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November 1, 1987

Volume 11, Number 21

Changes Due for NAB S&T

by David Hughes

Washington DC ... The NAB is expected to begin looking for a new VP to head its Science and Technology (S&T) Department as part of several changes announced for that department.

At a press conference 6 October, NAB President Eddie Fritts indicated that since S&T VP Tom Keller has made the decision to head the new Broadcast Technology Center (BTC), which will be partially funded by the NAB, the association will have to find someone else to head its technical department.

"Tom will be moving on," said Fritts, who announced the creation of the BTC in late September.

The NAB president added that two engineers from the S&T department will also be going with Keller to the BTC, which will initially research terrestrial high definition television (HDTV) and extended resolution TV systems.

While no mention was made of who those engineers were, both Ben Crutchfield and Ed Williams have been working on HDTV related projects as of late.



NAB Joint Board Chairman Wallace Jorgenson, President Eddie Fritts and former Joint Board Chairman Ted Snider discuss the past five years and the future for NAB including changes in the Science & Technology Department.

"The current S&T staff (that is leaving) will be replaced," Fritts said, stressing that the department's budget will remain intact even with the new center's work. "We have no plans to reduce S&T's budget."

Even though Keller and others will be leaving the NAB's technology department, they won't be far away. Keller has said that plans call for the new laboratory and research facility to be within walking distance of the NAB's downtown Washington DC headquarters, with eventual plans to move it under the

same roof.

The NAB's for-profit subsidiary, NAB Technologies Inc. is one of the investors in the new HDTV center.

NAB Technologies is also funding the development of the FMX FM stereo extension system, co-developed by Keller, via an organization called Broadcast Technology Partners.

No timetable has been announced as to when the new research center will be established, or when Keller will be replaced.

In response to Fritts' remarks, Keller told RW that he did not want to comment publicly on the changes. "Basically, how the organization will be restructured has not been determined yet," he said. "There will be a change of some sort."

Sources indicate that while Keller will be in charge of the BTC, he does not want to sever all his ties to the S&T department.

As of mid-October, Keller said that NAB officials were in the process of looking for office space for the new lab.

On a related note, the S&T department has also been looking to add an additional engineer to its staff.

While the news about the reorganized S&T department surfaced during the 6 October press conference, the main items discussed were the accomplishments of the NAB during Fritts' five years as president.

Flanked by former Joint Board Chairman Ted Snider, and current Joint Board Chairman Wallace Jorgenson, Fritts reported that the NAB's membership level was "at an all time high," and its "financial house was in order."

Since 1982, the NAB's radio membership has increased 13%, from 4,400 to 5,000.

Snider said that among the highlights of the past five years were the NAB's international relations with the broadcasters and governments of Canada and Mexico, including last year's agreement to expand AM daytimer operations.

Jorgenson pointed out that the NAB was well on the way to reaching its goals on many technical issues such as the development of FMX for FM, and with AM the acceptance of the NRSC standard.

Fritts also said that the search is still on for a replacement for the NAB's chief lobbyist John Summers, who has announced he will leave the organization. He also stressed the NAB's goal to emphasize lobbying activities from its individual member stations.

On other issues, Fritts maintained that the NAB is also exploring the possibility of getting Congress to examine comparative renewals for radio only, as the issue has been abandoned for TV.

He added that the organization is also working to get the Canadian government to remove a law that takes tax deductions away from Canadian advertisers that place their ads on US stations.

At press time, Fritts, Keller, and several other NAB officials were planning to visit Japan in late October to discuss HDTV with government and industry officials. Fritts did not rule out that talks on radio issues, such as AM stereo, might also be held.

For more information on the NAB's activities contact Bob Hallahan at 202-429-5479. Tom Keller can be reached at 202-429-5346.

FCC Postpones Stereo Action

by Alex Zavistovich

Washington DC ... The FCC, which had been expected to issue a statement in October regarding AM stereo, has opted to defer such action until later in the fall or possibly early winter.

Sources at the FCC maintain that Commission Chairman Dennis Patrick felt he was insufficiently prepared to make any statement about AM stereo during the 20 October FCC meeting. The issue will instead be addressed in November or December, sources estimated.

Patrick was unavailable for comment. In mid-September, Bill Hassinger, the engineering assistant to the chief of the Mass Media Bureau, told RW that the Commission would issue a single, all-inclusive statement at the Commissioner's October meeting.

The FCC was also expected to have specifically ruled on two pending petitions. One, filed by Texar in September 1986, had requested that the Commission select a single AM stereo standard; the second, filed by Press Broadcasting in November 1986, asked the FCC to require multisystem circuits for AM stereo receivers.

Instead of AM stereo, the Commission's October meeting will focus on a number of common carrier concerns. The FCC may also make a statement about the use of the K and W distinction in the allocation of call signs.

Earlier this year, the Commission had

proposed eliminating the use of the K prefix for stations west of the Mississippi River, allowing stations to use either K or W in their call signs, regardless of their location in the US. The proposal

has not been well-received in the industry.

For additional information, contact the FCC news media information office at 202-632-5050.

November 1, 1987

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Circle Reader Service 31 on Page 22

NABET Strike Settlement Near?

by Alex Zavistovich

Washington DC ... An end to the strike against NBC by the National Association of Broadcast Employees and Technicians (NABET) may be in sight, as the union voted on a tentative contract settlement reached in the strike's 16th week.

Two NABET units—couriers in Chicago and plant maintenance workers in Los Angeles—voted against the offer on 19 October. However, engineering

“*Two NABET units voted against the offer.*”

representatives adopted the proposal, despite negative votes from Cleveland, Burbank, and Los Angeles.

In total, 1,507 NABET members voted for the proposal; 738 opted to reject the offer. Engineers supported the new pact by a vote of 1,222 to 65.

Under union bylaws, however, all units affected by the strike—a total of 14—must approve the contract before it becomes effective. According to the union, talks with the two reluctant units would begin by late October.

At press time, NABET International Representative John Krieger was hopeful that a final settlement would be reached by the end of October.

NABET agreed on 11 October to submit a contract proposal along with a settlement letter to the 14 union locals engaged in the strike. The union had been on strike against NBC since 29 June, when the network unilaterally implemented a final contract offer to replace its previous four-year master contract with NABET.

The contract proposal was negotiated during a round of talks between the two sides which began 7 October. Discus-

sions followed on the heels of a failed bargaining session in late September.

On 22 September, the Federal Mediation and Conciliation Service (FMCS), which presided over several sessions of talks, called an end to negotiations. News of the new bargaining round had reached the media only the day before.

The new agreement would run for 29 months, with pay raises of 3.68% for the first year and 4.64% for the second. Also, a "lump sum" representing 3% of the current base pay would be paid to members on 1 April 1990.

The contract also addressed temporary employees, specifying a hiring limit of 4% of any unit the first year and 6% the second. Pay increases of 30% the first year and 40% the second were reportedly agreed to for the temporary hires.

NBC VP/Labor Relations Day Krolik said he was "glad to see the strike so nearly over." He added he was hopeful that the two remaining dissatisfied units would not be an impediment to reaching a contract settlement.

Krolik maintained that he believed NABET and NBC were "beginning an era of greater understanding and cooperation," rather than "assuming the traditional roles of labor and management."

A flurry of abortive contract discussions took place throughout early fall between NABET and NBC. Before the brief 22 September session, another round of negotiations ended 1 September, when the two sides were deemed by FMCS to be too far apart on basic issues.

The return to the bargaining table later that month left many insiders hopeful that a resolution was in sight for the strike, the longest in NABET's association with the network. Instead, the negotiations were terminated with no progress made.

The strain of the prolonged work stoppage had apparently begun to take its toll on some union members. By some reports, numerous NABET members in Washington, New York and Chicago requested a vote be taken on the network's contract offer in the weeks before

the settlement.

Union negotiators, however, rejected the vote petitions. Krieger maintained that NBC's so-called "final" offer had not been "substantive enough to take back to the membership."

The union had also been concerned in its negotiations about amnesty for striking union members. According to the settlement letter accompanying the agreement, any charges against striking members would be resolved under the terms of the new contract.

The newest agreement hammered out between the union and NBC could be considered at least a moral victory for NABET members.

NBC's Krolik, leader of the NBC negotiating committee, had stressed during talks that NBC did not plan to make any but the most minor changes to its final offer.

For additional information, contact NABET at 301-657-8420. Contact NBC at 212-664-4444.

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FCC Clips

FCC public affairs office reorganized

In late September, the Commission approved the separation of the Office of Congressional and Public Affairs (OCPA) into two independent offices.

Created by the reorganization are the Office of Public Affairs (OPA) and the Office of Legislative Affairs (OLA). John Kamp, formerly the director of the OCPA, will assume the director's role for the new OPA.

Assuming the directorship of OLA will be Sherrie Marshall Cooksey, who became Associate Director for Legislative Affairs on 15 September, approximately one week prior to the announcement of OCPA's reorganization.

Cooksey, who received a law degree from the University of North Carolina in 1977, had been in legal practice with the firm of Wiley, Rein & Fielding in Washington, DC. Before that, Cooksey served as Executive Secretary for the US Department of Treasury.

According to the FCC, the OPA will comprise the staff of the Director's office, the News Media Division, and the Consumer Assistance and Small Business Division. The OLA's role will be to implement FCC "legislative activities and programs."

For additional information, contact the FCC news media office at 202-632-5050.

New lunch policies enacted

The Office of Government Ethics (OGE), part of the Office of Personnel Management (OPM), announced in early September its intention to prohibit executive branch employees from accepting lunches paid for by reporters. The FCC is among the first groups to be affected by the new OGE guidelines.

Also prohibited under the OGE rules will be attendance by such federal employees at privately sponsored receptions and similar events.

Previous rules prohibited FCC officials from attending industry functions only in the case of "lavish" events—that is, events in which more than \$35 was spent on each individual. This \$35 ceiling could be exceeded only if the FCC employee was a participant in the event, as a speaker or in some other capacity.

The rules reportedly spring from an interpretation of a 1965 executive order, in which the OPM forbade executive branch employees from accepting gifts from any group or person affected by the policies of the branch agencies.

For more information, contact the news media office of the FCC at 202-632-5050.

Broadcast station totals

As of 30 September, the FCC reported a total of 10,175 licensed radio stations. Of that figure, 4,893 stations were AM; FM stations accounted for 3,999 licensed broadcasters.

The remaining 1,283 stations were FM educational facilities, according to the FCC.

For additional information, contact the news media office at 202-632-5050.

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Dawson To Leave Commission

by Alex Zavistovich

Washington DC ... The search to fill the FCC slot created when Dennis Patrick assumed the Commission chairmanship has now become more pressing, as Commissioner Mimi Dawson has also decided to leave the agency.

On 8 October, President Reagan announced his intention to nominate Dawson to the position of Deputy Secretary of the Department of Transportation.

Dawson will replace James H. Burnley, who was announced to assume the role of secretary of the the Department of Transportation, a position formerly held by Elizabeth Dole. Dole reportedly resigned in order to assist in the Presidential campaign of her husband, Robert Dole, the Republican Senator from Kansas.

A Reagan nominee, Dawson was sworn in as FCC commissioner in July 1981. She had previously served as chief of staff to Senator Robert Packwood, a Republican from Oregon.

At press time, Dawson could not be reached for comment about her change of jobs.

The next step in Dawson's appointment to the deputy secretary position is Senate confirmation, according to John Kamp, director of the FCC's Office of Public Affairs. Kamp speculated that confirmation hearings, unscheduled at press time, would take place "within the next couple of months."

With the impending departure of Dawson from the Commission, the search for new FCC panel members has



Commissioner Mimi Dawson is leaving her FCC post.

become more urgent. A hunt was still underway at press time to fill an opening on the FCC board created by Dennis Patrick's assumption of the role of Chairman last spring.

Patrick took charge of the Commission after former Chairman Mark Fowler stepped down from the post in April 1986.

The front runner for the FCC position reportedly is Bradley Holmes, chief of the Mass Media Bureau Policy and Rules Division. The 33-year-old Holmes, who had formerly served as Patrick's aide, was reported by wire services in August to be Reagan's intended nominee to the Commission slot.

With one position still vacant and a second due to open shortly, many former aspirants to the post for which Holmes is now the favored candidate will probably be back in the running, according to Kamp.

Kamp acknowledged that Holmes is the "apparent White House designee" for the vacant Commission seat. How-

ever, he noted a number of other candidates are "still in contention" for nomination to the Commission.

Among names still circulating for the job is Susan Wing, a communications attorney with the Washington DC-based firm of Hogan & Hartson. Wing reportedly interviewed at the White House for the FCC position.

Wing, however, maintained she was no longer in the running for the Commission vacancy. She said she was contacted by the White House "some time ago" in a courtesy call, following reports of Holmes as Reagan's intended choice for the Commission.

Also presumably still in contention for a Commission assignment is Craig Smith, director of the Freedom of Expression Foundation, a private organization with close ties to Senator Robert Packwood. Smith is the Republican senator's choice for the position, according to Kamp.

However, Smith maintained that, this late in the year, the Commission slot is "not a prize worth having." He said the administration would have been better served if the FCC vacancy had been filled at Fowler's departure in April, or by this past June at the latest.

Now, Smith said, the selection process "comes too close to the 1988 election year and too close to the end of the cur-

rent term of Congress." He pointed out that no one has been officially nominated, and speculated that even if someone were named, Congress would probably not address the issue until next year.

Kamp acknowledged the possibility of postponement of the selection. Still, he noted, if a candidate is proposed, the White House could conceivably grant a "recess appointment" in the absence of Congress.

Such an appointment would extend through the end of the next legislative year, Kamp commented. With the void which will be created by Dawson's departure, however, Kamp suggested that the White House will probably take action on a full-time Commission appointment in the near future.

Meanwhile, there has been no word from the Commission on the likelihood of Holmes' selection to the current open FCC seat. Kamp said the White House, which is handling the appointment, has not indicated when a final decision will be made.

Kamp also noted there is no "official" requirement for a five-member Commission panel. The Commission has been "operating effectively" with only four members since Fowler's departure this past spring, he said.

A fifth member, Kamp commented, is desirable simply to ensure against a deadlock on the panel.

For additional information, contact John Kamp at 202-632-5050.

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Slow Going for Antenna Project

by Alex Zavistovich

Washington DC . . . At press time, the NAB-sponsored project for the development of anti-skywave AM antennas was proceeding slowly, with leases for the project's two test sites remaining unsigned.

Two antenna designs are involved in the project, which aims to improve groundwave propagation while minimizing skywave radiation.

One design, by Ogden Prestholdt, is a two-element array comprised of a vertical element intersected by a horizontal element.

The second antenna, designed by Richard Biby of Communications Engineering Services is a modified monopole with a ring of 10° buried radials located 5° from the monopole.

Slow progress

According to NAB Director of Spectrum Engineering Michael Rau, progress on both antennas has been slow. The project has become entangled in paperwork, which the NAB hopes will be resolved by November.

The NAB has been negotiating with Washington DC's Howard University to obtain a lease for property the college owns in the DC suburb of Beltsville, MD. The Beltsville location is the NAB's preferred test site for the Prestholdt project.

In early August, Rau said, Howard University asked the NAB to prepare an environmental statement. The statement addressed the effect of the antenna project on various agricultural experiments the university is conducting in the vicinity of the NAB's selected site.

Rau said he has contacted the university several times over the past months, but the college has not come to a decision which would allow the NAB to go ahead with the project.

A lease has not yet been signed for the property, Rau said. Before the document

can be signed, he said the NAB requires approval from Howard University and a site survey, which will be conducted by Kidde Consultants, a civil engineering firm based in Laurel, MD.

Possible modification

The Prestholdt antenna project, when it begins, may be modified somewhat to help prove a theory presented during a



The Prestholdt antenna project . . . may be modified.

broadcast symposium of the Institute of Electrical and Electronics Engineers (IEEE), held in Washington in September.

The presentation was written by Al Christman of Ohio University, Al Resnick of Cap Cities/ABC, Jim Breakall of Lawrence Livermore Labs and Richard Adler of the Naval Postgraduate School.

In it, the authors used Numerical Electromagnetic Code (NEC) modelling to compare the effectiveness of buried radials versus elevated radials in AM antenna design. The report concluded that as few as four elevated radials would provide superior performance over 120 buried radials.

Improved power gain at low angles was among the advantages suggested by the authors in putting forth their theory. Other conclusions maintained that elevated radials improve groundwave radiation while attenuating skywave radiation.

Following the presentation, Prestholdt called the idea of elevated radials "intriguing." He added he would propose to the NAB that his project be expanded to

accommodate field testing of the effectiveness of such radials.

Rau noted that at press time he and Prestholdt had not yet discussed the modification to the antenna project. However, Rau said he would have "no problems" with allowing the change.

Biby antenna project

In addition to the change it may have prompted in the Prestholdt antenna project, the presentation at this year's IEEE also seems to have raised some new questions about the Biby design, by suggesting that elevated radials, rather than buried, would be better suited to minimizing skywave interference.

Rau, however, said that the presentation would have no effect on the Biby antenna project, which will be built on a site in Loudoun County, VA.

"It has always been known that you don't have to bury radials to have them work. The main reason for burying (the radials) is to protect them," Rau stated.

For the Biby antenna project, the NAB recently opted to build a model of the antenna, rather than full-scale. That decision was made following two studies in which NEC modelling determined that the antenna may behave differently than its designer had calculated.

The first of the studies, conducted by Richard Adler, was presented at the 1986 IEEE broadcast symposium. Adler noted some "discrepancies" between the NEC model's performance and Biby's calculations.

Those discrepancies were noted again earlier this year in a thesis submitted by Sarfraz Hussain, a master's degree candidate from Pakistan studying at the US Naval Postgraduate School. According to Hussain, the NEC model of Biby's antenna showed "overall attenuation of the skywave and the groundwave."

Rau commented that, after the decision was reached to build a model of Biby's antenna, the NAB contacted Loudoun County officials to notify them of the change in plans.

Formal notification was filed with the county on 30 September, Rau said. At press time, however, a response had not been received at the NAB; Rau was hopeful that some response from the county would be ready some time in November.

A lease for the Loudoun County site has been drafted by the NAB's attorneys, Rau said, and a site survey team has been assembled.

For additional information, contact Michael Rau at the NAB: 202-429-5346.

Bell Rate Suit Settled

by David Hughes

Tulsa OK . . . A lawsuit filed by an Oklahoma-based audio production firm against Southwestern Bell, which instituted a 1985 rate hike for audio and video lines, has been settled. However, neither party would comment on the resolution that was reached.

Pat Freeman, president of Tulsa-based FirstTake Productions, would not comment to RW about the details of the agreement between his firm and South-

western Bell.

"I am reluctant to say anything," Freeman said, "but I can tell you it has been settled."

G. Michael Bauer, the Oklahoma City attorney representing Southwestern Bell, also indicated that "an agreement has been reached." He said the settlement, which was reached out of court, was "a fair conclusion."

"But beyond that, I cannot not talk about it," Bauer added.

The suit, filed earlier this year by FirstTake in the US District Court for the Northern District of Oklahoma, and set for trial in September, contended that the phone company failed to give adequate warning about the hike, which raised FirstTake rates by up to 1000%.

The FCC requires that phone companies provide notice 45 days before a rate hike is implemented.

Spurred by the break-up of AT&T, other phone companies across the country also raised their rates for audio and video lines. The NAB said that stations reported rate hikes of 300% to as much as 2000%.

FirstTake, which produces spots for sponsors and then relays them to radio and TV stations via telco lines, claimed in the suit that it lost \$82,720 in profits due to clients cancelling their service because of the higher phone line rates. The production firm was also asking for \$100,000 in punitive damages.

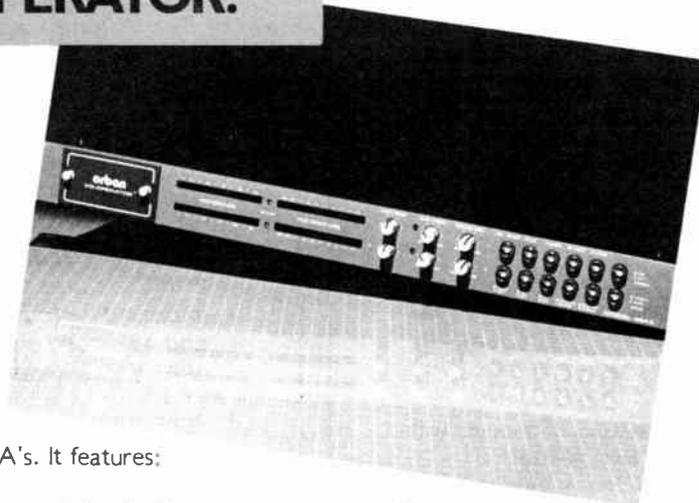
However, Bauer maintained that because of administrative delays at the FCC, which approved the rates, Southwestern Bell was not able to adequately warn its customers about the hike, which took effect 1 April 1985.

Southwestern Bell added that FirstTake filed its suit before exhausting its administrative remedies with the FCC.

Contact Pat Freeman at 918-495-1135, or G. Michael Bauer at 405-236-6754.

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OPINION

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

Noise-free AM

Dear RW:

I am fascinated by the recent NFR discussions here. I think there is real value in pursuing these thoughts as related to the AM band.

Stereo has never been the prime issue with the former AM listeners.

They continue to say "stereo" but upon further probing their references are clearly toward fidelity and freedom from noise.

As a ham radio operator I have recently discovered the joy of the 10 meter FM band and find it difficult to want to return to the noise of the single sideband portion.

"... manufacturers will rush to market NFR receivers" strikes me as a bit optimistic.

But when you consider the current listener preference for FM, it is a hell of a lot closer to market reality from the manufacturer's perspective than the present folly of dual chips and the incessant debate over systems that don't address the issue in the first place.

Bob Botik, President
Botik Broadcast Services, Inc.
Austin, TX

Station necessities

Dear RW:

I am writing in reference to Margaret Bryant's article in the 1 September issue of RW. "My Career as a Broadcast CE."

I found the article both humorous and

enjoyable. I also felt I needed to comment on some points made in her article.

First, I always thought that transmitter sites had no toilets because radio station owners will build a transmitter site and leave out whatever they can and that very often includes "The Can."

While I was working as the assistant engineer in Denver for then KPKE-FM it was decided to rebuild the transmitter site on Lookout Mountain west of town.

At first there was talk of including a toilet, sink, etc. and a back-up generator. After a review of plans by corporate management the generator stayed and the toilet, sink etc. went.

Secondly it is just a matter of time before she will find herself fixing something while dressed up from a date.

While at a station party at KPKE I got a frantic call from the jock that the temperature alarm had gone off at the transmitter site.

The next thing I know I am pulling on my winter boots and wading through snow to the transmitter building while dressed in a three piece suit.

I tried to explain to the girl at the air conditioning company's answering service that there were no windows in the building to open and that I was serious when I said I wanted the air conditioning fixed even though it was almost zero outside.

Thanks for a good article and a good newspaper.

Bill Emanuel, CE
KASH AM/FM
Anchorage, AK

Some exciting new developments are on the agenda for NAB Technologies, the NAB's for profit subsidiary.

Through Broadcast Technology Partners the association is continuing work on FMX for radio, while through the Broadcast Technology Center it will be working on high definition TV.

It makes sense for an organization such as the NAB to fill the void left by such events as the closing of the CBS Technical Center.

Such an effort will help the industry in the all important R&D area while at the same time creating revenue for the NAB, which would take some of the financial burden for their services off the shoulders of their members.

But some industry factions are beginning to wonder where the NAB is heading with its new-found commercial ventures.

There's some justifiable concern on the part of equipment manufacturers that the NAB could take a new technology and develop it into a product in a cooperative effort with a single vendor—giving that vendor an unfair marketing advantage over its competitors.

Or if NAB Technologies intends to market such products itself, it would be competing with the industry's vendors, and the association's reputation and membership ties with broadcasters would constitute an unfair advantage in itself.

