7 fonts, excel cond, approx 2 yrs old, \$4695. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Telemation TSE-200 SEG, \$500; Panasonic BT51300N 13" color video mon, \$225; Panasonic CT-110M 10" color video mon, \$150; American Data 553A vertical interval color productivity switcher, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Panasonic NV9600 U-matic, \$1600; NV9200A U-matic, \$700. A Chaney, Video Eng, 1415 Oak Knob Way, Sacramento CA 95833. 916-922-3456.

GVG 711C video proc amp, \$500; RCA TTS-1A delay EQ system, \$750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Sony CVM 1270 color mon/receiver, 12", vgc, \$350; JVC TM-22 U AC/DC port, monitor w/Kangaroo case, new, \$325. JVC AAP-26U supply/charger, \$125. B Dombrowski, Whirlwind Prod, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

Pelco MS512DT switcher, 12 in 1 out, \$125; Telemation TSG-2000 bdcig sync gen, \$950; Panasonic TR930U dual 9" B&W monitors, \$195. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Want to Buy

GVG proc amp, W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

RCA TCR-100A cartridge recorder, 2" (2); also need standards conversion box & RCA TK-47. H Henson, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

VIDEO TAPE RECORDERS

Want to Sell

Sony BVU 100 3/4" portable recorder, works fine, \$400. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

IVC 1" VTRs (4), one remote control & 2 service manuals, approx 30 tapes, \$500/pkg. J Richardson, Mercy Health Ctr, Mercy Dr, Dubuque IA 52001. 319-589-8708.

Sony VP1000, VP1200, VO1800, 3/4" players & recorder & approx 80 tapes, \$600/pkg. J Richardson, Mercy Health Ctr, Mercy Dr, Dubuque IA 52001. 319-589-8708.

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JVC CR-850U, CR6650-RM 86 3/4" U-matic editing system, excel cond, 250 hrs, BO. R Hiatt, WHSV, Rt 33 West, Harrisonburg VA 22801. 703-433-9191.

IVC 1" VTR, \$500; NEC 3/4" video cassette player, gd cond, \$500; JVC 5200U 3/4" video cassette player, like new, \$650. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Sony BVV1A w/component adapter & case, \$4000/BO. M Glaser, MRG Prod, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Want to Buy

Sony BVU-100 cabinet parts in gd cond, also need CLP-500 color adapter & AC-5000 adapter & carrying case for BVU-100, strap & gd BP-20 batteries. C Lund, Cycle Snd & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

Sony Betacam R/P portable for use by non-profit organ. M Glaser, MRG Prod, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Sony 3/4" VTR W-13-BH TV 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

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- 1970 CCA AM 10,000D, 10 kW AM
- 1966 Gates BC-50C, 50 kW AM
- 1976 CCA AM 50,000D, 50 kW AM

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ACTION-GRAM

Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

WTS: WTB: Category: _____

Make: _____ Model #: _____

Brief Description: _____

Price: _____

Contact Name: _____

Company Name: _____

Address: _____

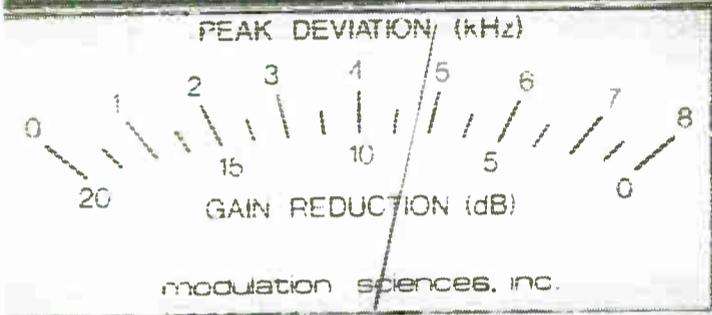
City, State, Zip: _____

Phone Number: _____

**Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an \$18/25 word basis. Call 1-800-336-3045 for details and complete display rates.

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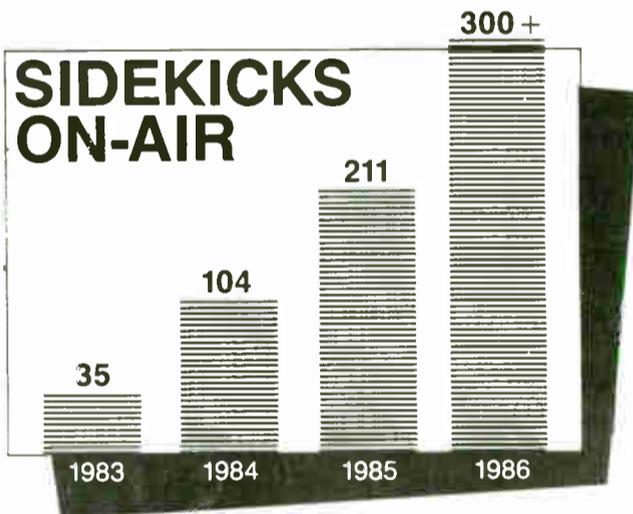
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THE RADIO CONSOLE ENGINEERING AND MANAGEMENT CAN AGREE ON

Finally engineers confined to tight budgets can choose a console that won't compromise station reliability or signal integrity. After all, the A-20 is a Wheatstone console. It borrows from the componentry and design of our larger A-500 consoles, currently installed in major markets all over the country, from frontline independents to national networks.

The A-20 features modular construction, a fully regulated rackmount power supply, logic follow, full machine control and, of course, an all gold contact interface system. This console has two mic channels and eight stereo line channels, each with A/B source select and program/audition bus assign (plus cue switches on the line modules). Standard features include program and audition VU meters, digital timer, and a monitor module for control room and headphone functions. Optional accessories include a studio control module, multiple line selector switch-banks and machine control panels, plus a full family of studio turret components.

The A-20 is a perfect choice for stations planning an upgrade in signal quality and control room image. It is also a natural choice for the newsroom. So profit from Wheatstone's experience and reputation—call us today for immediate action!

 Wheatstone® Corporation

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