In a relatively short space of time, the NAB has gone from selling hats and books at its conventions to developing its own products and talking about selling them for profit. What's next?

While it certainly takes revenue to provide the lobbying and other services which NAB's membership demands, is the creation of an equipment manufacturing and marketing arm an appropriate function for a broadcast trade association?

Is competing with other industry segments which also service the broadcast industry the best way for the NAB to generate revenue? The NAB recently backed away from selling NRSC filter kits to stations that can't afford new processors because an industry manufacturer decided to market the kits itself and the NAB didn't want to compete.

That decision should become a guideline for the NAB.

NAB Technologies can help the industry by performing and sponsoring R&D programs but it should then release any resulting products to the industry's equipment vendors who best know how to develop and market them. License fees are fine, but that is as far as it should go.

—RW

Research Not Retail

Need Separate Show For Radio

by Barrett Mayer

Oceanside CA ... Many have long recommended two trade shows each year for manufacturers and distributors to exhibit their wares to NAB members—one for TV and one for radio.

The number of attendees and exhibitors at the spring NAB show has long ago gotten out of hand.

It is so big that it has become impossible for the broadcaster to "cover" the exhibits from a *time* standpoint—to say nothing of the discomfort of limited hotel space, exhibit space, transportation and on-site food.

No room or time

Imagine 45,000 bodies trying to get in and out of a city, securing a decent hotel room (\$125 plus per night *without* a roommate—just a pillow), finding a cab or a car rental, etc.

Imagine too, 720 exhibitors complete with trucks, displays, equipment, lights, banners, signs and so on, all trying to get in and out of a single facility at the *same time* and you get an idea of the logistics required to avoid complete bedlam.

Imagine also spending just five minutes at each exhibit—five minutes

only (not including walking 10 city blocks). This requires 3600 minutes or 60 hours—or five 12 hour days.

Even if the broadcasters' feet and backs could take it, the show only lasts 3½ days. Hence, an impossibility!

A poor draw

The "Radio '87" second show of the year in Anaheim drew some 5000 to 6000 broadcasters over only 2½ days. The cost

Guest Editorial

to exhibitors is almost equal to the price of \$40,000 for exposure at the spring show in Dallas or Las Vegas.

This would seem to be the reason why the attendance is always much lower at the fall "radio show" (which really turns out to be a programming show).

Since manufacturers are loathe to spend thousands and thousands of dollars a *second* time each year and for 1/8th the exposure, the fall show, primarily aimed at radio programmers, continually falls short of doing its job. The solution?

One show for TV only, and one *full* show for radio *only*. Those manufacturers and distributors who sell to both

segments of the fifth estate can better display the units produced for a specific use.

I believe that the vast majority of exhibitors and station attendees voted for the convenience and facility of Las Vegas over any other city.

Radio programmers and leasing companies would have enough space if TV's huge exhibits were not combined with radio.

Two smaller shows can now be thoroughly covered by attendees in the 3½ days available and exhibitors could expand space to an appropriate area.

If you agree with the forgoing, why not drop a card or letter to the man behind the scenes: Richard L. Dobson Jr., Director of Exhibits, NAB, 1771 N Street NW, Washington DC 20036.

Barrett Mayer is president of Barrett Associates, a west coast broadcast equipment distributing firm. He can be reached at 619-433-5600.

RW welcomes guest editorials from readers. Submissions should be about 650 words, typed double-spaced, with a phone number included. Send to Radio World, Box 1214, Falls Church VA 22041.

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Support for Mandatory NRSC

by Alex Zavistovich

Washington DC ... The National Radio Systems Committee (NRSC) standard for AM preemphasis and deemphasis may become a mandatory standard for broadcasters, if its proponents are able to successfully convince the FCC.

At press time, a petition for rulemaking on having the standard made mandatory was in the works. The filing has been approved by the NRSC executive committee and is to be submitted, by the NAB, to the FCC in November, said NAB Director of Spectrum Engineering Michael Rau, NRSC coordinator.

Approved as voluntary

The NRSC standard, which recommends a 75 μ S preemphasis and complementary deemphasis, along with a 10 kHz band pass filter, was approved as a voluntary standard during the Radio

'86 convention last year in New Orleans.

At an NRSC meeting 9 September during the Radio '87 show in Anaheim, however, the committee decided to inquire of its approximately 150 members by letter ballot whether the preemphasis/deemphasis standard should be made mandatory.

There had been "strong support" during the meeting for submission of the standard to the FCC for rulemaking, according to the NRSC.

Sufficient response

Rau said as of 9 October only 25 responses had been received. Of those, 20 expressed support for making the NRSC standard mandatory; five responses opposed the action.

Despite a response of only one-sixth of its members, Rau maintained that the return rate was sufficient to convince the NRSC to support a push for mandatory

standing for its standard.

Rau said he had "no reason to believe the ratio of pros and cons would change if everyone were forced to submit a response."

Although there is no standard decision period taken by the FCC in response to such inquiries, Rau commented that the Commission's recent interest in reviewing its AM technical standards may aid in speeding a ruling on the NAB's petition.

Still, Rau speculated that a one- or two-year grace period for compliance may be instituted for AM stations, even if the standard were ruled on quickly in favor of making the standard mandatory.

RF mask

In another NRSC development, the RF mask, that portion of the NRSC standard aimed at reducing spurious emissions from broadcast antennas, has been submitted for public comment after being approved in draft interim form during the 9 September committee meeting.

The RF mask is a two-tiered standard with peak and average specifications for program emissions. The peak specifies 25 dB down at 10 kHz and 35 dB down at 20 kHz, sloping by 1 dB/kHz to -80 dB. The average specifies -35 dB at 20 kHz, tapering to -40 dB at a rate of 0.5 dB/kHz.

A six-month comment period has been set for the RF mask standard, Rau said. At press time, he noted, only "minor points" have been raised in early comments.

Rau added that he was in the process of contacting transmitter manufacturers

for their perspective on the interim RF mask standard. Although the companies were still being contacted at press time, Rau said he had been assured by the manufacturers that the standard would be carefully considered.

Next NRSC meeting

At press time an October meeting of the NRSC AM Technical subgroup was slated to take place.

“ “
*The filing ...
 is to be
 submitted by
 the NAB.*
 ” ”

The prevailing topic during that meeting was expected to be the FCC evaluation of its AM technical standards, according to Rau.

Of particular interest to the NRSC subgroup will be minimum usable signal strengths and co-channel, first and second adjacent channel protection ratios, he added.

NRSC members have supported the idea of a comprehensive report on the current state of AM technical standards to be submitted as comments on the FCC's notice of inquiry.

The meeting is also expected to include an update on NRSC audio voluntary standards conversion and a report on the status of the RF mask.

For additional information, contact Michael Rau at 202-429-5340.

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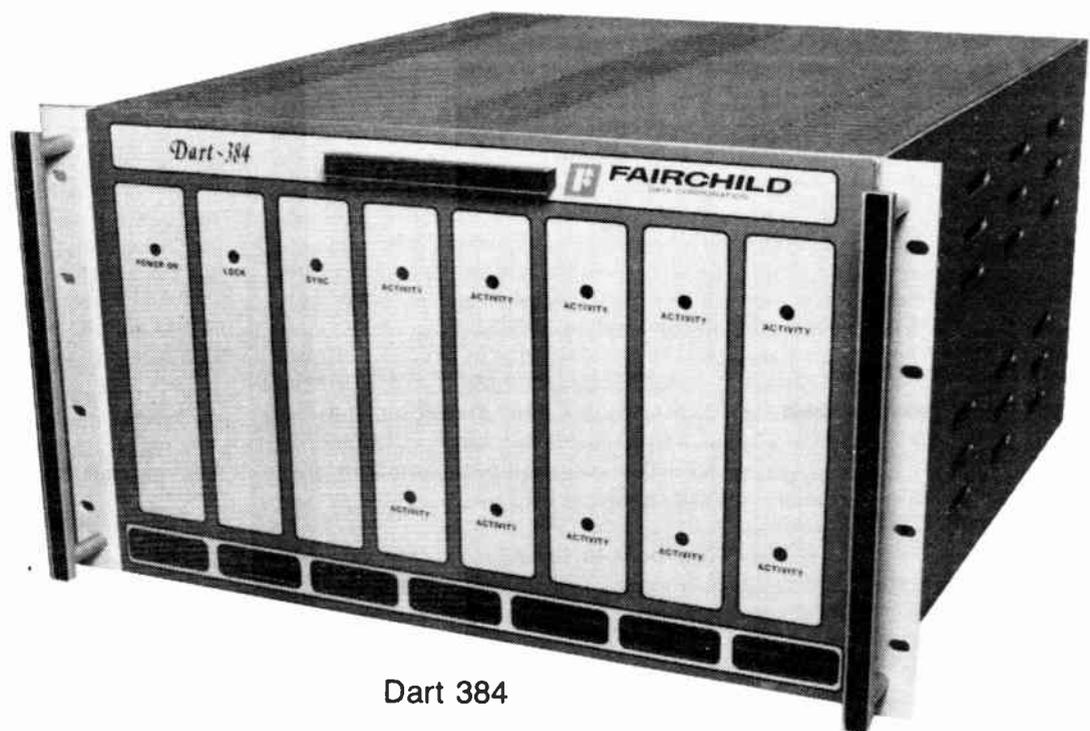
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World Radio History

Kahn Stations Use C-QUAM Tone

by Alex Zavistovich

Syracuse NY . . . Two Syracuse AM stereo stations which have used a 25 Hz pilot tone to transmit stereo broadcasts with Kahn/Hazeltine ISB equipment may have inadvertently lent support to a National Telecommunications and Information Administration (NTIA) recommendation to protect AM stereo pilot tones.

Motorola, which uses 25 Hz as the pilot tone for its C-QUAM AM stereo system, has recently voiced objections about use of the tone by WSYR and WAQX, upstate New York stations which broadcast using the Kahn/Hazeltine ISB stereo system.

However, a CE from one station maintains that the practice, since discontinued at both facilities, was employed only to improve the fidelity of the transmissions.

Spokespersons for WAQX could not be reached for comment. However, the station reportedly tried and ceased broadcasting with the C-QUAM pilot tone over a year ago. WSYR's experiment ended more recently, in September.

The NTIA had suggested protection of the C-QUAM pilot tone in a report on AM stereo, issued this summer.

Turning on the fidelity

WSYR CE Dave Solinske acknowledged that his station had, from 2 through 14 September, experimented with the 25 Hz tone to "turn on" fidelity of its signal, at 570 kHz.

Solinske said the WSYR was not concerned with stereo imaging when it conducted the tests. Rather, he said, the station was "looking for the best of both worlds"—maintaining the Kahn RF spectrum while opening the high fidelity bandwidth on AM stereo receivers.

He added that having the pilot tone activate the C-QUAM mode in receivers was "incidental," and not an objective in the test.

Solinske stated that the triggering of the C-QUAM stereo light was "unfortunate," adding that the fault lay not with WSYR, but with AM stereo receiver manufacturer's designs.

C-QUAM AM stereo receivers on the market give the impression, he said, that Kahn, Harris, or monophonic transmissions have poorer fidelity than C-QUAM. He added that the 25 Hz tone has a "dual purpose" and should be allowed by the FCC to be used by mono stations to open the bandwidth for improved fidelity.

Use of the 25 Hz tone did improve fidelity for WSYR, Solinske said. However, he said that in the fringes of its RF area WSYR's transmission induced "objectionable hiss" in stereo, which prompted discontinuation of the experiment.

WSYR originally chose the Kahn/Hazeltine ISB transmission system because a similar hiss was present in weaker coverage areas when using C-QUAM equipment, Solinske noted.

John Marino, VP/Engineering for NewCity Communications, which owns WSYR, was unavailable for comment.

Degraded stereo reception

Motorola's AM Stereo Broadcasting Manager Chris Payne noted that using the C-QUAM pilot tone with Kahn transmission equipment would result in

degraded stereo reception.

Because the tone also illuminates the stereo light on receivers, Payne was concerned that listeners might be misled into thinking that a C-QUAM station was performing unsatisfactorily.

Payne said his company has "worked to build C-QUAM AM stereo transmission and reception equipment of the highest technical quality."

"When someone causes our receiver to come up in stereo decoding an incorrect transmission, the sound is nowhere near what the system is designed to do," Payne commented. The reproduced stereo signal would lack true spatial orientation, he said, and would sound "smeared."

The result would be unnecessary expense incurred by the consumer, the receiver manufacturer and Motorola, "for an exercise which is basically invalid," he added.

Payne said a listener's introduction to AM stereo "ought to be a dramatic and impressive change" from the performance the consumer was used to in monophonic AM. He said such a change would not be possible if a Motorola receiver was decoding a Kahn transmission.

Use of one pilot tone with a different stereo system is an "extremely self-defeating thing to do," Payne continued. He stressed the practice was not in the self-interest of the station, the best in-

terest of the consumer or the industry.

Payne declined to comment on whether Motorola would pursue the matter any further.

Legalities uncertain

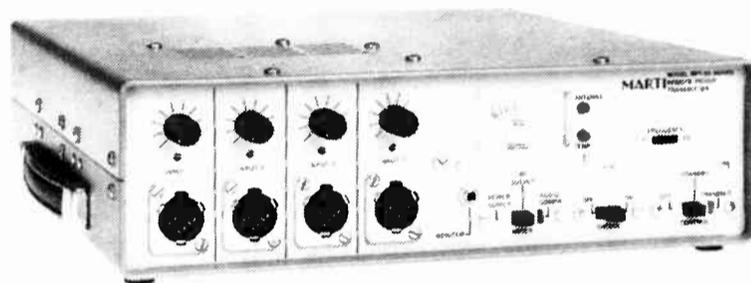
The legalities of the practice by WSYR and WAQX remain largely undetermined. FCC spokespersons maintained that, in the strictest sense, some violation of the FCC rules may have taken place.

If a pilot tone is used which is different than the pilot tone for which a station's equipment authorization was granted, the station may be in violation of Part 73.128 of the Rules, according to Frank Rose, of the FCC's Office of Engineering Technology (OET).

The problem, Rose said, is that the equipment being used may be different
(continued on page 8)

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International Support for AM

by David Hughes

Washington DC . . . The NAB, joined by its counterparts in Canada and Mexico, has approved a resolution calling for the implementation of the NRSC AM pre/deemphasis standard internationally.

The announcement came 29 September, when the NAB executive committee met with its counterparts, the Canadian Association of Broadcasters (CAB) and Mexico's La Camara Nacional de la Industria de Radio y Television (known as CIRT).

According to the NAB, the three broadcasting organizations agreed to "actively support implementation" of the

NRSC pre/deemphasis voluntary standard.

They also agreed to support the incorporation of the NRSC standard as an International Radio Consultative Committee (CCIR) recommendation and "to develop and support further CCIR recommendations concerning AM technical standards to improve audio quality on an international basis."

The CCIR is a European standards setting organization.

The groups said they would "recommend suitable changes to our respective governments."

"We live in an age where radio listeners expect high quality audio service," they said, adding that current North Ameri-

can AM technical standards do not always deliver optimum quality service.

During the summer, Canada has been accepting comment on the establishment of an AM pre/deemphasis standard based on the NRSC recommendation.

The three broadcast organizations also called for all AM stations in the three nations to convert to stereo. So far, only Canada has formally adopted an AM stereo standard.

By March 1988, all Canadian AM stereo stations are required to switch to C-QUAM.

The broadcast organization groups also passed resolutions dealing with AIDS, governmental restrictions on ad-

vertising, high definition TV and copyright payments for recorded music.

In a related international matter, NAB President Eddie Fritts said his organization is working to get Canada to eliminate legislation that prohibits tax breaks for Canadian advertisers that place their ads on US stations.

In other news, in early October the NAB announced the new line-up for its committees.

Art Suberbielle, president/GM of KANE, New Iberia, LA, is the chairman of the AM Improvement Subcommittee.

The Daytime Broadcasters Radio committee is headed by Bayard Walters, of the Cromwell Group.

Otis Freeman, Tribune Broadcasting, is chairman of the Engineering Advisory committee while T. Arthur Bone will head the Engineering Conference committee, and J.D. Williamson II, chairs the Radio Allocations Task Force.

For more information on the NAB's initiatives or committee membership, contact Bob Hallahan at 202-429-5350.

AM Stereo Pilot Tone Protection

(continued from page 7)

than that specified in the station's type acceptance application. However, because the FCC now allows any kind of AM stereo, such a distinction is not "black and white," Rose continued.

OET would consider such a case an operational problem, he said, which would then be directed to the attention of the Mass Media Bureau or the Field Operations Bureau.

Bill Hassinger, engineering assistant to the chief of the FCC's Mass Media Bureau, stressed that the practice undertaken at WSYR was not a sanctioned FCC experiment.

Hassinger said the Commission "does not encourage" such a practice. However, he added, in light of the fact that both WSYR and WAQX have discontinued using the 25 Hz pilot tone while transmitting in Kahn/Hazeltine ISB stereo, the FCC would probably not become involved.

Leonard Kahn, president of Kahn Communications, declined to comment on the case to RW.

Regardless of the legality or propriety of using a 25 Hz pilot tone while transmitting with Kahn gear, the practice has given some credence to an NTIA recommendation that the FCC protect the pilot tones of AM stereo systems.

The recommendation was part of an NTIA study on AM stereo released 12 August. The study also concluded that multisystem AM stereo receivers would be an impractical method of promoting AM stereo technology.

At the time, Bill Johnson, then acting chief of the Mass Media Bureau, commented that there was some question as to "what (the FCC) would be protecting the pilot tones against."

The sentiment was echoed by many others in the broadcast industry, who maintained the NTIA's suggestion was too vague.

For additional information, contact Dave Solinske at 315-472-9797. Contact Chris Payne at 202-862-1500, or Bill Hassinger at 202-632-6460.

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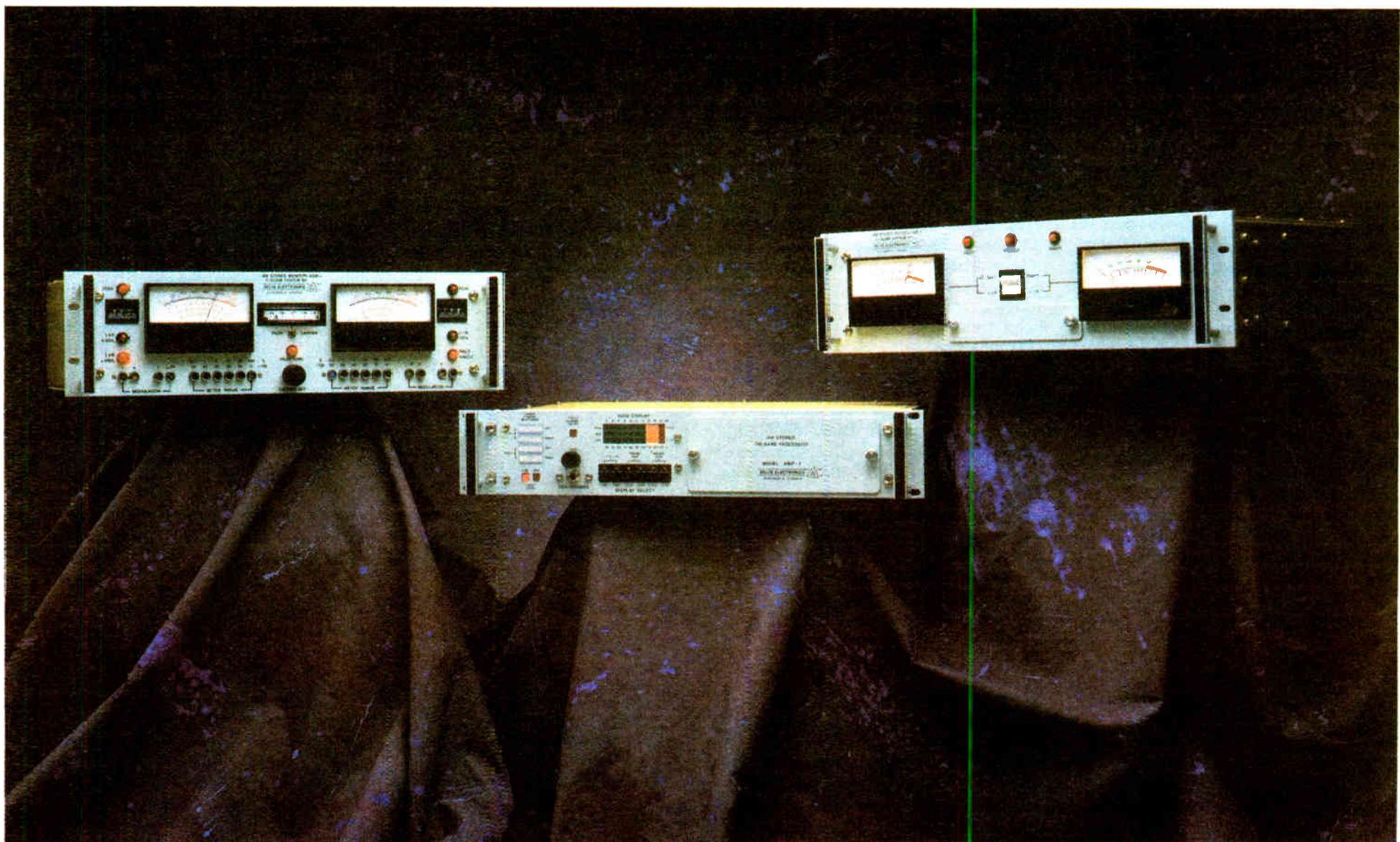
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SBE Show To Host 300 Booths

by Alex Zavistovich

St. Louis MO . . . Work on the 1987 National Convention of the Society of Broadcast Engineers (SBE), at press time, was almost completed. The event, to be held 10 to 12 November at the Cervantes Convention Center in St. Louis, promises to be "a service to the working engineer."



That's the opinion of SBE Executive Director Andy Butler, who said last year's convention was well-received. "If you liked it last year, you will love it this year," said Butler, adding that the convention schedule is larger and more diverse this year, as is the exhibit area.

Exhibit area

Trade show booth sales this year have exceeded those set last year, Butler said. The exhibit at Cervantes center will be set up to accommodate just over 300 booths, he added.

At press time, over 93 exhibitors had been assigned booth space, according to Butler.

A number of major manufacturers

purchased multiple-booth units, he said, including Ampex, BTS, Sony, Audio-Technica and Utah Scientific.

This year, the convention committee addressed several concerns about the exhibit portion of the convention, Butler said. Improved lighting has been arranged, and security procedures have been revised, he noted.

The convention, which was for many years a regional event, has drawn a number of large exhibitors. Several radio equipment firms have opted to exhibit at the SBE show rather than the NAB's September radio show which combines programming, sales and management as well as engineering.

Many companies say they see the SBE convention rising in importance, and particularly valuable in presenting equipment to a large segment of several markets.

Utah Scientific's National Sales Manager Gary LaMunyon said the SBE trade show "covers a large part of the Midwest," and draws customers from a number of those states.

"If a company is going to do any business in the Midwest, it has to make a showing (at SBE)," said LaMunyon. He added that many of the attendees at the SBE show may not have the opportunity to go to other large trade shows, such as the NAB spring meet.

BTS spokesperson Al Jensen agreed. He added that there are "more buyers" at the SBE convention than at other shows, which prompted BTS to step up its involvement in the convention this year.

"We (BTS) are starting to focus more on the smaller shows," Jensen said.

Other events

A full agenda of seminars and technical sessions are slated to begin 10 November to coincide with the exhibit.

Beyond the seminars and exhibits, the convention committee is planning a number of other activities, for both engineers in general and SBE members in particular.

The SBE executive committee will meet on the 9th, and a general SBE membership meeting will be held on the 10th. New executive officers for the society are to assume responsibility that day, Butler noted.

For additional information, contact Andy Butler at 718-706-7690.

SBE Exhibitors List (Selected Listing)

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Broadcast Automation, Inc.
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Crouse-Kimzey
Current Technology Inc.
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Dielectric Communications
Econo Broadcast Service
Electro Voice
Electronic Research
Eventide
Fidelipac Corp.
Flash Technology
Gentner Engineering
Harris Corp.
Howe Audio
Ice Crackers, Inc.
International Tapetronics Corp.
Jampro Antennas, Inc.

Johnson Electronics
Kahn Communications
Kintronics Lab
LDL Communications
LPB Inc.
M/A Com
Marti Electronics, Inc.
Microwave Radio Corp.
Mitsubishi Pro Audio Group
Modulation Sciences
Moseley
Motorola AM Stereo
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Service Phone Calls Now Cost

by Alex Zavistovich

Bellingham WA . . . What may become a future trend in customer service is being established at a Washington-based station automation company.

IGM, a major manufacturer of automation systems, has begun charging stations for telephone support for its products.

IGM charges \$60 per hour, with a 15 minute minimum for the telephone service. Increased support costs from having to service recycled equipment and the scarcity of qualified technicians at radio stations prompted the charges, according to IGM.

There is an alternative to the fee, however—for \$350 per year customers can gain access to phone support and other benefits at no additional cost.

Other companies in the broadcast industry seem to be sympathetic to IGM's position, but not supportive of the firm's practice. Those contacted by **RW** are continuing to provide free telephone support to their consumers, despite increased costs.

Letter to customers

In a July letter to IGM's customers, company President James Wells in part blamed rising support costs over the last

year for the new charges.

But he added that the current state of engineering at many stations may be at least partly responsible for the new policy, saying "the elimination of the engineering position at many stations has left us educating non-engineers on how to service the equipment and educating contract engineers on automation theory."

The charges for telephone support were instituted as an alternative to increases in the price of IGM products, Wells explained.

IGM began charging for support in July. An 800 WATS line feeds in to the company's sales and service departments from 49 states. The company's home state of Washington is excluded from the WATS line.

According to Wells' letter, service technicians write up each service call as if it were chargeable, but not all are. Charges for calls are determined by such factors as "the size of a related parts order" and IGM's "degree of responsibility" in the problem.

Any support call for equipment older than 15 years "will certainly be charged," Wells maintained.

For a \$350 yearly charge, Wells also offered IGM customers a package of service benefits including phone support

at no additional charge and "priority scheduling of service shops and field trips."

Negative reactions

Control Technology, a station-automation equipment dealer based in Ft. Lauderdale, has sold equipment from IGM and a competitor, Sentry. Control Technology President Jim Woodworth said IGM consumers have been "very negative" about the fee policy.

IGM equipment owners feel the company is "charging top dollar" for the products—some gear is priced at over \$19,000, Woodworth said. Many owners feel they "paid up front for the service when they bought the equipment."

In addition to providing support for recent sales, Control Technology also supports equipment from Broadcast Products, an automation manufacturing firm which Woodworth owned at one time. Some of Broadcast Products' gear is as old as 16 years.

Control Technology does not charge for its phone support, Woodworth said. The company views it as "a cost of doing business," he added.

Still, Woodworth maintained he could understand IGM's reasons for charging for older units, many of which are on their second or third generation owner-

ship. He expected, however, that support for new IGM equipment should be free of charge.

The policy of a majority of equipment companies is to provide telephone support for free to customers.

Continental Electronics, a transmitter manufacturer, provides 24-hour telephone support for its equipment owners. According to the company's field service supervisor David Chenoweth, the support is free of charge.

"The cost of support is figured into the cost of the sale," Chenoweth said. Support costs are treated "just like design costs, engineering costs, or any other expenses" that go into building a piece of equipment, he added.

Although Chenoweth agreed that support costs have gone up, and acknowledged that equipment prices have risen proportionally, he added that Continental also provides free phone support for Collins equipment, whose broadcast line had been taken over by Continental.

Continental urges its customers to call as soon as a problem is discovered, Chenoweth explained.

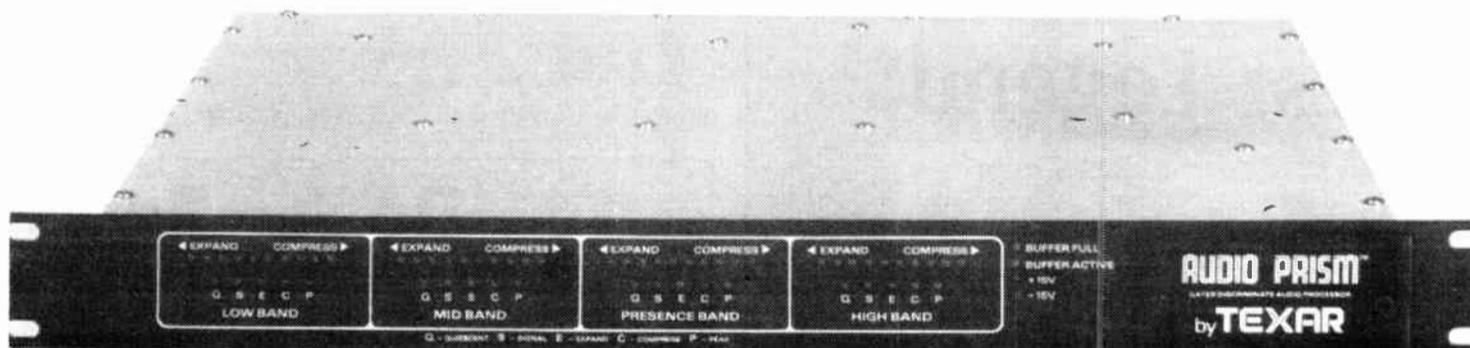
Chenoweth pointed out, however, that IGM is not the first manufacturer to charge for consumer support after the

(continued on page 20)

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Live, In Stereo . . . Barn Fire!

by John "Q" Shepler

Rockford IL . . . It's a bright November afternoon. The crisp country air ripples through Jerry O'Brian's lumberjack shirt as he fumbles with the cord trying to get the second mic to stay balanced on the station eaves.

Convinced it's secure, he bounds through the front door and into the studio. The network news is just wrapping up.

Jerry punches the two-minute ID cart and starts a song. With his show underway he relaxes a bit.

If the outdoor mics are working everything will be in order for a smooth four hours. He flicks mic channel two into cue.

"I wonder if anybody else has thought of this," Jerry muses. He has snaked two microphone cables from the stereo mic connectors around the console, out through the front hallway, down the steps and branching to each side of the building's front porch.

The mics themselves are sitting in the eaves pointed at the two-lane highway that runs past the station.

Turning up the cue volume, Jerry can hear various wind noises and distant farm animals. Then the sound of a semi-truck can be heard in the left channel panning its way to the right. The stereo effect is working.

Jerry grabs for a cassette. "This is definitely an air-check day."

Eager newshounds

Meanwhile the sound of a Jeep door slamming can be heard center stage.

Norm Ungar, CE, is frowning as he walks up the sidewalk.

He wonders what those microphone cables are doing dangling from the roof. He just shakes his head as he walks past the main studio to the shop.

Norm is usually in better spirits. However, the wireless mic equipment he is carrying has him worried.

He needs to get the noise level down before tonight's school board election remote. Otherwise "Wiley Coyote" will probably be in crying to the GM again.

Q-Tips

"Wiley Coyote" is the unofficial nickname of Wiley Cohen, station news director, a wiry little man with network ambitions and little patience for equipment problems that might make him look bad.

His partner is Christine Cacciatore, on her first job after journalism school.

Christine is also easily excitable when it comes to news and is suspected of having a police scanner under her pillow. Her nickname around the station is "catch-a-story."

Norm does not want to face the formidable news duo with a broken wireless setup. He works fast, knowing they'll be pulling in at any minute.

Wireless worries

He retrieves new batteries from the refrigerator and grabs the last two electrical elements that haven't been dropped.

While waiting for his soldering iron to

heat Norm rolls the batteries through his hands to get them up to room temperature.

The wireless mics are in two pieces—a transmitter pack and a plug-in electret lavalier microphone. The mics and transmitters come apart easily for repairs.

This arrangement works well with a diversity whip antenna/receiver out to a couple hundred feet.

The big problems with wireless mic packs are batteries and mics. The batteries need to be changed after every performance and the mics will only work until they are dropped.

Unfortunately, no one wants to admit dropping a microphone so the mic packs have to be tested before letting them out of the station.

Somehow the news crew kept a flaky one and now Norm has to hustle to get it fixed.

Drama next door

Meanwhile, Jerry is convinced that he'll wow some PD with his latest weather forecast. Quickly he rewinds the air-check cassette to make sure that the convoy of National Guard trucks really sounded as impressive on tape as they did in his headphones.

Yup, under the forecast you can distinctly hear the trucks moving from left to right. A couple of them even beep their horns in front of the station.

Jerry turns up the mic cue volume hoping for a cow or some birds for the next forecast. Something doesn't sound right, though.

There is kind of a roaring, crackling sound this time. Oh no. Maybe the mic preamp is going out.

Jerry leans back in his chair hoping to attract Norm's attention through the transmitter room window. No luck.

He is about to get up and head for the shop when Christine charges into the studio with a serious look on her face.

Brushing Jerry aside, she pushes the news two-way PTT button and asks Wiley if he is ready with the fire report.

Fire? What fire? The one right across the road at their neighbor's farm, it turns out.

Too close to home

Through the studio window Jerry can see Wiley getting out of the news car. He is about 100' from a barn that is rapidly being engulfed in flames.

Jerry puts his outdoor mics into cue again. The roaring and crackling from the fire is much louder now.

He sits back down at the console and reads the news bulletin intro for Christine. As soon as Wiley indicates he is ready they go live to the scene.

Everything sounds as expected for the first 15 seconds or so. Then a loud crack is heard followed by a ripping noise and the signal starts to break up.

Instinctively, Jerry pots up his outdoor mics which help to cover the effect of the RPU signal cutting in and out.

What happened? Wiley appears to be okay and seems to be saying something about the roof exploding. Wait a minute—a large burning panel has landed on the car.

Within a few seconds the station's remote vehicle is out of commission. Wiley throws the microphone to the ground in disgust and just stands there with his hands on his hips.

Spark of an idea

Norm, Christine and Jerry meet at the front door. Jerry eyes his outdoor setup and suggests running a longer mic cable across the road to Wiley.

Nice thought, but they don't have 500' of cable even if they hook all of the available mic cords together. And besides, who knows what problems could be caused by draping microphones cables across a highway.

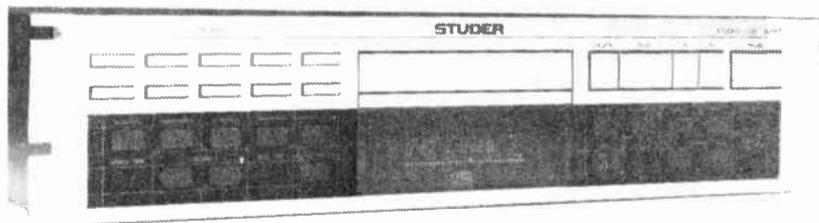
Norm gets a flash of inspiration and disappears into the back room.

In a few seconds he rushes past them clutching the repaired wireless microphone pack and a radio-headset. Halfway out he door he calls back, "put remote C in cue."

Remote C is a special hookup they used only once last year for the station's

(continued on next page)

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News Remote Is a Team Effort

(continued from previous page) 25th anniversary. They needed a way to interview people pulling off the highway during the anniversary celebration.

Norm's solution was a long range wireless microphone that worked great. The yagi was still hanging on the tower pointing toward the road. But, would it still pick up with the additional distance?

Wiley looks at Norm in disbelief. He had completely written this story off a minute ago. Well . . . maybe there's hope yet.

Back on track

Wiley grabs the wireless pack and clips it to his belt. He clips the lavalier mic to the top of his sweater and dons the headset. "Can you guys hear any of this," he calls to the studio.

The signal is so-so in cue. However, mixing it with the outdoor mics gives something of a credible sound to the hissy but intelligible wireless signal.

Christine makes a short interruption announcement and once again they are broadcasting live from the scene. Wiley parades back and forth in front of the barn describing how the inferno is raging out of control.

In the distance the sirens of the rural volunteer department trucks can be heard getting closer.

Norm heads over to the burned news car to see if anything can be salvaged. After pulling away the blackened roofing material, it really doesn't look so bad.

Surviving the worst

The whip antenna and insulator are completely charred and most of the paint on one side is ruined. However, the windows were up and the interior looks okay. Would it run?

Gently, Norm pries open the driver's door. Gobs of black stuff flake off and fall to the ground. He crawls inside. The smell is pretty bad.

Norm is astonished to find that the

mixer is still on, although the meter shows no signal. The microphone cable is pretty much melted where it passed between the door and frame of the car.

Norm reaches behind the seat and grabs the backup microphone and cable. This one works fine in the same mixer channel. Now, if only they had another antenna handy.

Norm thinks for a second and then yanks the car radio antenna plug free. He balances the center conductor pin in the transmitter output connector and steadies the connection with a bent-up paper clip.

It looks awful and the mismatch must be atrocious. But would it work?

"Jerry are you getting this?" Norm keys the open mic.

"Sounds good at this end," comes the reply.

Norm feels a rush of accomplishment as he slides out of the car and brings the live microphone to Wiley.

Without missing a beat Wiley continues his report speaking into both the wireless and car mics.

He smiles and waves at Norm . . . might even say something complimentary about engineering to the GM. Well,

one can hope.

As Norm prepares to head back to the station three fire trucks scream past him and into the barnyard. Norm flashes a quick glance across the road to Jerry's mics sticking out of the eaves.

"Sure hope he had those potted up for the trucks," Norm says to himself with a grin. "A stereo news remote. Now there's a novel idea!"

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

Radio World 21

October 1, 1987

Riding Out A Lightning Strike

by John "Q" Shepler

Rockford IL . . . It's one of those muggy August afternoons, the dog-days. Tim Mullin, CE, is about to have an early supper before heading to the station.

He stands in front of the open refrigerator door trying to choose the best of the leftovers. The cold from the fridge feels so good he hates to make a decision.

A moment later, Tim hears a crack of thunder in the distance. He decides to grab half a sub and hit the road before he gets caught in a downpour.

Tim peels into the station parking lot just as the first big drops hit his windshield. With an orange soda in one hand he scrambles across the lot and through the front door.

Pausing to catch his breath he can hear Jerry White, the intern, cueing up a new automation tape.

Lightning strike
The outside light has disappeared in a matter of a few minutes. The booms of thunder preceded by the ripping of lightning bolts are getting more and more frequent.

Q-Tips

Suddenly the lights in the station are off. The taped music means to a stop. Before Tim knows it the lights pop back on but the sound doesn't return.

There is only a faint hissing in the monitor speaker. Tim heads to the equipment racks where Jerry is also working the remote control.

The meters are dead. No plate and filaments. Jerry slabs at the buttons and again. No luck. He turns to with a help-me stare.

Tim charges through the back and out 300 feet to the transmitter building. It's dead quiet inside.

The exhaust fan as well as the mitter is shutdown. The air hangs and Tim can smell some funny like plastic melting.

Tim glances at the breaker box. The main is tripped as well as the meter breaker. He kicks the main breaker and the fluorescent lights flicker and the exhaust fan also starts to rattle. The louvers creak open. The fan as an air monitor is hissing.

Precious seconds
Instinctively Tim pops the final cavity. As he sets the smell increases.

Now there are some burning smells mixed in. His head his stomach.

Like all dedicated engineers a professional conscience.

It takes the form of a long ing away the seconds of Tim feels the sweep hand those lost seconds, then pulse is racing. What to.

His right arm lurches open cavity. Then it freezes.

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

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Circle Reader Service 24 on Page 22

See Us at SBE Booth 1016

Circle Reader Service 33 on Page 22

Systems Approach to Antennas

by W.C. Alexander

Part IV of IV

Dallas TX ... In the last part various types of antennas and their characteristics were examined. In this final installment we'll look at system planning using antenna technology.

As with any other project, you have to know what you want to accomplish by your actions.

Thus, performance goals must be outlined in advance.

An engineer planning an FM antenna installation must have a clear picture of what the system is expected to do before he can properly choose one.

Budgetary considerations are, of course, primary in most cases. A fixed amount is available for the project, and that amount must suffice.

Here is where the antenna gain/TPO question is most often answered.

Perhaps more important than initial cost is the operating cost of a transmitter plant.

In many cases a high TPO/low gain

antenna may be called for, but that may require up to twice the transmitter power.

Transmitters are not inexpensive as initial investments, but they can be even more expensive in terms of operating costs.

Consider that a 25 kW transmitter with a ten-bay antenna will require about 39 kW from the power line. Now consider that a 40 kW transmitter with a six-bay antenna will require 64 kW from the power line, with both combinations producing the same ERP.

At today's power prices the 40 kW/six-bay configuration would cost \$15,000 more per year to operate than would the 25 kW/ten-bay system. If air conditioning is taken into consideration, that cost jumps to almost \$26,000 more!

There are trade-offs to be made, and this must be decided in each instance.

Terrain considerations

Generally speaking in areas of rough terrain or urban sprawl lower gain antennas tend to work better, producing better penetration and less multipath. More energy is radiated and fill is better.

On the other hand, on flat terrain that is lightly built up high gain antennas work fine. There are fewer obstructions to cause multipath and shadowing.

Particular attention must be paid to the nulls here, however, because as an antenna increases in size the nulls tend to be farther away from the antenna.

More first null fill and perhaps some second null fill may be called for.

In some situations where there is mountainous terrain or obstructions around the transmitter, more null fill may be called for. As previously stated, this effectively broadens the main lobe and results in improved multipath.

It must be decided what amount, if any, of beam tilt to use. Taller towers or higher elevation sites increase the significance of beam tilt.

Generally an amount of beam tilt should be chosen that will place the main lobe at or slightly below the radio horizon.

In special instances, where targeting a specific area as opposed to maximum geographical area is of concern, greater amounts of beam tilting may be required to bring the main lobe even further below the horizon.

Roto-tiller antennas

The type of antenna to be used is also of importance. Generally speaking the broad bandwidth, 50 ohm center feed type antennas will give better results.

Some engineers have referred to these antennas, which consist of a series of segmented, phase-coupled dipoles, as "roto-tillers" because of their appearance.

Their looks aside, they do perform very well and tend to create much less source-induced multipath than other antenna types.

The added cost of such broadband antennas is somewhat offset by the simplicity of installation, lighter weight and lack of de-icing equipment.

Antennas of this type are particularly well suited to stations that use one or more subcarriers.

Optimization

Almost any antenna on the market today has the option of optimization.

Typically the manufacturer measures one bay of the actual antenna on an antenna range by mounting it on a pole or tower section of the same type that will be used in the field, and placing it on a turnstile and rotating it while making calibrated measurements of the Vpol pattern.

Then parasitic elements are added and moved around with respect to the antenna until the best circularity is achieved.

The locations of these parasitic elements are carefully noted and included in the antenna assembly instructions.

Optimization does provide more uniform coverage than is possible with a
(continued on next page)

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In the several years since its introduction, OPTIMOD-AM Model 9100A has become one of the most-often used tools for improving AM audio.

Now there is a new opportunity for AM improvement. Over a year ago, the National Radio Systems Committee brought broadcasters, equipment manufacturers, and receiver manufacturers together to talk about a voluntary national transmission standard that would make wideband high-fidelity AM radios practical.

Today, after hundreds of hours of discussion and study, the standard finally exists that will allow receiver manufacturers to increase and flatten their frequency response without risk of increased interference. But for them to do this, broadcasters must implement the standard: a "modified 75 μ s" pre-emphasis specification brightens up the sound on older radios while minimizing interference to adjacent stations, while a sharp-cutoff 10kHz low-pass filter specification protects the second adjacencies by limiting occupied bandwidth.

Receiver manufacturers have stated their willingness to replace their current AM receiver designs (with their telephone-quality fidelity) with AM receivers having full 10kHz frequency response—but *only* if and when the NRSC standard is fully adopted by broadcasters. For the NRSC standards to be successful, broadcasters must change over *quickly*. If the new high-fidelity receivers generate complaints of interference caused by stations not complying with the new standard, the receiver manufacturers will revert back to the present low fidelity 3kHz designs! *Everyone* will lose.

Orban was the first to propose and implement AM pre-emphasis and low-pass filtering, and we were heavily involved in the Committee work and research. We strongly endorse the new NRSC standard. It's good engineering *and* good business, and we are making it easy for all OPTIMOD-AM owners to comply.

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See Us at SBE Booth 501

Circle Reader Service 7 on Page 22

Antenna Design Takes Planning

(continued from previous page)
non-optimized antenna.

This becomes very important when antennas are face-mounted on large towers, where the steel in the tower distorts the radiation pattern.

As to whether or not optimization is worthwhile, each situation will have to decide for itself.

Optimization can cost from a few hundred up to several thousand dollars, depending on antenna type and size. If the budget allows, it is probably worthwhile.

Transmission lines

While planning an antenna system one cannot overlook the transmission line. Indeed, it is the medium by which the transmitter's energy output is delivered to the antenna.

There are many types and sizes of transmission lines available, and each has its advantages and disadvantages.

Flexible "Heliac" type lines have the advantage of low cost and easy installation, but typically have considerably higher losses and lower power handling capability.

In addition, should the line ever become damaged due to bullet holes or internal arcing, it is difficult to repair.

On the other hand rigid lines are considerably more expensive and more difficult to install.

They require an abundance of special hangers and hardware to attach the sections to the tower, and allowances must be made in the horizontal run for thermal expansion.

Rigid efficiency

The advantages of rigid lines are better efficiency, lower losses, higher power handling capability and better repairability.

For example, a 3" Heliac line is capable of handling 37 kW and has a loss of 0.14 dB per 100'. A 3-1/8" rigid line is capable of handling 52 kW and has a loss of 0.089 dB per 100'.

These differences are significant because they directly affect initial purchase price and operating cost.

A 50 kW station using a 4-bay antenna would require 23.4 kW of antenna input power.

If 500' of 3" Heliac were used the transmitter would have to deliver 27.5 kW into the line. If the same length of 3-1/8" rigid line were used the TPO would need to be 25.9 kW.

This translates into \$1,500 per year in direct operating costs, not counting the increased air conditioning load and tube wear that would go along with the higher TPO.

In another situation, where 3-1/8" rigid

line could be used to deliver 40 kW of TPO to an antenna, 3" Heliac could not, and this tends to equalize the costs over the long run.

A system that works

Using good judgement and sound engineering principles, FM antenna systems can be created that very efficiently deliver a good signal to the specific area(s) where coverage is desired.

There are proven ways to lessen multipath and improve penetration, and this ties back directly to listener satisfaction—which is what it's all about.

At every corner is a fork in the road, with each fork leading to another until

our frustrated engineer seems lost in the forest of trade-offs, budgets and manufacturers' claims.

But with a clear vision of the whole picture and performance goals in sharp focus a system can be designed and built that will be the very best for a station with what (realistic) budget is available.

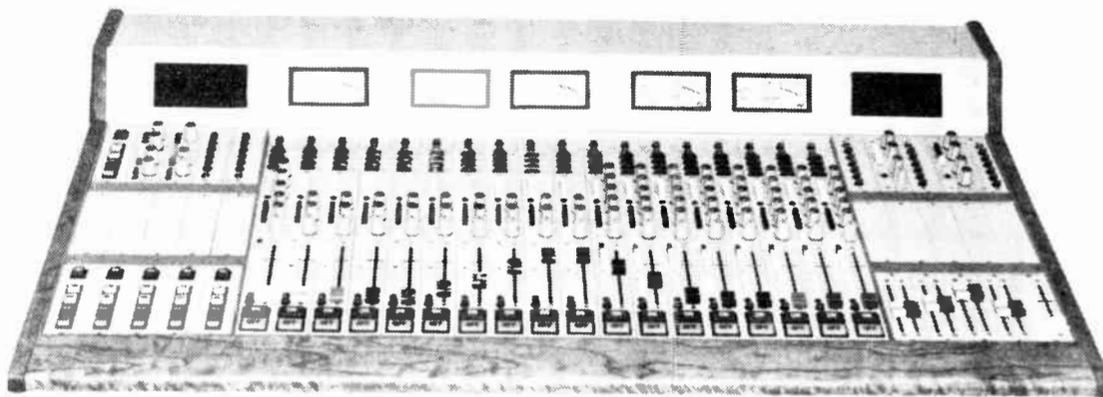
I must thank Ed Lorentz, PE, my mentor, for his advice and guidance, and Tom Silliman, PE for sharing his experiences and insights with me.

W.C. Alexander is Director of Engineering for Crawford Broadcasting Company, and a soon-to-be-published novelist. He can be reached at 214-445-1713.

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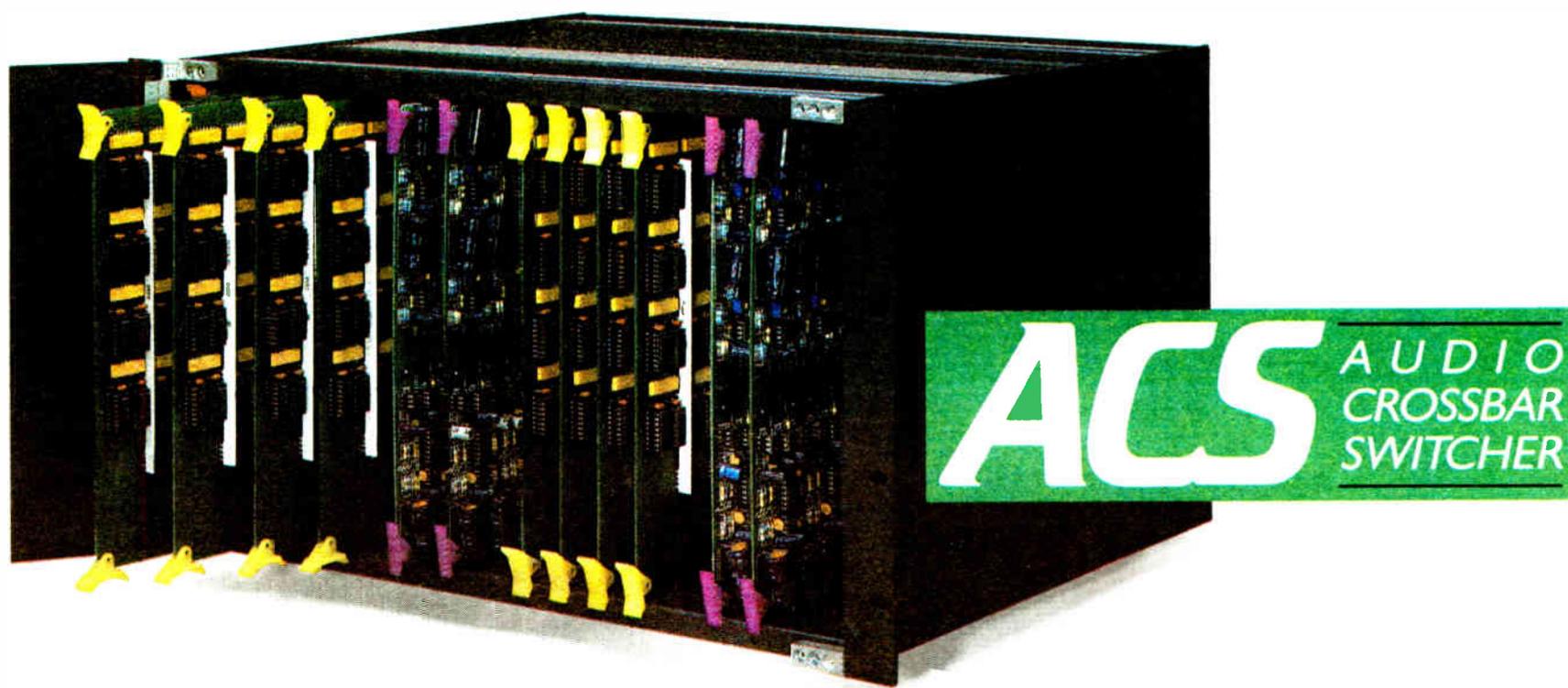


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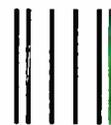
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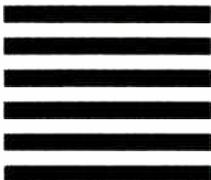
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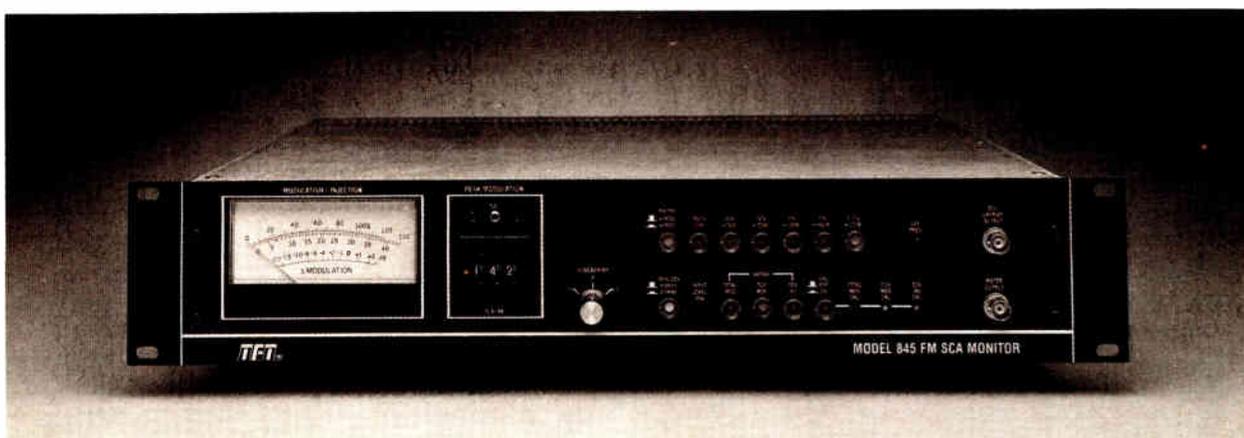
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(optional)

Do-It-Yourself AC Test Device

by Frederick Baumgartner

Englewood CO ... An unfortunately large amount of gear seems to hover in the blowing fuse mode. Sometimes it's an apron fuse and other times it's the line breaker.

When you get it on the bench ... poof, the fuse goes again.

You may have a hint as to where the problem lies. For example if the lights dim before the fuse blows the problem is likely after the transformer.

If you are real lucky you may get a glimpse of light from a part (like a resistor) that normally does not glow, or be able to localize a puff of smoke to an area smaller than the shop.

If the transformer primary isn't shorted and nothing has the distinctive black "fix me" coloration, having the fuse blow within seconds of turning it on makes the search for the problem more than difficult.

You could of course set the gear aside, call it a "fuse tester" and use it to find what line a particular outlet is on or to make sure a batch of glass fuses will blow.

Another alternative is an AC test bench as in Figure 1.

Scrap parts

My device is made of parts collected from swap fests and scrap gear, and it seems that every five years or so I collect enough "stuff" to build another one.

I use a ground fault interrupter—GFI—outlet on the bench (to reduce the pain associated with coming between the ground and hot side of the AC) which this plugs into.

I used to have one built into the bench, but if you have only enough gear for one put it in a carry-around box.

Because parts placement is anything but critical (however heavy) I used this as an excuse to build possibly the ugliest home brew project ever.

While I keep it hidden, it is nice to know it is there.

Putting it together

T1 is switched in and out by S1. It is an isolation transformer. When in line neither side of the line is grounded.

In consumer gear without transformers, or where the fault may be to the ground pin or chassis, this comes in handy and greatly reduces the risks of your being a major portion of the circuit.

T2 is an auto transformer, which allows you to sneak up on the voltage as well as torture your own designs with under and overvoltage (I try to design my stuff so that it will work from 90 to 135 VAC for long periods).

The line voltage meter is almost a necessity. S2 allows you to remove this from the circuit.

L1 is a 100 W lamp and L2 is 400 W (two 200 W bulbs if need be). When S3 is open either 100 or 500 W of light bulbs (depending on the status of S4) are in series with the line.

A few particulars

With the lights in line, the worst case is a dead short which lights the lamps to full brilliance.

In units drawing too much current it allows you to get some voltage in while you nose around looking for

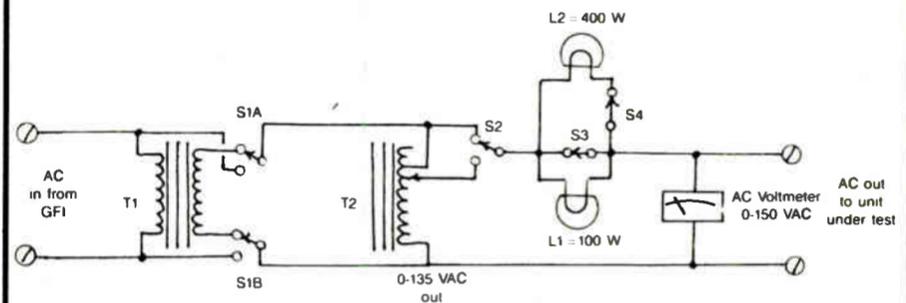
the problem.

In cases where the unit "takes off" after some point and blows the fuse, this allows you to slow the process down long enough to maybe see what is happening.

Using this is safer than using full unisolated line voltage on equipment with problems and can save you a pile of fuses or trips to the fuse box.

Frederick Baumgartner, assistant CE at KWGN-TV and former CE of WIBA, Madison, WI, is a frequent contributor to RW. He can be reached at 303-740-2883.

Figure 1. AC Bench Supply.



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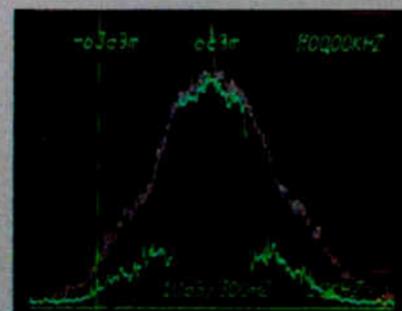
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18 GHz STLs: Son of 23 GHz

by Tim McCartney

Boise ID . . . If the attractiveness of 23 GHz STLs appeals to your station's needs, then 18 GHz is equally as bright for longer hops. M-A/Com is enhancing its 23 GHz line with the lower frequency and a couple of other manufacturers are doing likewise.

Since the traditional aural STL in the 944-951 MHz range has likely been long congested in your market and therefore not an option any more, the new band offers hope.

Those aspects of 23 GHz which are most appealing transfer over to 18 as well.

These include digital modulation of the video channel, additional high performance subcarriers and of course, available spectrum space.

As for the downside, rain attenuation heads the list. And since it is such a new technology, first-time users become part of the field testing.

Distances

While 23 GHz is usually limited to 10 miles or less, a distance of up to 15 miles is possible at 18 GHz with the use of the largest antenna size (6').

One manufacturer quotes a reliability factor in semi-arid Boise of 99.95% over 10 miles using 4' antennas.

Rain attenuation figures the greatest

impact on the possible distance. Only the wettest of wet snow has any effect at all. Typically, normal snow doesn't become a factor until transmission approaches 50 GHz or higher.

When pushing the limit out of the 15 mile maximum distance, the use of a 6' dish is essential. But, its 0.6° narrow beamwidth could introduce wind effects. It certainly requires careful alignment.

Staying well above the fade margin isn't always so predictable with new technologies (the first 18 GHz units were shipped in September 1987). There are, however, a few noteworthy comparisons.

Other users

Telephone company microwave links are frequently 60 miles at 12 GHz. And, TV stations in Boise are successful with their hops of 15 or more miles at 2, 7 and 13 GHz.

Transmitter output is 63 mW (+18 dBm) to 126 mW (+21 dBm), which is comparable to the 23 GHz power levels.

Experienced microwave engineers seem to prefer higher power levels over larger antenna sizes for long hops because of the problems with tighter beamwidths and signal bending.

By comparison TV stations in Boise are using 1 or 2 W at 13 GHz.

A possible area for improvement of this technology is the addition of an out-

put amp on the transmitter dish to boost transmit power. To date, however, this is an idea only.

Broadband use

Figure 1 demonstrates a possible use of the 10 MHz baseband, showing the video channel modulated digitally.

Sony pulse code modulation (PCM) is one way to do this, but the firm has abandoned production of the line in favor of development of its R-DAT technology.

In a few years Sony is expected to reintroduce some sort of replacement using the new system.

In the interim the dbx 700 is the primary but expensive way to do the job. However in RF environments like the transmitter building, the dbx system may be the only choice since Sony's units do not have balanced audio connections.

As for analog subcarriers, it looks like the sky might be the limit. After my 1 July RW article on 23 GHz, a representative of one firm called to say that he can insert as many as 12 analog subcarriers!

My own bench testing of one analog SCA on KBSU's 23 GHz system showed SNR down as low as -63 dB.

And, there was some trouble with the pre- and de-emphasis circuits. Final resolution of this problem awaits.

Part 74 of the FCC rules allows broadcast stations (radio included) to file in the 18 GHz band for STL use.

We can file in the 17.7-18.14 and 19.26-19.7 GHz ranges. Channels are generally 40 MHz wide. Thus, the lowest channel is 17.72 and the highest is 19.68.

FCC form 313 is used for filing.

More expensive

Of course it must cost more than the 950 MHz STL system—lots more. Here are some numbers.

A transmit and receive terminal, two 6' antennas, two SCA channels, etc. would cost about \$28,850. A savings of \$8,000 can be realized by using 2' antennas and dropping both SCA channels.

Compare this to the \$12,000 an equivalent 950 MHz STL costs. But then, if you could get a 950 license, you probably would have!

With the first units shipped last September it's hard to say how many radio stations will use 18 GHz for their STL hops. The band is open virtually to any user, much like 23 GHz.

As digital systems creep into our stations we should think about our STL systems.

If the timing, needs and maybe price are right, it may already be time to put digital between the studio and transmitter.

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



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Circle Reader Service 41 on Page 22



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Circle Reader Service 48 on Page 22

Just a Chief Engineer's Fantasy

by Barry Mishkind

Tucson AZ ... I have a dream ... Yet, upon reflection I guess it must have been that super rum chocolate desert creation.

At first I was sure the phone had gone off (at 3 AM yet!) and on the other end my friend and fellow engineer Bob was saying that it was essential that we meet immediately at his studio.

Well, OK, Bob's a good egg most of the time. He's helped me out during emergencies so I felt I'd better roll and get there as soon as possible.

Imagine my surprise to see the parking lot full of vehicles belonging to local radio engineers. What could be wrong, I wondered?

Did the transmitter explode? Did the antenna matching unit get hit by lightning? What *did* bring out all these chief engineers at 3 AM?

All seemed calm near the tower base so I figured that it obviously had to be a major failure in the control room.

Right, that old console did have a flaky power supply and it would be a disaster if it wasn't fixed by morning drive.

But inside the station there was no panic there, either! Everyone was sitting around in the conference room drinking coffee or cola, chatting about things engineering.

The real reason

Finally, Bob came in and started to explain. He'd been thinking about a discussion we'd had at the last radio engineers' luncheon.

He said he'd decided it was time to do something about the modulation wars that had turned virtually every station in the market to broadcasting square waves between 2.3 kHz and 2.8 kHz in an attempt to be the loudest signal on the band.

It had to be done in the middle of the night, he said, so that none of our PDs would get wind of us getting together and acting in unity to do something.

"Enough is enough!" he cried out. "We, as a group of professionals have to do something before average time spent listening drops below three minutes."

Bill spoke up in agreement, saying that there had recently been a whole series of auto accidents apparently caused by people distracted from road conditions while they tried to find a listenable station.

Peter felt the same way, and complained that his PD had demanded so much processing that the alley behind the station was now filled with the tops of waves that had been clipped in their new MegaMod audio machine.

Rich, who had a relative who used to

work for the FCC, finally admitted that his solution was special bribes through his cousin.

That kept the local FCC monitoring station from his door when they did a sweep of the market.

Quickly three guys wanted to know how much it cost. Rich clammed up.

One by one the engineers had their turn. The general feeling was that the modulation wars were not doing anyone any good, and the aural signature of our collective craftsmanship was not one of which to be proud.

Yet no one felt they could turn their processing down because the very next morning the PD would scream that they

were now only half as loud as station "X."

Was there anything that could reverse the trend to more and more smash?

The engineers talked of their feelings and the frustrations of dealing with a group of people that whose concept of modulation was watching the mod monitor needle hang motionless at 99%.

Anything less seemed to be considered a wasted opportunity to grab more listeners as they tuned past the station.

All that said, Bob went on to describe his plan.

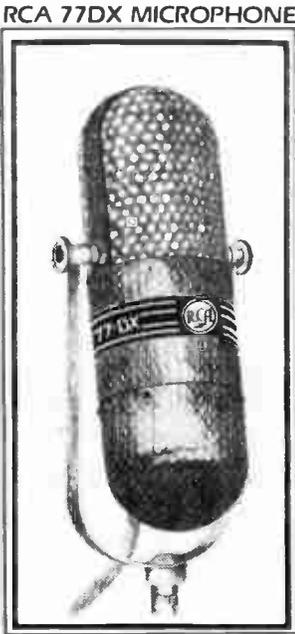
We would all go directly to our respective processors and remove exactly 3 dB
(continued on page 20)

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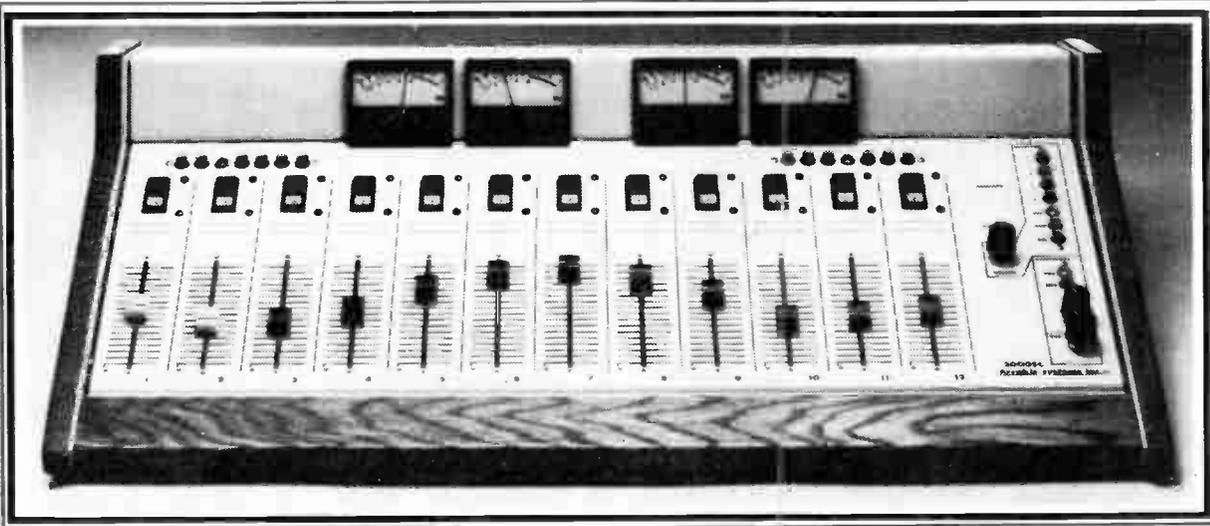
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Circle Reader Service 16 on Page 22

Charge For Service Phone Calls

(continued from page 11)

sale. Several computer companies charge, which Chenoweth suspects is "to avoid abuse of the service."

Moseley Associates' Sales Manager David Chancey said his company also offers phone support at no charge, and will attempt to repair "anything we have in the field, if possible."

Chancey said he "sympathized" with the attitude at IGM, particularly because of what appears to be a large amount of "recycled" equipment in the market.

Older products passed down to smaller stations may be "generations removed" from any current technology, Chancey explained. Providing technical support to a non-technically oriented consumer over the phone can become frustrating, he commented.

Support costs have in general increased in the broadcast industry, Chancey said, concurring with IGM's position. "Just trying to service the equipment in good conscience can be expensive," he added.

Still, Chancey said, Moseley has no plans to begin charging for telephone support for its products.

Customer service bought with products

Orban National Sales Manager Howard Mullinack said that customer service within the warranty period or afterward "is something the user is buying when they buy (Orban) products."

Orban does not charge for phone support, Mullinack noted.

Mullinack agreed with IGM contentions that support costs have risen and

that there are fewer people with technical expertise employed at some stations. However, he said that Orban tries to work within those constraints.

Mullinack added that, to a degree, increased support costs factor into the prices Orban sets on its equipment. He stressed, however, that price increases on Orban's products are "rising no faster than the rate of inflation."

Harris Broadcast Division also does not charge for telephone customer support. According to Harris Director of Sales Support Dave May, the broadcast

division has never charged for such service.

Still, May pointed out that the practice was not unheard of in other branches of Harris Corporation. Auditoron, a business computer system manufactured by a company owned by Harris, had charged by the phone call for technical service from 1982 until 1986, when Harris discontinued the product, May said.

May also concurred that a decrease in technical personnel and increased support costs are a problem for manufacturers.

He noted that in recent years there has been a shift of technical expertise away from radio towards other industries, which has resulted in more consultants servicing equipment. In areas where there are insufficient consultants, May said extra pressure is brought to bear on the manufacturer.

May suggested that if the mainstream broadcast market continued to lose technical ability in the field, Harris may have to institute maintenance programs or a subscription program for customer service.

However, he stressed, such programs "are not in Harris' plans."

For additional information, contact IGM at 206-733-4567.

A CE's Dream of Modulation Truce

(continued from page 19)

of clipping and 10 dB of compression from our audio chains.

We would all do it at exactly 5:03 AM, and then recalibrate our modulation monitors so that they would look exactly the same to the programmers.

Then we would lock up, go home and relax in the knowledge that everyone would be putting out a cleaner signal.

We would be getting a lot of calls, Bob said, asking what we had done to improve the sound of the stations in the market.

Consultants from all over the country would call and try to find out how we all managed to be both loud and clean, and how they could do it in their markets.

An award would come from the NAB proclaiming that we had done a major service to the industry and certainly we

would be in demand to consult the major chains.

Go for it!

With all that glory in our eyes, we went and did it. Not one PD noticed the difference in modulation levels.

Sure enough, my boss called me into his office and told me how much more his friends and clients liked our "new" clean sound.

When he asked me what it was I did I was busily turning my toe in the carpet, trying not to spill the beans and not claim all the credit.

"Well, we did do a few things with the audio chain to clean up some problems." And then, . . .

"Bzzzzzzz" It was the alarm clock. Time to start the day. It was odd how good I felt, as if we really had done it.

Driving in to work, I thought I heard less distortion and breakup than normal.

Maybe the plan is working.

Maybe, if we could take just a few more dB of smash out, it would clean up totally. Several ideas began to come to mind.

Arriving at the office I found a phone message from Bob. "Howdy, guy", he answered in a cheerful manner. "Got some good news!"

"Well, let me in on it", I replied.

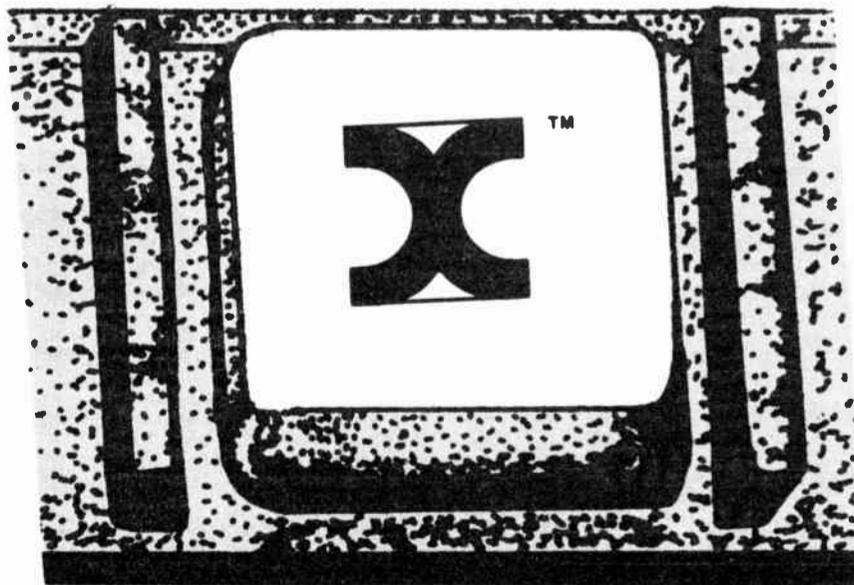
"OK", said Bob, "Just thought you'd like to know that overnight we installed the new Multi-MegaMod processor with the variable post squash tri-clipper circuit. We're now at least .025 dB hotter than you guys! Just try and catch up with us!"

I had a dream . . .

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797.

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BROADCAST COMPUTING

Program Adapts to PSA Levels

by Peter Burk

Pepperell MA ... Pre-sunrise authorizations (PSA) for AM stations often require low power levels that are not easily attained with the main transmitter.

One solution is a low-power transmitter just for PSA or PSSA operation.

Another, often less expensive, is a pre-sunrise adapter. Connected between the transmitter and the antenna, the adapter reduces the power going to the antenna while the transmitter hums along at full power.

Really nothing more than an RF power

splitter, the adapter consists of a capacitor in series with the antenna and an inductor in series with a dummy load of the same impedance as the antenna.

Bob Groome submitted this month's program shown in Listing 1, which calculates the component values for such an adapter. Here's how the program works.

From the data input in lines 40-70, the power ratio is calculated (lines 120-170).

The square root of that ratio is then used to determine appropriate inductive and capacitive reactances in lines 180-190. Lines 200-210 then calculate the component values, using the frequency

specified in line 60.

The current flow for each leg is computed in lines 140-160. Groome suggests coil and capacitor current ratings at least three times this amount to allow a safety margin.

Listing 2 is a trial run of the program. This is how it should appear if you run it on an IBM PC or compatible. Groome points out that you may have to shorten some of the variable names if your BASIC doesn't permit long variable names.

Figure 1 is the schematic for the PSA adapter. Groome adds that, "We could have just as well done this with the XL

and XC swapped."

He also suggests installing a tapped coil in series with a standard value capacitor. Then the coil can be used to set the capacitor to the exact reactance.

This program is available for downloading on the Allied/Radio World Bulletin Board.

Peter Burk is president of Advanced Micro-Dynamics. He can be reached at 617-433-8877. For questions about the program contact Bob Groome via the Radio World Allied Bulletin Board at 317-935-0531.

Listing 1. PSA Adapter Program in BASIC.

```

10 CLS
20 rem
30 Print "PSA Calculator Program"
40 INPUT "Transmitter Power";PHI
50 INPUT "Reduced Power Required";PLOW
60 INPUT "Frequency in kHz";F
70 INPUT "Impedance (usually 50 ohms)";Z
80 rem
90 rem
100 rem
110 rem
120 PDIF=PHI - PLOW
130 rem
140 IH1=SOR(PHI/Z): ILOW=SOR(PLOW/Z)
150 IDIF=PHI - PLOW
160 IDUMMY=SOR(IDIF/Z)
170 NI=SOR(PDIF/PLOW)
180 XL= Z/NI: REM INDUCTOR
190 XC= (NI*Z): REM CAPACITOR
200 L=159*XL/F: REM 159=1/2*PI*10 IN UH
210 C=159000000/(F*XC): REM C IN pF
220 REM
230 REM
240 PRINT
250 PRINT "For ";PLOW;" watts, you will need"
260 PRINT "an inductor of ";L;" uH in series"
270 PRINT "with your dummy load and a capacitor"
280 PRINT "of ";C;" pF in series with the"
290 PRINT "antenna system."
300 PRINT
310 REM
320 PRINT
330 PRINT "The current from the transmitter is ";IH1;" amps."
340 PRINT "The current to the antenna system is ";ILOW;" amps."
350 PRINT "The current to the dummy load is ";IDUMMY;" amps."
360 INPUT "qaxis ";A1: A=SC(A1): IF A=9 OR A=10 THEN END
370 GOTO 40
380 rem
390 rem by Bob Groome
    
```

Listing 2. A trial run of the PSA Adapter program.

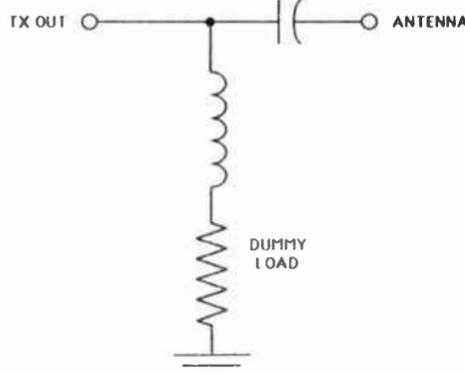
```

RUN
PSA Calculator Program
Transmitter Power? 1000
Reduced Power Required? 100
Frequency in kHz? 1230
Impedance (usually 50 ohms)? 50

For 100 watts, you will need
an inductor of 2.15442 uH in series
with your dummy load, and a capacitor
of 861.7386 pF in series with the
antenna system.

The current from the transmitter is 4.47214 amps.
The current to the antenna system is 1.414214 amps.
The current to the dummy load is 4.242641 amps.
qaxis 9
    
```

Figure 1. PSA Adapter Schematic. Program calculates values for a capacitor and inductor.



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Fail Safe: After Deregulation

by Harold Hallikainen

San Luis Obispo CA ... In our last article we looked at the old remote control fail safe requirements, and the discussion and rules on which current operator and remote control requirements are based.

Insight on Rules

At the NAB panel discussion on new technologies John Reiser of the FCC said he had some problems with the notion that fail safe had been eliminated.

"I know from where you're coming that we've considered the fail safe, which meant that if that line was severed that the transmitter automatically shut itself off. In that sense, fail safe was eliminated," Reiser explained.

"But," he continued, "the ability to turn the transmitter off at all times is still there. I guess traditionally you said you just open the line and that means turning the transmitter off."

I asked the FCC about various matters regarding what I call "continuous carrier control" (after all, "fail safe" has been eliminated!).

The response is in a letter from the Policy and Rules Division of the Mass Media Bureau dated 6 February, 1987 (call me for a copy).

I pointed out that even with "fail safe" it was common practice to have a short delay (generally under a minute) between the detection of loss of control and the transmitter shut down.

I proposed specifying the shut down period after loss of control at some longer period, perhaps up to the three hours permitted on loss of telemetry.

This would allow a pure dial-up sys-

tem to confirm operation automatically once every hour or two, insuring that the "control circuit" is still available.

Such a "handshake" procedure could be easily handled by requiring a control point computer to call the transmitter once an hour, confirming that the circuit and equipment are still available.

DTMF and voice synthesis

Then there are the computers (or programmable remote controls) that are not used for the control point terminal, such as systems that rely on DTMF control and voice synthesis metering.

In these cases the operator could call the transmitter site once every hour or two and key in a password confirming that the system is still operating properly and resetting a transmitter shut down timer.

With such a system the operator would generally be able to shut down the transmitter within 30 seconds—close to the immediate termination requirement of 73.1410(c).

Should the operator be unable to immediately shut down the transmitter due to a failure in the dial up telephone circuitry (or associated equipment) the transmitter would shut down anyway within three hours.

Although such an arrangement might appear to satisfy the requirements of the FCC Rules, it is *not* acceptable to the

FCC, according to the previously mentioned letter.

Necessary termination

The letter says: "You are correct that the station can remain in operation for a period of up to three hours after a telemetry (operating power indication) failure. This is on the assumption that the loss of readings probably does not mean an 'out-of-tolerance' condition."

"However, unless the ability to determine the operating parameters is restored within that time or manual operation is assumed, the operator must terminate transmissions."

The letter goes on to state that the means to terminate transmitter operation must always be available when the duty operator detects an out-of-tolerance condition requiring it.

"Although the traditional concept of telephone line or circuit fail-safe is not specified in the Rules, the requirement to immediately terminate operation is given in Section 73.1410(e)."

It goes on to say that if the dial-up telephone is not necessarily immediately available, the program line, microwave STL or other RF carrier can be used to shut down the transmission, each of these being under control of the licensee.

A dial-up phone where the transmitter calls the control point at regular intervals is permissible, the Commission maintains, but no substitute in out-of-tolerance conditions.

The Commission policy is, I believe, **(continued on page 24)**

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Circle Reader Service 15 on Page 22

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007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
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Circle Reader Service 44 on Page 22

New Telcos A Mixed Blessing

by Steve Church, Pres
Telos Systems

Part I

Cleveland OH . . . Just as there are no painless birthdays (above the 25th or so!) the growth of new telephone technology since deregulation has also been a mixed blessing.

While most of us would not want to return to the days of AT&T's monopoly rule over the phone industry, we are discovering that all of the new phone service options are requiring us to become more "tele-knowledgeable" so that we may wisely choose from among the many services and vendors vying for our business.

In my conversations with engineers and phone people, both while as an engineer myself and as I've assisted Telos 10 interface system users, I've had the opportunity to learn more than I thought I'd ever care to know about telephone companies and their phone networks, as well as the offerings of the private "interconnect" phone equipment vendors.

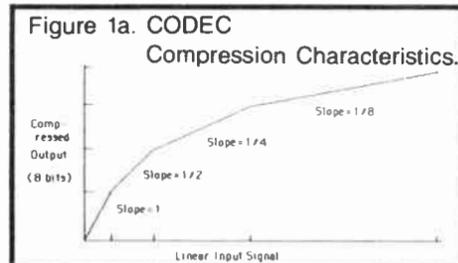
We'll start with a few notes on the telephone network—focusing on what is known in the industry as "POTS," or Plain Old Telephone Service.

Most stations are required to use special high-volume exchanges for their contest and request lines. This probably results from the days when aggressive PDs desired the publicity that "burning-out" a phone exchange would generate.

Some of you may recall a promotion

called "The Last Contest," which was designed with that goal in mind.

The choke network works by diverting calls beginning with the unique choke prefix around the local "serving Central Office" and sending them directly to the choke switching exchange, usually co-located with the main downtown ex-



change equipment.

The phone company dedicates a very few talk paths—wire trunks or special carrier equipment—to the task of connecting the caller's serving CO choke ports to the choke exchange equipment, bypassing the usual switching and routing process.

Unfortunately a very limited number of paths are generally provided. In the densely populated Los Angeles area, for instance, only three connections exist from most Central Offices.

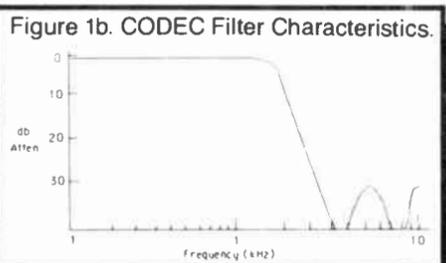
Often the poorest facilities are given over to high-volume service. After all, it's only kids calling for contests, right?

I heard a story once about three stations in a major city whose PDs were chasing each other around the clock with big contests. They realized that the

first station to announce the "cue to call" would fill the choke system to capacity, preventing the other stations from receiving *any* calls.

Despite complaints to the phone company, nothing was done.

Finally, a chief at one station had a brainstorm—he'd put the Marti in a truck



and drive around to various pay phones. Supposedly this idea worked; the phone company, it is said, suddenly found a way to increase capacity.

Warring PDs are not the only problem with choke service. Generally, unless you are near the choke CO, unique FX circuits are employed to connect the choke CO to your serving CO.

FX circuits are usually expensive, and pose certain technical challenges. FXs have separate "four-wire" send and receive paths with hybrids at each end.

Since, as we know hybrids are imperfect, a potential for a special kind of feedback called "singing" exists. This results from the inevitable leakage from the send to the receive ports at each hybrid.

How do the phone people solve this problem? By inserting a pad—anywhere

from 2 dB to 8 dB is common. This is one of the reasons why choke lines often have lower audio level than standard lines.

Because of their higher complexity, choke lines usually have bumpier impedance curves as well, making good hybrid performance at the radio station end difficult when simple analog units are used, due to the problem of finding appropriate balance network values.

In some areas, the FX circuits are being replaced by internal call-forwarding. This means that your published number is actually being software forwarded to your "real" number originating from your local serving CO.

The main advantage to this approach is the lower cost, since you don't have to pay the premium for the FX circuit. There is usually a small call-forwarding charge, however. The number of callers active in the choke system still is generally limited.

The new 5ESS exchange switches and others being installed in many areas have true digital talk paths as well as the now common digital control functions.

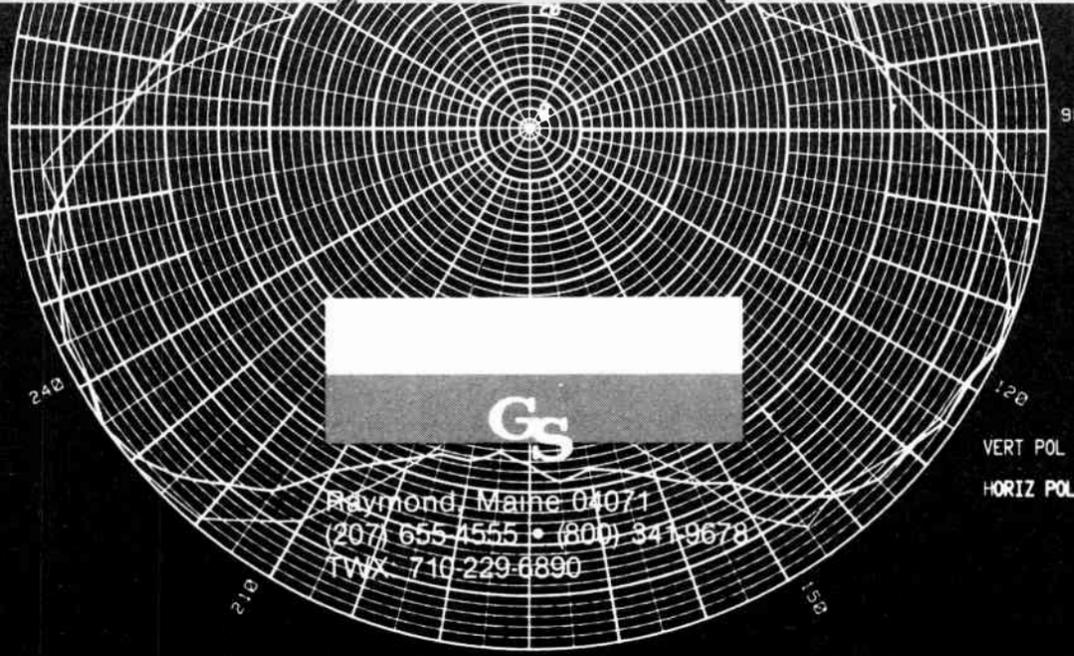
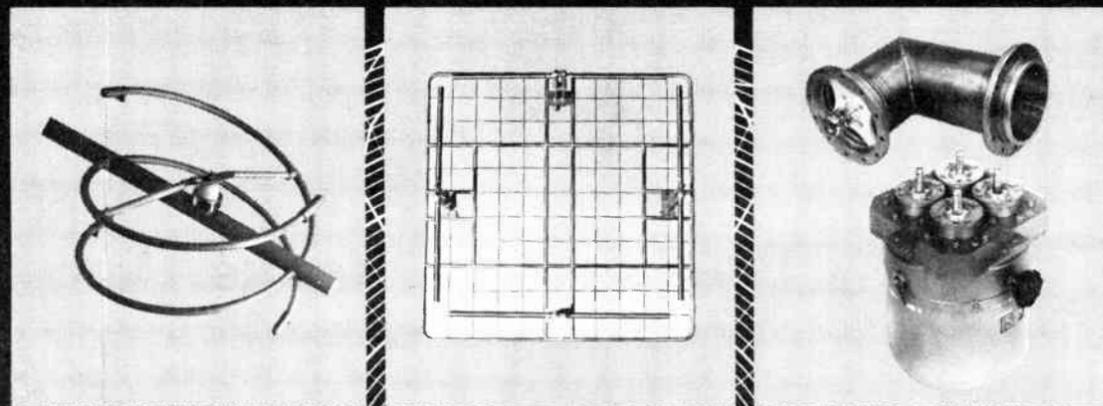
Speech is digitized in special A/D converters called CODECs (short for CODer-DECoders). CODECs are usually single chips which incorporate the required anti-aliasing filter, A/D, bus interface, D/A and smoothing filter—in a 28- or 16-pin DIP!

They are a remarkable example of current IC technology, but do have some flaws. Audio is "instantaneously" compressed (in the digital domain) in order to squeeze the full speech dynamic range into only 8 bits. Compare this to the 16 bits used for most audio digitiza-

(continued on page 24)

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Current FCC Policy on Fail Safe

(continued from page 22)

rather clearly stated in this letter although it may not be to our liking. Let's look at some of the current approaches to non-traditional remote control and see how they fit this policy.

First is the use of the STL squelch relay for "continuous carrier control."

Provided that the operator does indeed have control over the STL carrier on/off function, this would appear to allow the use of dial-up or other "part time" circuits for routine transmitter control and metering.

The operator must have continuous access to the STL carrier control switch.

Similarly, a program audio detect circuit could be used for "continuous car-

rier control" provided the operator has continuous access to a control that allows program audio to be removed thus causing the transmitter to shut down.

But the use of a control point where routine control and metering is accomplished over a dial-up circuit, but where continuous control of the program audio, STL carrier or some other continuous circuit to the transmitter is available does not appear to meet the requirements of FCC policy.

This would appear to allow the use of dial-up control from a studio location where the operator has access to program audio or an STL carrier switch.

It appears that using an answering service for transmitter operation can be

accomplished within the policy with certain precautions.

The answering service would need a continuous control over the transmitter on/off function.

If this is typically provided by an STL squelch relay, it may be necessary to run a dedicated phone line (or a dedicated radio circuit) from the answering service to the STL transmitter.

Silence sense

If lack of program audio is used to shut down the transmitter it may be necessary to run a dedicated phone line (or dedicated radio circuit) from the answering service to an audio program switch.

While many STL transmitters provided

a pair of contacts that can be shorted to enable the transmitter, merely extending these contacts through a leased line may not be satisfactory to the Commission in that a typical line failure (a short) would cause loss of continuous control and leave the transmitter on the air.

A typical method of detecting loss of continuous control in the old days (DC remote control) was to have the control point put a voltage on the line that is detected at the transmitter.

Having the answering service place a voltage on the leased line that drives a relay at the studio which, when released, drops the STL carrier or program audio, would appear to provide assurance that continuous carrier control is available.

Special cases

When placing remote transmitter control at non-traditional locations (such as the answering service), special precautions must be taken.

Many of these are not part of the remote control rules, but are required of each station anyway. These include the following:

- The operator must be licensed and fully instructed in the operation of the transmitter [73.1860].
- The operator must monitor the EBS monitoring assignment, either hearing that station continuously or hearing it immediately after reception of the EBS attention signal.
- The operator must transmit the EBS attention signal, send the appropriate voice announcement from the EBS Checklist, rebroadcast national emergency programming (EBS participating station) or shut the station down (non-participating station).

Next month, we'll continue with non-traditional remote control points, including program network control points and the CE's briefcase.

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200, or through the Radio World Allied Bulletin Board 317-935-0531.

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Telephone Technology

(continued from page 23)

tion (see Figure 1a and 1b).

The standard telephone sample rate is 8 kHz, meaning that the input anti-aliasing filter must be very steep in order to pass audio to 3.4 kHz and provide full attenuation at the Nyquist frequency of 4 kHz.

Fifth order ellipticals are used with an ultimate roll-off of only around 35 dB. This sounds respectable, but remember that anything above the 4 kHz Nyquist frequency will alias and appear in the 300 Hz to 3.4 kHz band as distortion.

Typical CODECs would probably have distortion of 2-3% from aliasing and other factors depending on the frequency distribution of the arriving audio.

If you've ever heard a strange sort of "raspy noise" on a telephone circuit that seems to be correlated with the speech, you are probably hearing the effects of this kind of distortion combined with audible quantization errors.

For more information, contact the author at 216-361-0463.

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Gates Solid Statesman II preamps (2) in operating cond w/manuals, \$50 ea, plus ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

Shure M64 phono preamp, \$50. P Cibley, Cibley Music, 138 E 78th, NY NY 10016. 212-986-2219.

PR&E SDA-8 rack mount stereo audio dist amp, new w/manuals (2), BO. R Royster, 8922 Valencia Dr, spring Valley CA 92077.

Phase Linear 400 & 4000 preamp, excel cond, as pair, \$400. W Laughlin, KDCV, 2636 N 56th, Lincoln NE 68504. 402-466-8670.

Rane HC6 6 chan stereo headphone amp, like new, \$200. G Ernst, Bayside Snd, P.O.B 166, Lincoln City OR 97367. 503-996-6020.

Crown D-60, \$250. J Diamond, Blue Diamond Studios, Box 102C, Chubbick Rd RD1, Canonsburg PA 15317. 412-746-2540.

Shure M67, gd cond, w/A67B & manual, \$200 plus ship. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

McIntosh 240, BO. H Quinton, BRT Recd, 275 E Oakland Pk Blvd, Ft Lauderdale FL 33312. 305-925-7117.

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Dynaco Stereo 70, P Hans, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883.

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AM tower for 1430 kHz, 160-170', BO. C Nandel, KAMP, POB 1018, El Centro CA 92244. 619-352-2277.

Scala color log for ch 3, (4) Scala HDV for ch 3 & 300' of cable. J Carroll, Carroll Bldg, POB 549, Tawas City MI 48764. 517-362-3417.

HF-4 1/8" Cu2Y 255' Cablewave Flexwell (141' new); (2) 734602 Cablewave gas pass female 6" connectors; 913864 Cablewave hoisting grip, \$4000/all. B Weiss, KLSI, 1722 Main, Kansas City MO 64108. 816-474-6400.

Cablewave 30' FLC7850J w/(2) N connectors; 10' FLC7850J w/(1) N connector. B Musso, WGC, 165 Harris St, Chester SC 29706. 803-377-1111.

Andrew 83799 1-5/8" fittings, EIA flanges for Andrew HJ7-58 heliax, \$69 ea; Andrew HJ7-59 heliax 1-5/8", gd cond, \$3/ft. W Foster, WBBK, POB 568, Blakely GA 31723. 912-723-4311.

Jampro 2 bay & ERI 3 bay on 92.1 MHz, BO. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-296-3797.

Andrew 3-1/8" coax, 425' w/connectors, EIA plus pressure inlet w/90 hangers & tower leg stand-offs, no burns. T Vaubel, KEZT, Box 1647, Ames IA 50010. 515-232-0104.

BFA-4-A 4 bay, tuned to 96.7 MHz antenna. P Knies, WBDC, POB 95, Madison IN 47250. 812-265-3322.

Comm Products 3-1/8" transmission line, 20' sections (10), \$90 ea; Kline 1000' guyed tower, standing near Albion NE, BO; GE chan 8 transmit antenna, TY-52B, 4 bay helical on tower, BO; Prodeline type 100-847 6 1/8" 50 ohm transmission line, (50) 20' sections on tower, BO. J Fuehrer, NTV Network, Box 220, Kearney NE 68868. 308-743-2494.

RCA BFH-7A FM antenna at 98.3, 1-5/8" flange input, excel cond, w/deicer transformers but not tower mounts or deicer external wiring, BO plus pkg & ship. S Kuiper, WFM, POB 147, Menomonee Falls WI 53051. 414-255-3100.

Phelps Dodge CPFM-8 8 bay CP antenna, tuned to 101.1 MHz, BO; 20 sections of 3-1/8" rigid coax, 20' length, including bullets & non-insulated hangers, BO; Stainless 3000' of 1" guy wire on reels of 1000', approx 2 yrs old, BO. R Goodman, WCKN, POB 650, Anderson SC 29621. 803-226-1511.

Cablewave FCC 38-505 510' phase stabilized cables (3) electrically phase matched to ±1° at 930 kHz, \$1000. T Fernandez, WKXY, POB 2500, Sarasota FL 33578. 813-366-4422.

ERI 25 kW isocoupler, 102.9 MHz retunable, \$2000. P Jellison, WBLY, 117 S Fountain Ave #301, Springfield OH 45502. 513-324-5643.

Andrew H850A, 8-1/8" heliax, 700' on spool, 12 yrs old, BO. G Velker, WMCU, 2300 NW 135 St, Miami FL 33167. 305-681-4689.

Tower, 309', 24" face insulated for AM, will hold FM & STL, 10 yrs old, \$3000 & you remove. P Jellison, WBLY, 117 S Fountain Ave #301, Springfield OH 45502. 513-324-5643.

Collins 37CP FM, 12 bay, 12 yrs old, rebuilt in 1986, BO. G Velker, WMCU, 2300 NW 135 St, Miami FL 33167. 305-681-4689.

Phelps Dodge, new in 1977, hi-power, 10 bay FM, 104.7 MHz, w/deicers, \$8000/BO. D Fields, KUFO, POB 1713, Big Spring TX 79721. 915-263-7326.

Phelps Dodge SPC-5, 5 bay FM heavy duty, new, used 6 weeks, BO. A Anderson, KBMR, 3500 E Rosser, Bismarck ND 58501. 701-255-1234.

Phelps-Dodge HFM-LP4 4 bay FM, 91.5 MHz, \$1000. E Welch, WKCL, POB 809, Ladson SC 29456. 803-553-5420.

Utility towers, (3) 250', standing on ground, like new phasor, 1070 kHz in Folsom, BO. A Anderson, KBMR, 3500 E Rosser, Bismarck ND 58501. 701-255-1234.

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SWA dual audio matrix system & XLR cable sets for simultaneous encode & decode of a stereo signal, made for Lexicon Inc, list price \$995, now \$395, new! Call Lexicon sales, 617-891-6790.

Orban 414A, used only 6 mos. J Kennedy, WGEL, POB 177, Greenville IL 62246. 618-664-3300.

Shure SM-7, \$275; new SM-54, \$175. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Altec 9860A graphic EQ. W Ditzel, Ditzel Prod, 933 Shroger Rd, Dayton OH 45419. 513-298-5381.

Eventide BD980 stereo digital delay, used less than 5 mos, \$4500. J Boyd, Capps Bldg, 115 NW Oregon Ave #18, Bend OR 97701. 503-389-7885.

Shure M-625 Voicegate, one new, \$100 plus ship, one used, \$75 plus ship. S Sibulsky, KVNI, POB 308, Coeur d'Alene ID 83812. 208-664-9271.

Symetrix SE-400 parametric EQ, excel cond, \$350; Soundcraftsmen SE-540 10 band/chan EQ, gd cond, \$100. C Fries, KSQY, Box D, Deanwood SD 57732. 605-578-3533.

Harris Phase Fizer audio TBC, w/3 encoder units, 18 mos old, BO. T Bryan, KARO, 503 Old Hwy 63, Columbia MO 65201. 314-442-3116.

dbx 150 type 1 NR, \$140/BO. R Branske, WLOO, 875 N Michigan, Chicago IL 60611. 312-440-3100.

Furman RV-1 reverb w/limiter, mint cond, \$180. R Coates, KJJG, 724 2nd Ave E, Spencer IA 51301. 712-262-8036.

Fisher stereo reverb, \$50. R Coates, KJJG, 724 2nd Ave E, Spencer IA 51301. 712-262-8036.

Dorrough 310 FM DAP tri-band compressor/limiter, matched pair FM, mint w/manuals, BO; PR&E MX FM, AM Multimax tri-band compressor, matched pair FM, new & two AM models, one new, one used, mint cond, \$1000 for FM pair, \$500 for AM model w/manuals. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

SAE 5000A NR, mint cond, \$150; Phase Linear 1000 single-ended NR, expander, limiter, excel cond, \$125; ADC SA-1 spec analyzer, \$85. W Laughlin, KDCV, 2636 N 56th, Lincoln NE 68504. 402-466-8670.

White 1/4 oct passive EQ, high end & 1 kHz boost modules, rack mt, excel cond, \$90. B Busetti, Lizard Elect, 1124 W 2nd St, Florence CO 81226. 303-784-3540.

Shure FP11 & FP12 mic to line & headphone amp, \$89 ea. C Butler, Butler Bldg Srvs, 1775 Bartlett Ave, Orange Park FL 32073. 904-264-8169.

Symetrix SE400 EQ's, \$250; Soundcraftsmen SE450 EQ, \$100. C Fries, KSQY, Box D, Deadwood SD 57732. 605-578-3533.

Shure Production Master sub-mixer, mates to M67/M267, \$100 plus ship. S Sibulsky, KVNI, POB 308, Coeur d'Alene ID 83812. 208-664-9271.

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ERI Super Power 6 bay FM on 94.7 MHz, \$1000. WFBQ, 616 Fallcreek Rd, Indianapolis IN 46220. 317-257-7565.

Tower, 70' self-supporting, \$1000. D Fields, KUFO, POB 1713, Big Springs TX 79721. 915-263-7326.

Tower, 980', solid leg, zone A w/guy wires, on ground. L Dupree, KQID, POB 7057, Alexandria LA 71301. 318-445-1234.

Gates lighting chokes, (2), never used, \$75 ea/BO. G Wilson, WGLE, 7519 Dorr #196, Toledo OH 43617. 419-865-7289.

ERI CP FM 4 bay, B Dodge, WTU, POB 1818, Brattleboro VT 05301. 802-254-2560.

Continental/ERI 12 bay CP antenna, 93.1 MHz. L Dupree, KQID, POB 7057, Alexandria LA 71301. 318-445-1234.

Pirol 18, 200' tower, 7 yrs old, on ground, \$2395 plus ship. S Peters, KKCM, Box 357, Minneapolis MN 55379. 612-496-1530.

Phelps Dodge 4 bay FM HP, 96.7 MHz, \$2500. J Powell, WSEL, POB 240, Pontotoc MS 38863. 601-489-1440.

Rohn 65G (350') w/guys & light fixtures, excel cond, \$10,000; (14) 20' sections of 4" face w/Torgue Gay Dresser tower, \$15,000. G Johnson, Johnson Tower Service, POB 66, Burlington ND 58722. 701-839-3229.

H&W microwave antenna, \$500. R Smith, WGSB, POB 406, Summersville GA. 404-857-5815.

Gates 6 bay, 106.5 MHz or trade. K Le Masters, Thomas Comm, POB 249, New Martinsdale WV 26155. 304-455-3030.

Shively Labs 6811, 1 kW low power CP, 2 bay FM, 103.1 MHz, w/mounting brackets, \$300. D Matthews, KASK, 802 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

Tower, 85' heavy duty, free standing tapered tower, base 8' square. S Bauder, WOE, E 1825 Hwy 182, Park Falls WI 54552. 715-762-2611.

Hughes & Philips beacon, side light flasher & cell, trade for Marti equip/BO. B Zellmer, KRZD, POB 2224, Greeley CO 80632. 303-351-8354.

Rohn 45-G 10' section, w/tapered base. B Zellmer, KRZD, POB 2224, Greeley CO 80632. 303-351-8354.

RCA TFU24DM UHF ant, ch 41, \$5000; MC UHF corner reflector ant, gain of 10, \$250. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TFU 24DM UHF ant on chan 41, \$5000; EMCEE UHF corner reflector antenna 10 gain, \$200. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Gates FMC-10, 10 bay FM w/de-icers, avail soon, \$5000; Utility Type 480, 95' guyed tubular tower, 30" face, non-insulated, avail soon, \$1000; Utility 95' pole, approx 10" diameter, avail soon, \$2000. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Want to Buy

Nitrogen regulator & fittings for pressurization of transmission line. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

High band VHF TV antenna, tuneable to chan 10 or 12, will re-harness & rebuild. J Powley, KIUU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Bogner or Scala UHF TV translator or LPTV antenna, for low end of UHF band, 1 kW input rated or more pref. J Powley, KIUU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Antenna feed line, 7/8", 500-1000'. R Wright, WLLX, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-2916.

AUDIO PRODUCTION OTHER

Want to Sell

Eventide H949 Harmonizer, like new, \$2500. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

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Want to Buy

Various cart machines, turntables, boards, etc. Fox Radio, POB 3387, Cocoa FL 32924. 305-799-3306

Quad headphones. D Fortenberry, KVON, 1124 Foster Rd. Napa CA 94558. 707-252-1440.

Alden C2000 color radar w/zoom soft wave w/19" RGB monitor & autodialer, \$4800. B Hughes, KNET, POB 649, Palestine TX 75801. 214-729-6077.

AKG K340 headphones, \$115. S Rosenthal, Rosenthal Prod. 3145 Geary Blvd Ste 344, San Fran CA 94118. 415-665-1035.

AUTOMATION EQUIP.

Want to Sell

Schafer 800 control unit, as is in rack, \$400 w/diagrams. N Allebaugh, WICE, 100 John St. Cumberland RI 02864. 401-725-9000.

Autocue 25 Hz tone gen, rack mount, gd cond. manual, \$100 plus ship. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

SMC 450 Carousel bi-directional, excel cond, \$2500. B Stephens, WQCB, POB 273, Brewer ME 04412. 207-989-5631.

SMC RS50 (3) 50 event programmer for 250 & 350 series Carousels, w/cables, \$500 ea. R Casey, KGOK, POB 610, Pauls Valley OK 73075. 405-238-3314.

Gates SC-48 system, (4) Carousel, (2) random access units, (2) Scully 270 RR switcher loggers extras, as is, you pay frt, BO. JR Cox, KRZK, Box S, Branson MO 65616. 417-334-6003.

Harris 995-7867-001 R-R source interface cards (2) for System 90/9000, \$150 ea. C Bryson, Comserv, 93 Robinhood Dr, Zelenople PA 16063. 412-776-5204.

Schafer system, (4) Ampex 440 R-R's, (2) McCarta cart machines, presently in use, gd cond, avail aft 11/1/87. \$500. K Steinhilber, WWPA, 230 Market St, Williamsport PA 17701. 717-323-7119.

Instacart 48 PBS stereo, used less than 50 hrs, mint cond, \$7500 firm. D Jenkins, KCLB, 50 Mark West Springs Rd #3, Santa Rosa CA 95403. 707-528-9236.

MEI 100MP microprocessor control programmer, w/latest factory mods, run 8 sources plus net input, \$2000. T Saunders, WSBH, 56 Tagger Ln, Southampton NY 11968. 516-283-9500.

IGM Instacart 24 tray, mono, BO over \$2000. K Harnack, KWLN, 88 Union Cntr Ste 309, Memphis TN 33103. 901-529-0098.

SMC ESP-1 complete w/remote control, data encoder, (3) IGM Instacart decks & interfaces, \$20K/BO. P Wolf, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

BE System 16X, excel cond, 3 yrs old, (4) Otari ARS-1000s, (2) IGM 24-tray, IGM 48-tray, control panel, live-assist panel, (2) CRTs, battery backup, all interfaces, T Spaight, WLRZ, POB 73, Peru IL 61354. 815-224-2100.

Sono-Mag 250RS 24 tray stereo Carousel, new, wired for RS, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Automation System, SMC DP-1 programmer, 16 chan switcher, 4 SMC/Otari reels, Scully 270 reel, 5 SMC 252-RS random select Carousels, 3 dual PB cart machines, time announcer, teletype logging encoder/decoder, \$8000. D Mackenzie, WJBR, 2617 Ebright Rd, Wilmington DE 19810. 302-475-4000.

CAMERAS (VIDEO)

Want to Sell

Sony DXC-1640 single tube camera, \$900. J Fuehrer, NTV Network, Box 220, Kearney NE 68868. 308-743-2494.

Hitachi FP40S Saticon camera w/access & lens, BO over \$3000. Kosack, 516-489-1071.

Panasonic NV9400 w/2 battery's, Porta Brace, battery charger & service manual, like new cond, \$2850. R Nimtz, Univ of Notre Dame, POB 542, Notre Dame IN 46556. 219-239-6423.

Norelco PC 70 w/10:1 Angenieux lenses (11) all need work, \$3000/all. N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

JVC KY1900 w/case, battery & charger, excel cond, \$2200. R Larson, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-848-3172.

Want to Buy

Bdct quality chip camera, anything reasonably priced, possibly compatible to Betacam. Kosack, 516-489-1071.

IVC 500 (3), BO. JB Salazar, Missionary Bible Crusade, 102 E Lyon, Baredo TX 78040. 512-722-6832.

CART MACHINES

Want to Sell

Orrtronic cart tape replater, \$175. W Ditzel, Ditzel Prod, 933 Shroger Rd, Dayton OH 45419. 513-298-5381.

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Tapecaster, Spotmaster machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7222.

Telex Viking 230 (2), \$125 ea. M Preace, Foothill Deanza Comm Coll, 12345 El Monte Ave, Los Altos Hills CA 94022. 415-960-4260 or 408-773-9793.

Spotmaster 5 spot cart machine, \$500 plus frt or trade for Tapecaster RP plus \$200. B Brown, Pro Bdct Serv, 3720 Greenwich Rd, Louisville KY 40218. 502-459-8792 aft 5 PM.

Beaucart Type 22, (2) stereo PB, gd cond, \$400 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Collins Twin-Tape R/P, in service, \$250. L Houck, Rollin Recdg, 210 Allgett, San Antonio TX 78201. 512-736-5483.

RCA RT-126 mono R/P, gd cond w/tech manuals, \$200; RCA RT-126 mono PB, \$150; rack mount tray for (2) RT-126 cart machines, \$25. P Combs, Only Son Prods, 2316 Forrest Home Ave, Dayton OH 45404. 513-236-2340.

Gates-ATC Criterion 80 mono cart machines (2), gd working cond, \$250 ea. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

Tapecaster 700RP, gd working cond, \$475; Tapecaster 700P, gd for parts, BO. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

PR&E Tomcat, rackmount stereo R/P w/factory spare parts kit, Maxitrac heads, new; (3) Tomcat stereo reproducers in rack mount, trimount, new, Maxitrac heads w/manuals, \$11,500 for all 4. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Audicord A-Series stereo reproducers, as is, need work (3), \$150 ea. E Welch, WKCL, POB 809, Ladson SC 29456. 803-553-5420.

Spotmaster 500BR R/P unit, works, \$150. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

Audicord A-Series stereo R/P w/3 tones, as is, need some work, \$250/BO. E Welch, WKCL, POB 809, Ladson SC 29456. 803-553-5420.

Spotmaster 1070 R/P, mic & line inputs, mono, \$300. P Badger, WKRE, POB 220, Exmore VA 23350. 804-442-5000.

ITC RP-3 mono R/P desk mount, 2 tone, excel cond, w/manual, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

ITC SP-3 (2) desk mount stereo reproducers, excel cond, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Want to Buy

ITC splicefinder, S James, Re-nu Carts, Rt 6 Box 127, Ottumwa IA 52501. 515-684-7012.

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.

Splicefinder, good used one. D Sherwood, WMKC, 334 N State, St Ignace MI 49781. 906-643-9494.

ITC Premium Line parts, pieces, boards, cases, WP deck, any cond. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Ampex 4 trk w/electr, 1/4" 1/2 & 1/4 trk heads, remote, \$2550. D Green, Waves Snd Rcdrs, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Uher Reporter 440, \$150. JB Salazar, Gods Missionary Revival Crusade, 102 E Lyon, Laredo TX 78040. 512-722-6832.

Metrotech logger, gd cond, BO. Kosack, 516-489-1071.

Revox A-77 2tk sell/trade for IBM compatible PC; 14" reels IGM prerecorded easy listening tapes (30). F Anderson, Anderson Assoc, 3801 5th Ave S, Great Falls MT 59405. 406-452-2810.

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Sony 501PCM 2 chan digital recorders (2), one \$700, one \$500 as is. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.

Technics 1520 (2) 2 trk, \$500 ea. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.

Ampex 440C mono in factory cabinet, \$1200. D Green, Waves Snd Rcdrs, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Otari MX5050BII 2 trk, \$1200. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.

Tascam 122B w/RC90 remote control, \$325. J Travis, WKIC, POB 506, Bath NY 14810. 607-776-4151.

Pentagon cassette duplicators, 1 master, 3 slaves, mono. N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Ampex AG500 2 trk in Ampex shipping case, gd cond, \$300. G Give, Video Connection, 31844 Ranch Amigos Rd, Bonifall CA 92003. 619-749-7662.

Ampex AG 350, gd cond, \$300/BO. L Houck, Rollin Recdg, 210 Allgett, San Antonio TX 78201. 512-736-5483.

Sony 777, (5) some mono, 2 trk, 1/4 trk, some rack mt, some case, call for specifics, \$75 ea. M Preace, Foothill Deanza Comm Coll, 12345 El Monte Ave, Los Altos Hills CA 94022. 415-960-4260 or 408-773-9793.

Ampex single chan chassis tube elect, \$50 ea. M Preace, Foothill Deanza Comm Coll, 12345 El Monte Ave, Los Altos Hills CA 94022. 415-960-4260 or 408-773-9793.

Ampex 351 2 trk, 7.5/15, \$450; 1/4 trk 3.75/7.5, \$250. M Preace, Foothill Deanza Comm Coll, 12345 El Monte Ave, Los Altos Hills CA 94022. 415-960-4260 or 408-773-9793.

Scully 250-2 R/P, 2 ch 2 trk stereo, 7.5 & 15 ips, 10.5" cap, rack mountable simulsync, rarely used mint cond, w/manuals, \$925 firm. J Lee, WNGS, POB 1292, Lake Worth FL 33460. 305-969-3684.

Technics RS-B100 studio grade cassette deck, rack-mount, 1 yr old, \$395. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Crown 801 FT portable w/case & 4 chan mic mixer, vgc; Crown portable amp/speaker, rarely used mint cond, w/manuals, \$925 firm. J Lee, WNGS, POB 1292, Lake Worth FL 33460. 305-969-3684.

Ampex PR-10 (2) FT unmounted, working, \$300/both. B Weiss, KLSI, 1722 Main, Kansas City MO 64108. 816-474-6400.

Ampex PR10 w/manual, \$100; Crown 700, 2 trk, w/manual, \$150. R Nimtz, Univ of Notre Dame, POB 542, Notre Dame IN 46556. 219-239-6423.

Ampex AG440C 1/2" 4 trk, mint cond w/metal roll-around cabinet, DC servo capstan motor, 7.5 & 15 ips w/AG440 remote control, complete service manual & STL test tape, \$3200. J Block, The Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Scully 280 R/P, takes up to 14" reels as-is, repairable, w/book, \$200. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Ampex AG-440 mono in Russlang wooden roll-around console, 7.5-15 ips, \$1250. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Ampex 351/440, 2 trk in console, excel cond, \$1000; Ampex MM1000 transport parts; various cassette decks; reverb equipment; generators; & various recording studio gear, call for details & prices. B Skye, Plant Recdg, 2200 Bridgeway, Sausalito CA 94965. 415-332-6100.

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Ampex MM1000 16 trk w/dbx NR, VSO remote control, test tape wiring harness, spare parts, new heads, \$6000. G Ernst, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

Telex 6120 R-R module, like new, \$1995. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Ampex Parts, 351 transport, no capstan motor or heads, \$100; 7.5 & 3.75 ips motor & 15 & 7.5 ips motor, \$75 ea; AG-350 2 trk elect, \$150 for pair; AG-440 2 trk electr w/AG-440 PS, \$250; AG-440 rec & play heads, \$75 ea; (2) homemade wood recorder consoles w/overbridge for 7" of elect, \$50 ea. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Ampex 601 portable unit in case, mono, no power cord, \$150. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

Scully 100 parts, motors, schematics, call or write w/req; Scully 24 trk w/16 trk heads, spare parts, doc. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Ampex 601 portable unit in case, mono, no power cord, \$150. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

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Ampex AG350 ss 8 trk, \$2200; Ampex 350 ss 4 trk, Ampex 350 ss, 3 trk, \$725; Ampex 350 2 trk (2), \$700 ea; Ampex FT 350, \$525. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Dokorder 1140 1/4" 4 trk, gd cond, \$500. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

Ampex PR10 rack mnt w/elect, works OK, \$150 plus frt. M Kanter, WPOB, 50 Knickerbocker Rd, Plainfield NY 11803.

Pioneer 102L 1/4" 2 chan w/4 chan repro, gd cond, \$300. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

Otari MX5050-QHXD 1/2" 4 chan, excel cond, low hrs, recently realigned, almost new, \$2000. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

Scully 280-2 (2) in roll around cabinets, \$900 ea. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

Scully 284-8 1" 8 trk, late model w/silent punch & motion sensing, used only in home studio, w/4 spare record/repro modules, excel cond, \$2900. B Sgorbati, Sgam Recording, 747 Saddle River Rd, Monsey NY 10952. 914-356-6553.

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Revox B710 MK 2 rack extensions, \$10. Teac TZ612 reel hubs, black, \$10. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Revox B710MKZ service & parts manual, \$10. Teac 3440 service & parts manual, \$5; Revox B77 MK II ops manual, \$5; Technics 1500 US service/parts manual, \$5. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Scully 284-B : 4 track heads & misc parts - New - Make offer or trade for Ampex 440 B or C electronics. Ampex ATR 100 circuit boards : price—Ampex PR-10-600 heads 75% off. What do you have to trade? All items in this offer limited to stock on hand.

B Lindahl, NorthWestern Inc
1224 SW Bowly Portland OR 97205
503-226-0170 or 800-547-2252

Scully 280 2 trk, w/wood console, \$600/BO; Superscope RBC-2, 5 V NiCad battery pack, \$12; VSC Soundpacer C-4, new cond, \$125; Alpha 21, 16:1 hi-spnd mono cass dupl, vgc, \$700. Ed Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Otari 5050 8 trk wrack & splices, \$3500; Otari 5050B 2 trk master machine, \$1500. W Brengman, Bill Harris Std, 74 N 9th Ave, Beachgrove IN 46107. 317-787-2001.

Roll-around cabinet w/overbridge, cut for Revox A77, \$100. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.



Broadcast Equipment Exchange

CASSETTES . . . WTS

Ampex 350 FT w/manual, \$500/BO. B Fourer, Fourer Prod, 38190 Twin Pines Dr, Warrenville IL 60555. 312-393-1179.

Want to Buy

Pioneer RT701 or 707, working & in gd shape, 2 or 4 trk. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

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

Teac RC120 remote to fit Teac 3340S. K Moore. Listen to Your Heart Music, 4119 Aberdeen Ave, Nashville TN 37205. 615-385-2470.

Rack mounts for Revox A77, at least 1, 2 pref. R Petty, KORE, 2080 Laura St, Springfield OR 97477. 503-749-5673.

Studer B67 MK 2, in gd shape, ready to go. R Cannata, Canfrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Scully 284B-8. M Guthrie, WUSA, 504 Reo St, Tampa FL 33609. 813-876-0455.

Crown SC824 rec & amp elect. DMT AV, Box 9064-RW, Newark NJ 07104. 201-484-5291.

RT707 1/4 reversible reel. J Vukelich, Metrc Recdg, 4551 Flag Ave, Minneapolis MN 55426. 612-537-1431.

CONSOLES

Want to Sell

CCA Futura Six stereo broadcast board, works \$750. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

Harris Gateway, mono 8 chan, now in service. BO. JR Cox, KRZK, Box S, Branson MO 65616. 417-334-6003.

Ampro, 5 chan mono, fair cond, operating, \$175. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Neotek Series I, 16 x 8 x 2, \$5000, BEM 100 dual mono bdct console, \$895; Teac mdl 3, 8 x 4, \$250, all complete w/full manuals. T Trott, 305-323-0472.

Soundcraft 200B-24 audio mixer, excel cond, \$2500. J Fugher, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Yamaha PM-430 8 x 2 portable mixer, mint cond, \$700. B Weiss, KLSI, 1722 Main, Kansas City MO 64108. 816-474-6400.

Harris Stereo 5, BO. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-296-3797.

Ramsa URTA-20, 20 x 8 x 2 studio board, mint cond in teakwood console, \$5500 incl 3 patch bays. J Block, The Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Harris Stereo 80, gd cond, \$1000. H Gibbs, College of Wooster WCWS, Box 3177, Wooster OH 44691. 216-263-2000 X2767.

Gates Yard power supplies & monitor amps (2) in excel cond w/tubes, \$75 ea; GE BC-1A power supply, gd cond, needs minor work, \$30; Gates Yard misc parts, some new, some used, call for details. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

Russco 505 mono, new, \$900. J Bretzke, 709 Colgate, Lancaster TX 75115. 214-227-9077.

BE 4M50 mono 4 chan, w/spare chips, gd cond, \$500. B Brown, Pro Bdct Serv, 3720 Greenwich Rd, Louisville KY 40218. 502-459-8792 aft 5 PM.

API console parts: amps, faders, meters, older 2061 type input modules, 4 chan/assembly, 24 chan monitor mix section. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Auditronics 110-8 16 x 8 x 2, 16 VU's, 16 trk monitor & foldback system, built-in timer, spares, \$5000. N Burke, Burke Sound, 50 Mendell #11, San Francisco CA 94124. 415-285-8800.

Optimix disc based automation system, 40 chan capacity, w/32 VCAs presently installed. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Gates Dualux II stereo 8 chan, gd cond w/spare modules, 9 spares inc program output & PS, in service now, \$700 plus freight. W Brown, WACF, POB 367, Paris IL 61944. 217-465-6336.

Teac Series 10A *R&B, A fully loaded, 12 in 4 out studio ready, \$1500; B is 12 x 4 mixer, \$1000. R Clark, Tru Sound Std, 106 S Swenson, Stanford TX 79553. 915-773-3314.

WE 12B, power supply needs work, otherwise almost mint cond, w/manual, BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Soundworkshop 1280B, 12 x 8 x 2, \$1500. S Burgh, Bdct Monster Stds, 645 Bdway, NY NY 10012. 212-260-5226.

RCA 8 chan, dual bus tube type console, BO plus ship. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

API console parts, EQ's, line amps, mic amps, blank panels, faders, input modules, card cages, opamps. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Sparta A-16R rack mountable console, 5-chan, 15 input, 2 chan output, \$600 plus ship. S Sibulsky, KVNI, POB 308, Coeur d'Alene ID 83814. 208-664-9271.

Ampex MX35 mixers (3), \$250 ea; Altec portable mixers 1567A, \$260 ea; Sigma mixers (4) 4 chan, \$240 ea. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Studio Mixer II, 24 x 8 x 2, 3 band EQ, 6 sends, never used, \$3900. B Sgorbati, Sgam Recording, 747 Saddle River Rd, Monsey NY 10952. 914-356-6553.

Auditronics 501 16 trk 26 inputs, 16 x 8 x 2 in line modules, 4 band EQ, monitor & echo assign, almost new, \$9500. B Vneis, BV Snd Studios, 211 E 43rd St, NY NY 10017. 212-949-9170.

Tangent 32-16, 16 bus, 8 x 8, producer's desk, normalized patch bay, like new, comes w/pedestal & snake, \$4200/BO. R Tyrone, DB Snd Prod, 3902 Palomar Ln, Austin TX 78727. 512-255-9975.

Ramsa WR88-16 mixing console, \$3500. W Brengman, Bill Harris Std, 74 N 9th Ave, Beachgrove IN 46107. 317-787-2001.

MCI JH416 16 chan mod w/low noise opamps, \$2000/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Studiomaster 16 x 8 x 2, Anvil case, like new, \$1600. B Busetti, 1124 W 2nd, Florence CO 81226.

Russco 505 Studio Master console, mono, BO. K Schipper, KQKS, 9191 Sheridan Blvd, Ste 205, Westminster CO 80030. 303-427-7700.

Sparta 8 ch stereo w/power supply, \$375. B Fourer, Fourer Prod, 38190 Twin Pines Dr, Warrenville IL 60555. 312-393-1179.

Shure M-267, almost new, \$195. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

McMartin B-801, mono, 8 chan, gd cond, w/spare boards, \$850. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

Sony MX-16 8 x 4 mixer, works fine, OK cosmetics, w/spare pot & service manual, \$175. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Automated mix system retrofitable to any console, Optimix disc based system w/40 chan capacity, 32 VCAs in this system, \$10K. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4468.

Gatesway mono 8 pot board, tube type, fair cond; also Collins 212E in fair cond, sell or trade for R-R. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Want to Buy

Gates Yard, stereo, immaculate cond, have parts, want complete console. B Bartoli, New World Bdct, Rte 2 Box 749B, Mt Shasta CA 96067. 916-926-3273.

Teac 2A mixer. R Coates, KJGG, 724 2nd Ave E, Spencer IA 51301. 712-262-8036.

DISCO & SOUND EQUIP.

Want to Sell

dbx 161 compressor/limiter, \$150. D Green, Waves Snd Rcds, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Echoplex III reverb 142, vgc, \$800. D Green, Waves Snd Rcds, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Ursa Major 8X-32, digital reverb w/programmable memory, like new w/manual, rack mountable, stereo, \$800. K MacGregor, 38 Talbot Ln, Greenwich CT 06820. 203-531-6075.

Orban 622B, parametric EQ, stereo, 4 bands/chan, excel cond. K MacGregor, 38 Talbot Ln, Greenwich CT 06820. 203-531-6075.

Mic splitter, 3 space rack panel w/3 Audisar transformers plus 1 Hi Z to Lo Z instrument transformer, ground lift switchers, \$125; Scamp mini rack w/power supply, TT patch-bay, 504 parametric, S23 stereo autogpanner, F300S expander/gate, 501 compressor, \$1500. R McMillen, Cascade Recdg, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

EML 101 synthesizer plus Roland 104 analog sequencer, FAT 4 oscillator analog sound, \$500/pr. R McMillen, Cascade Recdg, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Mic snake, 50', 12 input, \$150. S Burgh, Bdct Monster Stds, 645 Bdway, NY NY 10012. 212-260-5226.

Fairchild 359 spring reverb, \$250. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Complete 8 trk prod studio incl Scully 264-B. Soundworkshop 1280, etc., \$10,000. T Houston, Custom Audio Recdg, 929 California Ave, Bakersfield CA 93304. 805-324-0736.

KEF 104AB studio reference series speakers, (2) no grills, excel cond, \$500. M Milchman, Unsprung Music, 322 W 57 St, NY NY 10019. 212-469-7354.

JBL 4312 studio monitors, \$400/pr; Century L100, \$300/pr; 4408, \$200/pr. G Ernst, Bay-side Snd, POB 186, Lincoln City OR 97367. 503-996-6020.

EMT 140-T vintage reverb, mono, \$1500. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Studio Tech Echoplex II, \$1200/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Studio package, 16 input console, 2 trk & 8 trk Scully, D150 Crown amp, Russco TTs, (2) Altec limiters, Fairchild limiter, (2) mixdown speakers, 8 mic booms, cassette recorder, Sony & AKG mics, \$6500. B Burchett, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

EMT 140ST reverb plate, excel cond, \$3200. R Vogt, Vogt Quality Rec, Box 302, Needham MA 02192. 617-444-8687.

Delta Lab DL-4 digital delay, \$325; Loft delay line/flanger, \$200; Eventide phaser, \$375; Omni-Craft 4 chan noise gate, \$200; UREI 9 band stereo graphic EQ, \$425; (2) dbx 216 16 chan NR systems w/spare modules, \$2000/16 chan system. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

Valley People rack, (3) Gain Brain II, Maxi Q parametric, \$950; Shure room analyzer, \$175; Linn drum computer, \$1400. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Orban 245F, (2) brand new, BO. B Salzman, Steves Comm, 2695 Regis Dr, Boulder CO 80303. 303-476-6786.

Audio Kinetics 310 cue lock, set up for JVC, MCI, ATR100, \$4500/BO. A Lucciani, National Video Ctr, 460 W 42nd St, NY NY 10036. 212-279-2000.

Shure Pro Master 6 chan, excel cond, BO. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

JBL studio monitors, 4311B, \$600/BO for pair. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Want to Buy

Pultec, Sontec, Lang, ITI EQ's. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Will trade new Studer CD player and/or cash for used Pultecs, Lang, program EQ's. D Pettty, Larrabee Sound, 8811 Santa Monica, W Hollywood CA 90069. 213-657-6750.

LIMITERS

Want to Sell

Collins 26U-2 FM limiter. P Knies, WBDC, POB 95, Madison IN 47250. 812-265-3322.

CRL SPP-800/SMP800/APP-400, gd cond, \$1200/all. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Aphex Compellor in excel cond, \$850. B Stephens, WQCB, POB 273, Brewer ME 04412. 207-989-5631.

Orban 9000A excel cond, w/manual, \$2200. A Caswell, C&G Bdct, POB 177, Linden MI 48451. 313-739-4545.

CBS 411 Volumax tested, fully operational, excel cond, w/manual, \$300 plus ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

Dorrough 310 AM, gd cond, \$850; UREI BL40 Modu-limiter, gd cond, \$300. M Parsons, KASM, Old Hiway 52, Albany MN 56307. 218-829-1326.

DAP 310, excel cond, \$800. C Tarkenton, WCOH, 154 Boon Dr, Newnan GA 30263. 404-253-4636.

UREI 1176-N needs minor work, \$120 w/book. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Orban Optimod 9000A AM, \$1500. S Conley, WSPF, Box 1709, Hickory NC 28603. 704-328-1731.

Gates Solid Statesman limiter, needs work, BO. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

CRL AM4S stereo AM processor, SPP800; (2) SEP400B; SMP900, 2 yrs old, new cond, in rack, working, \$3800/BO. L Jones, WKIE, 6001 Wilkinson Rd, Richmond VA 23227. 804-264-1540.

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Inovonics
SANTA CRUZ, CA (408) 458-0552

CBS Labs Volumax 411 stereo processor w/manual, cond unknown, \$200. S Kuiper, WFMR, POB 147, Menomonee Falls WI 53051. 414-255-3100.

CBS Audimax automatic gain control, needs work, BO. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

Dorrough 310, \$700; Gates Solid Statesman (2), \$50. J Vriesen, KBEW, Hwy 169 N, Blue Earth MN 56013. 507-526-2181.

Orban 8000A, mint cond (2) w/manuals, \$1750 ea; PR&E ML FM Multimeter, single chan FM limiter/compressor, 4 matched pairs, new w/manuals, \$1200/pr; CBS Labs 4110 slimline stereo audio compressor, very low hrs w/manual, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Pye stereo compressor, discrete transistor design from early 70's, spare parts & doc. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Audimax 4440 AGC (2), \$300 ea. K Harnack, KWLN, 88 Union Cntr Ste 309, Memphis TN 38103. 901-529-0098.

Orban Optimod 8000A compressor, limiter, stereo gen, excel cond, \$2000. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Automated Bdct Controls wideband mod controller, new, composite clipper, w/manuals (2), BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

CBS Volumax 411 stereo, \$250. R Gray, Aray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-6941.

Dorrough DAP 310 like new, extra AM peak limiter board, \$650. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Aphex IIB bdct aural exciter, less than 1 yr old, \$1850. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Gates Solid Statesman FM limiter, \$200. K Harnack, KWLN, 88 Union Cntr Ste 309, Memphis TN 38103. 901-529-0098.

UREI LA5, similar to LA4, w/rack mt, \$250. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Inovonics 220 audio level optimizer, mono, BO. C Coombs, Cape Cod CC, Rte 132 W, Barnstable MA 02668. 617-362-2131.

Harris MSP90, FM, \$500; CBS Audimax #3, \$500; CBS Volumax, \$100. T Hunt, KILA, 2201 S 6th St, Las Vegas NV 89104. 702-731-5452.

CRL AM4, mono, factory realigned, \$1300. T Saunders WSBH, 56 Tagger, Southampton NY 11968. 516-283-9530.

Fairchild Conax 600 mono, \$250; Gates Stay-well M5167, \$250. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Distributor Directory

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

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Broadcast Equipment Exchange

LIMITERS . . . WTS

Texar Audio Prism, (2), \$2800/both. M Wilson, KNOE, Monroe LA. 318-388-8888.

Want to Buy

Limponder, prefer complete, any cond. P Beckman, Philbec Audio, 2001 N 35th Ave, Hollywood FL 33021. 305-989-4680.

Optimod studio chassis. J Scaggs, Chr Bdcg, 542 Butternut St, Abilene TX 79602. 915-676-1405.

Orban 8000A. J Stromquist, WNCB, 2816, Hogberg St, Duluth MN 55811. 218-722-3017.

Orban 8000A. E Sutton, WOKI, 114 Tulsa Rd, Oak Ridge TN 37830. 615-483-8451.

MICROPHONES

Want to Sell

AKG D330BT, vocal mic, LF filter & hi-boost, \$110; E-V CS15 condenser, cardioid, similar to AKG 451, \$125. R McMillen, Cascade Recdg, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Parts for AKG C28A & S7C 4126A mics. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

RCA 77DX (2) very clean w/orig cloth covers, like new, \$500 ea. B Pinkstaff, Pinkstaff Prod, POB 5262, Santa Monica CA 90405. 213-399-1942.

E-V 642 shotgun, gd cond, \$95. B Dickerson, WPXE, Box 520, Starke FL 32091. 904-964-5001.

RCA UZ 4089-A antique ring spring condenser mic w/stand, used by Roosevelt in Demo convention of 1932, excel original cond, w/framed letter of authenticity, \$395. R Cane, Miami Picture & Snd, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Telefunken U47 & 49 w/w/pwrpcks, \$100-1400; MK Caps V14, \$250 ea; 77DX w/cable 44's w/VM switch. United Recd Labs, 681 Fifth Ave, NY NY 10002. 212-751-4660.

AKG C414EB condenser, \$500. P Cibley, Cibley Music, 138 E 78th, NY NY 10016. 212-966-2219.

Neumann N80G2 phantom 48 V, \$80. Y Jing, Aerial Recdg, 140A Bellevue Ave, Newport RI 02840. 401-846-9743.

AKG 451E (2) excel cond, preamp & capsule just rebuilt by factory, \$400 for both; EV DL42 (2), excel cond, just rebuilt by factory, \$400 ea. C Butler, Butler Bdct Srvs, 1775 Bartlett Ave, Orange Park FL 32073. 904-264-8169.

RCA 44BX w/orig desk stand from early 50's, sounds & looks gd, \$375/BO. L Smith, Box 69, Amsterdam NY 12010. 518-843-2500.

Sennheiser 404 & 405, both need work, have spare cables, PS, BO or trade. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Parts for AKG C-28 & S7C 4126A, mainly outer shell & windscreens. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Superscope EC12B (6) electret cond lapel mics, gd cond, \$22 ea/all six \$120. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

AKG D1000E (3), \$50 ea; (3) SM33 Shure ribbon mic, \$100 ea. C Fries, KSQY, Box D, Deadwood SD 57732. 605-578-3533.

Beyer M260 dynamic ribbon, like new, \$250. G Wilson, WGLE, 7519 Dorr #196, Toledo OH 43617. 419-865-7289.

Neumann U47 power supply & stand, \$2250. L Oliver, Lynn Oliver Sids, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

AKG D1000E (3), excel cond, \$50 ea; Shure SM-33 ribbon mics, excel cond, \$100 ea or all for \$250. C Fries, KSQY, Box D, Dearwood SD 57732. 605-578-3533.

AKG 451EB (2) brand new, \$300 ea; AKG CK-22 Omni Capsule, brand new, \$100. J Diamond, Blue Diamond Studios, Box 102C, Chubbic Rd RD1, Canonsburg PA 15317. 412-746-2540.

E-V 665 mics (2), dynamic cardioid, \$199/pr. J Sunier, Audiophile Audition, 21 Stetson Ave, Kentfield CA 94904. 415-457-2741.

Shure 556A, orig, gd cond, \$150/BO. D Guidry, Sound Concepts, 1113 Jackson St, Alexandria LA 71301. 318-473-4170.

Want to Buy

American DR-330, must be in gd working cond. JM Newman, Box 7703, Atlanta GA 30357. 404-876-8623.

RCA 77DX mic, working or not. ETS Record, POB 932, Honolulu HI 96808.

RCA 44DX. T Schnitt, Schnitt Assoc, 1327 Destination Ln, Virginia Beach VA 23454. 304-496-0099.

Neumann mics, all models, any cond, working or not, access also. S Rosenthal, Rosenthal Prod, 3145 Geary Blvd Ste 344, San Fran CA 94118. 415-665-1035.

MISCELLANEOUS

Want to Sell

WECO 94N & 120E repeat coils, \$10 ea. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Radio Shack 4, 2 disk drives, BO. J Bretzke, 709 Colgate, Lancaster TX 75115. 214-227-9077.

Anvil travel road case, new, \$150. B Weiss, KLSI, 1722 Main, Kansas City MO 64108. 816-474-6400.

Radio Shack 64K color computer, word processor, TP10 40 column printer, Centronic 588 DM printer, \$150 plus ship. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Patch panels, 6 rows tip, ring, sleeve, normal, 24 jacks/row, stereo or mono, \$50 wire wrap, \$35 solder + ship. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Square D 100 A 3PDT safety switch, \$100 plus ship. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

S-A SAT-32, trade 15 kHz audio card for 7.5 kHz card. G Avey, KHSI, POB 489, Chico CA 95927. 916-893-8926.

Sears air compressor w/tank, \$200; Code-a-phone 180 automatic phone line message player (3), \$100. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

MCI comm bldgs (3), 8 x 10 x 16 w/cable racks, heat, AC, lights, \$3495. R Wurst, Wuster Tower, POB 227, Gainesville TX 76240. 817-665-0485 aft 6PM.

HSC-1 video hum stop coil, never used, \$50. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

ITT phone system w/amps, will trade 12 telephones business systems w/amps etc for good tripod w/floatng head. Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Clarostat 73JA 90-2K ohms, 10 turn precision pots, \$200 ea or \$100 for all. G Wilson, WGLE, 7519 Dorr #196, Toledo OH 43617. 419-865-7289.

Ruslang 23T41058 cart rack, Lazy Susan for 148 carts, like new, \$120. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Sola line voltage reg, input 208 V single phase, 5 kV. J Turner, WMIN, Mt Carmel PA. 717-339-1600.

Harris dummy load 50 kW, new, BO. A Anderson, KBMR, 3500 E Rosser, Bismarck ND 58501. 701-255-1234.

Beau motor, new for Ampex AG-440, 3-speed/7.5-15-30, \$275. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Geiling vacuum tube console module, mic pre, EQ & line amp, BO. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Anvil case, 27" x 22" x 17" deep, heavy duty casters, twist latches & ball corners, gd shape, \$300. B Deakin, Village Sports, POB 3300, Chapel Hill NC 27515. 919-968-4811.

Teletype 33 (2), ASR, w/punch & reader, w/or w/o stands, take one or both, \$250 ea or BO & you pick-up; many 16mm projectors to sell; Fairchild Galaxy (rear screen) salesman's projector. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

Jack Strip, 52 RTS, dbl closed-circuit jacks, all grounds normalled, gd cond, \$100; UTC xmtrs A21 500/500 ohms; (2) A22 50,200, 500/50,200,500 ohms; (2) A24 15K/500,333, 200,125,50 ohms; (2) A39 600,150/2K,500 ohms, \$20 ea/all 7 \$120; (2) UTC A33 20 dB magnetic shields, \$10/both; line xmtrs (2) EV 502, EV 502B, Shure A86A, \$12.50 ea/all for \$40. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Plate transformer, 3-phase 240 V primary, 4000 V, 1 A nominal sec, unused, \$450/BO/trade. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

MPA Industries K-55 speed gun, perfect for race coverage, \$650. D Murray, WPRQ, POB WPRQ, Kingsport TN 37663. 615-239-4745.

Fifty years of catalogs, Allied, Lafayette, Radio Wire TV, G-R, H-P, Tek, World Radio, McGee, Olson, Radio-Masters, General Radio Experimenter, Dumont Oscillographer, SASE for list. F. Yonker, 7 Old Farms Rd, Saddle River NJ 07458.

Kepeco 19" rack mount regulated power supply, variable 0-50 V at 5 A, mint cond, \$135/BO. P Davis, Davis Radio, POB 615, Manassquan NJ 08736. 201-974-2180.

AP news wire paper, 8" wide, 12 rolls per box, 10 boxes avail, \$15 per box plus frt. D Smith, KKLs, Box 460, Rapid City SD 57709. 605-343-6161.

RCA, GE, Tamophone portable & mobile misc gear. J Hayes, Programming Plus, Box 90486, San Diego CA 92109. 619-272-7587.

Steel racks, (6) 6' open, \$40 ea. R Skelly, 103 Brandywine Ct, Bricktown NJ 08724. 201-840-8136.

Metal audio rack, 67" high, 61" of rack space, has back door, black, BO. B Franklin, Franklin Assoc, POB 110194, Birmingham AL 35211. 205-787-0756.

Want to Buy

Software & hardware for computer logging & traffic for radio station. C Alexander, WYTW, Box 669, Cadillac MI 49601. 616-775-1071.

Motor for Sparta-matic cart-time delay & reverb, model CD-15, motor D162H, or equiv. T Heathwood, Heritage Radio, POB 16, Boston MA 02167.

Advise & info on accounting & logging software for IBM PC's. C Alexander, WYTW, POB 669, Cadillac MI 49601. 616-775-1071.

Phase converter, single to 3 phase AC converter, Phasemaster or equal, to handle 10 kW or more. J Powley, KLIU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Manual for Scully 280. M Baykiam, Gran-ny's Kitchen, 6689 Orchard Lake Dr Ste 151, W Bloomfield MI 48033. 313-737-0751.

MONITORS

Want to Sell

Collins FM mod monitor, BO or trade for stereo audio console or TTs. Kosack, 516-489-1071.

Traid 16mm hot splicer \$125; Zeiss Movie-scope viewer Pro Jr tripod/head plus case, \$275; 16mm Moviola 4 gang sync counter, \$175; (2) Moviola rewinds, \$150; 16mm 400' Mitchell mags, \$50 ea; 16mm Arri mags, \$150 ea; 35mm Arri mags, \$175 ea. C Crawford, 8 Piedmont Dr, Cranbury NJ 08512. 609-799-1382.

Harris FT-80/FS-80, gd cond on 92.1 w/RF amp, \$750/all 3. P Wolf, WVHG, 329 S Main, Labelle FL 33935. 813-574-5548.

HP 335B FM monitor, tuned to 99.9 MHz w/manual & all tubes, \$75; GR Type 11 AM freq monitor, 1010 kHz w/manual & all tubes, \$30. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

McMartin TBM 2000 SCA monitor, cond unknown, \$200. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Collins FM freq monitor, \$100. R Gray, Aray Audio, 223 W Mtn Rd, W Simsbery CT 06092. 203-658-6941.

TFT 753 mono AM mod mon w/pre-selector options, new, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Belar FMM1 & FMS1 & RFA1, on 88.9 currently, \$1850 for pkg. B Klinger, WRDL, 401 College Ave, Ashland OH 44805. 419-289-4142 X5137.

Belar RFA-1 AM RF amp, excel cond, w/manual, BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Want to Buy

TFT tuneable mod monitor or equiv QEI. B Dodge, WTLJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

Belar RFA-1 FM RF amp for FMM-1. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

CCA AMM-10 AM mod monitor. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

CCA AMF-10 AM freq monitor. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

MOVIE PROD. EQUIP.

Want to Sell

Arriflex UST 5B1 single system audio amp, \$200 plus UPS. Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Athena 4000 film projector, gd cond, \$800; B&H 2592 16mm projector, excel cond, \$300; Visual Graphics graphics camera, pos one, 320, \$2000; Eastman 16mm projector, 275 w/spare parats, \$700. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Beaulieu R16 12-120 zoom, 2 battery pks charger, 2 magazines, AC adaptor, case, mint cond, BO; Canon Scoopic 16MS, 2 battery's, charger & case, mint cond, BO. C Crawford, Photec Inc, 8 Piedmont Dr, Cranbury NJ 08512. 609-799-1362.

Bolex camera body, 16mm C mount lenses w/Beaulieu access. W Ditzel, Ditzel Prod, 933 Shroger Rd, Dayton OH 45419. 513-298-5381.

Auricon 16mm sound on film 200 foot programmer; Precision 16 & 35mm optical & magnetic sound reader; Zeiss 16mm Movie-scope. H Deans, Deans Prod, 170 Grand St, White Plains NY 10601. 914-949-5920.

RECEIVERS & TRANSCIEVERS

Want to Sell

Soundcraftsmen 6200 rack mount, AM/FM stereo digital tuner, 16 presets, 1 yr old, \$195. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Kenwood R1000 comm receiver, \$275. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Motorola TPN 1154A base station power supply 14.1 VDC, approx 5 amps, BO. 516-489-1071.

Want to Buy

Old tube type McMartin SCA receiver, any freq, K Smith, Smith Engr, RR3 Box 483, Gorham ME 04038. 207-929-6129.

Antique tube type shortwave receivers for demo & display purposes, no junk, working only. NDXE, Box 569, Opelika AL 36801. 205-749-1898.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Moseley PCL 505 mono STL w/antennas, \$4500. S Allen, 7356 35th Ave NE, Seattle WA 98115. 206-525-8089.

Consultants

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Employment

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POSITIONS WANTED

CE seeks work, eng 2 college stations, NBN, HBO MDS CE NYC, CET, FCC licensed & certified, NABER, NARTE & ISCET member. M Rakoff, 114-41 Queens Blvd, Ste 148, Forest Hills NY 11375. 718-591-0002.

DJ, young, ambitious, experienced seeks a FT position on medium or large market Gospel or Christian Rock station, medium market exper, 9,000 hrs on air. C Hull, 2834 E Malone Box 8, Sikeston MO 63801. 314-683-6044 (12-3 PM).

CE, very exper, small to major market, high power AM/FM, D-As, turnkey installations, studio designs, automation, hard working team player, in Michigan. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 10-1.

HELP WANTED

CE, NE major mkt FM, need results oriented person w/good people skills and top level construction & maintenance abilities. Send



Broadcast Equipment Exchange

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ESP-2 programmer, (3) 450 bi-directional Carousels, (5) A.R.S. 1000 R-R, 721 mono dual cartridge playback, T.G. 25S.F. tone generator, for more info call or write Jerry Hafner, First Federal Savings & Loan, 202 State St., Madison WI 53703. 608-256-8311 X215.

Gates MS862, remote control, \$250. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

M/A-com 23 GHz microwave system for TV. J Carroll, Carroll Bldg, POB 549, Tawas City MI 48764. 517-362-3417.

Microwave passive reflector, \$200; Wegener 1602 mainframe w/PS & 2012-01 data demod/demultiplexer, \$450. J Fuehrer, NTV Network, Box 220, Kearney NE 68868. 308-743-2494.

Pinzone/Comtech 5 meter TVRO system, motor driven, 8250 receiver, \$20,000. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Potomac RC-16T, 2 yrs old, like new, avail immed, in service. BO P Wahl, WWIB, 3155 S Woodard, Chippewa Falls WI 54729. 715-726-1226.

S-A DAT-32 trade 15 kHz audio card for 7.5 kHz audio card. J Genke, KWIX, 300 W Reed St, Moberly MO 65270. 816-263-1500.

Moseley 505C composite STL system, complete \$7000; Meseley 505C composite STL system, complete \$15,000 w/dishes & hard-line. T Troit, 305-323-0472.

S-A Series 9000 satellite dish, 3.2 meters w/extender panels, BO. J Hansen, KFMD, Des Moines IA. 515-282-1033.

Wegener CCN Radio Network rec & tone decoder, w/1602 mainframe, 1615 demod card & 1647 cue tone card, \$500. K Harnack, WEZI, 6080 Mt Moriah, Memphis TN 38115. 901-365-2032.

15K card for S-A 7325 DPU, sell or trade for 7.5K card, \$880. C Wilson, KSFE, POB 738, Needles CA 92363. 619-326-2101.

Simpson 7026 freq counter. 904-760-1413.

Moseley MRC1600, new unit, \$2500. R Lury, WRVR, 5904 Ridgeway Pkwy, Memphis TN 38118. 901-767-0104.

Micro Controls PLG 10 SCA gen, used 6 mos, set for 23 kHz, \$500. D Fields, KUFO, POB 1713, Big Springs TX 79721. 915-263-7326.

Moseley CIP-1 slave relay panel, rack mount w/relays (2), BO; Moseley PCL-505C, 50 MHz composite aural STL system w/factory spare parts kit, \$5000. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Century Video MRP-1 ABC Talk Radio cue decoder, like new, \$350. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Dalsat DS-140 satellite receiver cue encoder, excel cond, BO. F Kelly, WAZZ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Moseley PCL-404 mono STL system, works perfectly, BO over \$1500. K Harnack, Harnack Eng, 88 Union Cir Ste 307, Memphis TN 38103. 901-529-0098.

Wegener 1602 satellite subcarrier demod, 6.3 MHz for CNN radio, \$350. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Microdyne SPSC receiver & power supply. 904-760-1413.

M/A-Com MA-4001 satellite receiver, 3.7-4.2 GHz input, freq agile, baseband, video & audio outputs, \$500. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Moseley remote control w/relay panel for FM subcarrier use, older model, gd cond, sell or trade. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Want to Buy

Moseley TRC15 xmtr remote control wired w/meters. G Avey, KHSL, POB 489, Chico CA 95927. 916-893-8926.

Marti, gd cond unit, xmtr & rec, UHF or VHF. G Jones, WYTM, POB 717, Fayetteville TN 37334. 615-433-1531.

Wegener satellite gear in gd cond, 1601 mainframe, 1626 demod card, 1648 tone decoder, 1644 relay card. B Dodge, WTJL, POB 1818, Brattleboro VT 05301. 802-254-2560.

RPT 15 or RPT-2 RPU system. B Zellmer, KRZD, POB 2224, Greeley CO 80632. 303-351-8354.

STATIONS

Want to Sell

KRAN AM daytimer, Morton TX, \$60,000 cash. E Couzens, 806-266-5545.

Class A FM in Oklahoma w/new equip, low down to qualified, iong payout, retiring, \$149,000. G Erway, 405-832-5432 after 6 PM.

Radio station, 1000 W daytimer, big band, jazz & 50's swing station, only live format of its kind in S Colorado, large senior community plus 6 acres, \$400,000. Susan, KAYK, 4211 N Elizabeth, Pueblo CO 81008. 303-542-1480.

CP, FM radio station, sell or trade. G Lack, 205 N Second St, Thayer MO 65791. 417-264-7266. (M-Th)

Want to Buy

Will buy your AM, FM or combo, your price, my terms, no money down, brokers protected, I pay all fees, any location. Box 81, Westhampton NY 11977.

FM CP or AM/FM combo, medium market. D Ganske, WISM, 1819 Mitchell Ave, Eau Claire WI 54701. 715-836-9476.

MBE interested in CP or starter AM or FM in Oregon. N Parke, Parke-Reyes Co, POB 1583, Portland OR 97207. 503-293-0353.

FM CP you can't build? Don't want? Running out of time? I may be interested. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

STEREO GENERATORS

Want to Sell

RCA BTS-1A stereo gen. P Knies, WBDC, POB 95, Madison IN 47250. 812-265-3322.

Moseley SCG-3T rack mount FM stereo gen w/manual, excel cond, \$150; Moseley SCG-9 (2), stereo gen, rack mount, new, \$975 ea. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Harris MS15R stereo gen, \$1000 or trade for Orban 8000 Optimod. B Umberger, WNLT, 51 S Main Ave, Clearwater FL 33575. 813-446-0957.

Want to Buy

Harris, Kahn or Motorola AM stereo, complete pkg. D Ganske, WISM, 1819 Mitchell Ave, Eau Claire WI 54701. 715-836-9476.

Kahn stereo gen. NDXE Eng, Box 569, Opelika AL 36801. 205-749-1898.

Motorola AM stereo system, gd cond. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

SWITCHERS (VIDEO)

Want to Sell

VIX 114 AZ Vital prod switcher w/dual chan Squeeze-zoom, \$20,000. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

ISI 902 switcher, \$1750. E Denke, American Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-8273.

Telemation switcher trade or sell. JB Salazar, Gods Missionary Revival Crusade, 102 E Lyon, Laredo TX 78040. 512-722-6832.

TAPES, CARTS REELS

Want to Sell

Record collection, original oldies rock-n-roll, LP's & 45's. M Jazmin, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Fidelipac Master carts (1000), mostly 3-5 min, vgc & tape quality, large lots only \$1.50 ea, BO on entire lot. S Schneider, WBMX, 408 S Oak Park, Oak Park IL 60302. 312-524-3240.

NAB reels, 10.5" 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.

3M-Scotch 206, 208 & Ampex 632 1/4" on 5", 7" & 10 1/2" reels-repro. Also avail Ampex 406, 456, 3M 250 & Agfa 469 2" audio tape w/no splices & with one splice. Also available Ampex 406 & 456 1" audio tape with no splices. Call for prices. Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572. 1-800-331-3191 or in NYS 516-678-4414.

Recortec 1" video tape evaluator; also Recortec 3/4" video tape evaluator. N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Aristocart carts, (400+) need rewinding, \$1 ea/BO. M McCarthy, KGRC, Box 1017, Hannibal MO 63401. 314-221-2221.

Album Beautiful Music Library, 2400, complete list upon request, BO. C Bryson, Conserv, 93 Robinhood Dr, Zelienople PA 16063. 412-776-5204.

Fidelipac carts wound w/Scotchcart tape, various lengths, 50+ ea. B Musso, WGCD, 165 Harris St, Chester SC 29706. 803-377-1111.

Audio tape, 1", 3M on reel (34 pcs), \$20; 3M on hub (6 pcs), \$15; Ampex on reel (8 pcs), \$20; Audiotape on reel (11 pcs) \$15; Audiotape on hub (1), \$10; 3M 1" leader tape (1), \$10. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Carts, 10-1/2 min, (400), gd cond, \$1.50 ea. K Hollingsworth, KCSP, 214 E Georgetown St, Crystal Springs MS 39059. 601-892-3001.

Complete black music library, 1940's to 1980's, also complete black gospel library, \$2000/BO. F Kelly, WAZZ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Replacement record jackets, white, fabricated, (5), \$10 plus ship. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

U-Matic 3/4" video cassettes, (9) short lengths (5-10 min) w/vinyl cases, \$3.50 ea/all for \$27. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Hit Parade of Star's automated library, developed as Saturday showcase for radio, \$150. J Shepherd, Globe Prod, POB 20465, Roanoke VA 24018. 703-344-3283.

3M 206 1/2" tape (12) full, (2) partial hubs, 3M 208 full hub, Ampex 406 full hub, \$5 per roll; (2) 1/2" metal 10" reels, \$3 ea or entire lot \$70. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

3M 206 1" tape, (6) full on reels, 3M 208 (2) full one on reel, other on hub, Ampex 406 partial on hub, \$10/roll or entire lot, \$70. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Audiopacks, various selection (300), 40-70 sec, \$300. J Carrigan, WDOM, Providence College, Providence RI 02918. 401-865-2460.

Want to Buy

Clean 1/4" dub of the Source's Whamco gag commercials, circa 1982-83, will provide tape & compensate for time spent dubbing. KM Richards, 2670 Vancouver Ave, Ventura CA 93003. 805-643-7607.

Jingle demo reels & pkgs to trade. D Ferreira, WFCR, POB 416, Sunderland MA 01375. 413-665-8536.

Copies of Top 100/200 or more of each year from 1954 or before to 1987. Stevenson Corp, PO Box 735, Blaine WA 98230.

Aristocart wanted for rebuilding, will pay 25+ ea. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

TAX DEDUCT. EQUIP

Equip wanted for educ FM, new non-comm 200 W, seeks donations all bdct equip, tax receipt provided. J Rauch, WSCO, Fairfield Chr Academy, 590 Lake Rd SE, Lancaster OH 43130. 614-654-5550.

Eng student desiring donation of bdct equip (anything), EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

SCA receivers for non-commercial college station. G Bready, WUVT, 100 N Main, Blacksburg VA 24060. 703-951-1642.

Donations needed for college station, main needs are R-R's, anything gladly accepted. M Cohen, KDUR, POB 7339, Durango CO 81301. 303-247-7261.

School needs equip for educ FM & recording studio. B Dean, DownEast Machine School, RT 1 Box 388, Machias ME 04654. 207-255-4735.

Xmtr & antenna, 250 W range, for non-profit public station. S Rubick, KDNK, POB 1388, Carbondale CO 81623. 303-963-0139.

ENG related equip to train bdct news students at Univ of FL, call or write. D Hofmann, WUFT, Box 13375, Gainesville FL 32604. 904-392-4311.

Eng student desiring donation of bdct equip (anything), EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

TEST EQUIPMENT

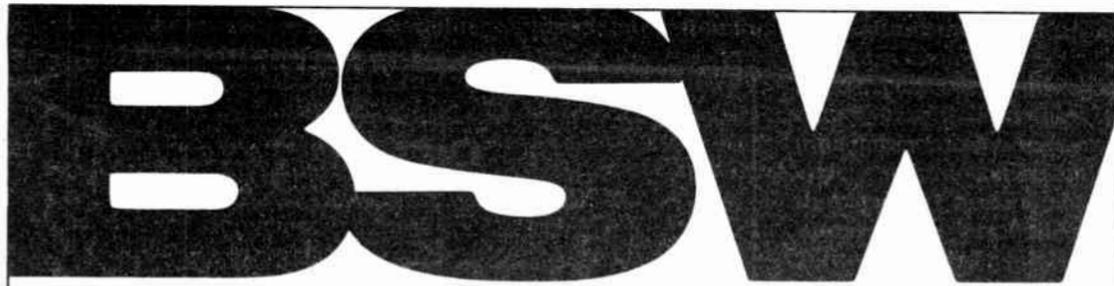
Want to Sell

Tek RM529 rack mount waveform monitor, \$500; Tek 529 cabinet mount waveform monitor, \$500. J Fuehrer, NTV Network, Box 220, Kearney NE 68868. 308-743-2494.

B&K 820 portable digital cap meter, \$130. C Zalenski, EDS Comm, 9 River Terr, Johnson City NY 13790. 607-798-7111.

Fluke 8050A, excel cond, standard plus dB & relative, \$285. R McMillen, Cascade Recd, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Heath SG-18A, Heath assembled, gd cond, \$100/BO; Heath IM-58, gd cond, \$100/BO. P Wolf, WVHG, 329 S Main, Labelle FL 33935. 813-574-5548.



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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: Help Wanted With Box Number
 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____
Company/Station _____
Address _____
City _____ State _____ Zip _____
Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041



Broadcast Equipment Exchange

TEST . . . WTS

Matec exponential gen, \$200; Delary 48 VDC power supply, new, \$60; HP diff volt-meter & ratiometer, \$200; Tek 547 scope, dual trace, \$95, plus UPS on all. Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Tek 529 waveform monitor trade for editing equip, 1/2" or 3/4". JB Salazar, Gods Missionary Revival Crusade, 102 E Lyon, Laredo TX 78040. 512-722-6832.

Test equip & spec sheets & manuals for sale, send SAE for lists. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Sound Tech 1000A/1100A FM alignment gen w/stereo gen & signal conditioner, new, w/manuals, must sell together, rack mount. BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Secore Z meter 2, freq counter & scope, BO. C Creekmore, Metro Traffic Control, 101 Wymore Rd Ste 200, Altamont Springs FL 32714. 305-682-1500.

Hitachi V202 dual trace scope. 904-760-1413.

Want to Buy

Bird or equiv Thru-line wattmeter w/3-1/8" or 1-5/8" flanged line section; Bird or equiv inline wattmeter, Mdl 43. B Emanuel, KASH, 1300 E 68th Ave #208, Anchorage AK 99518. 907-522-1515.

TRANSMITTERS

Want to Sell

Collins 20V3 1 kW w/cutback to 250, presently on air, in top shape w/solid state power supply, \$6000/BO. J Scott, WENT, Harrison St Ext, Gloversville NY 12078. 518-725-7175.

RCA TE 444 250 W FM xmtr, older design, mono only, rewired & rebuilt, working cond, mint cond physically, \$750, plus load/ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

LPB 20 W AM, gd shape, 1020 kHz, \$485. A Caswell, C&G Bdcg, POB 177, Linden MI 46451. 313-739-4545.

Collins AM Type 20 Mdl 3 AM 230 V, single phase, 60 Hz; RCA FM xmtr, mdl BTF-1E, 1 kW; RCA BTE 10c exciter. P Knies, WBDC, POB 95, Madison IN 47250. 812-265-3322.

Wegener 1691 cable FM xmtr cards/Wegener 1693 stereo synthesizer cards, set for \$475. T Trott, 305-323-0472.

RCA BTA 5F 5kW AM, excel cond, recently removed from service w/floor layouts & manuals, \$10,000 plus load/ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

RCA BTA-5F mod transformer, new in crate, \$600 plus ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

GE VHF TV xmtr, TT-23a, 20 kW visual on chan 8, \$4500. J Fuehrer, NTV Network, Box 220, Kearney NE 68868. 308-743-2494.

RCA TTU60A 60 kW, chan 33 xmtr w/TTUE 44 exciter, pulser & filterplexer, visual klystrons low hrs, aural klystron 4 yrs old, avail Jan '88. J Fletcher, WCFT, 4000 37th E, Tuscaloosa AL 35405. 205-553-1333.

Continental 315B 5 kW AM, \$9000. R Chase, WPRQ, POB WPRQ, Kingsport TN 37663. 615-239-8787.

RCA BTF-1D 1 kW xmtr w/RCA BTE-10B exciter in gd working cond, \$3500. Shane or John, WCIR, 21 Airport Ind Pk, Beaver WV 25813. 304-252-6452.

Visual DVFM3 3 kW operational w/factory exciter & QE1 exciter, all tuned to 106.3, \$3500/BO, you ship. JR Cox, KRKZ, Box S, Branson MO 65616. 417-334-6003.

VHF 10 W LPTV xmtr, ch 3, never used. J Carroll, Carroll Bdcg, POB 549, Tawas City MI 48764. 517-362-3417.

OVER 115 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FMs: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

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World leader in AM and FM transmitters.

BESCO INTERNACIONAL
5946 Club Oaks Drive
Dallas, TX 75248

214-630-3600
214-276-9725

RCA BTA 50F 50 kW AM, excel cond, recently out of service, complete w/floor layouts & manuals, \$18,000 plus load/ship. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

CCA FM40E/SC1E FM exciter & stereo gen. J Kennedy, WGEL, POB 177, Greenville IL 62246. 618-664-3300.

ITA FM 5000 for parts w/tubes & harmonic filter, BO. J Yeager, WVLC, POB 1559, Lexington KY 40592. 606-253-5900.

BEXT Inc.
739 Fifth Ave.
San Diego, CA 92101
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Credit/Leasing options available.

RCA BTA25 250 W xmt, \$750/BO. K Hollingsworth, KCSP, 214 E Georgetown St, Crystal Springs MS 39059. 601-892-3001.

Gates BC1E 590 kHz, 1 kW, gd cond, some spare tubes, \$1500/BO. J Yeager, WVLC, POB 1559, Lexington KY 40592. 606-253-5900.

Collins 830F-1A, 10 kW FM, gd cond, w/exciter & stereo gen, manuals, BO. J Whitmer, Murray Bdcg, POB 1340, Murray KY 42071. 502-759-1300.

Harris TE-3, new FM exciters, (2) one w/factory stereo gen (new) & one w/composite stereo input panel w/manuals, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Bext TEX20P 15 W exciter, \$1995; Bext 1 kW FM xmtr, \$6995. B White, 4600 E Herndon #244, Clovis CA 93612. 209-298-2373.

Solid state audio driver for Harris BC10H, latest design, \$1000/BO. T Saunders, WSBH, 56 Tagger Ln, Southampton NY 11968. 516-283-9500.

RCA BTA-1L 1 kW, working when removed from service, w/manual, BO plus ship. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Gates FM1G/1H 1 kW FM, w/new final & spare parts, 97.7 MHz. \$4800/BO. D Balough, WOXY, 5120 College Corner Pike, Oxford OH 45056. 513-523-4114.

CSI STA 5/10 kW AM, 1982, currently on-air w/new tubes, current proof, \$18,000/BO. J Hoge, WYND, 316 E Taylor Rd, Deland FL 32724. 904-734-1310.

McMartin B-910 exciter, 102.9 MHz removed from service 4/87 w/some extra modules, \$1000. P. Jellison, WBLV, 117 S Fountain Ave #301, Springfield OH 45502. 513-324-5643.

Want to Buy

Non-Profit Christian station needs 2.5 kW 90.3 FM xmtr & 6 chan console, 2 TTs, etc. D Snyder, Adonai Comm, Box 426, Cowdersport PA 16915. 814-274-8085.

FM, 3 kW solid state, 3 bay antenna 102.3 MHz & solid state exciter. C Franklin, Franklin Bdcg, 237 Western Blvd, Jacksonville NC 28540. 919-353-3131.

FM xmtr, 5 kW, prefer circa 1960's RCA. C Bryson, Comserv, 93 Robinhood Dr, Zelenople PA 19063. 412-776-5204.

Low-band chan 4+ VHF xmtr, 10-30 kW w/VSF filter, harmonic filters; low-band VHF xmtr, 10-30 kW retunable to chan 4+ J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Wilcox VHF 500 W xmtr, need someone to change to FM xmtr, will ship unit anywhere for conversion, serious inquiries only. R Smith, WGPS, POB 406, Summersville GA 30747. 404-857-5815.

AM xmtr, 1 kW, any make, any model. Fox Radio, POB 3387, Cocoa FL 32924. 305-799-3306.

Gates Vanguard, 1 kW xmtr. J Walley, KORV, 1538 18th St, Oroville CA 95965. 916-533-1610.

CCA or CSI 10 kW or 20 kW FM xmtr. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

High band VHF xmtr, any make/mdl, 100 W to 25-35 kW, will consider low power driver stage of any xmtr. J Powley, KIIU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

FM xmtr for standby, 10, 20 or 25 kW. D Hollingsworth, KXKZ, POB 430, Ruston LA 71270. 318-255-5000.

RCA TTU-1B 1 kW xmtr or parts, need to keep existing unit operating, any cond; RCA TTU-2A 2 kW xmtr or parts, need to rebuild damaged unit, any cond. J Powley, KIIU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

TUBES

Want to Sell

Tubes, 833A (2), '83 date code, never used, \$125/pr. R Kerbaw, WTJN, Box 1127, Beckley WV 25802. 304-877-5592.

Econco 3CX3000A7 rebuilt tube. J Kennedy, WGEL, POB 177, Greenville IL 62246. 618-664-3300.

Assorted audio tubes, call for info. D Fields, KUFO, POB 1713, Big Springs TX 79721. 915-263-7326.

Eimac 3CX1000A7, new, BO over \$200. K Harnack, Harnack Eng, 88 Union Cir Ste 307, Memphis TN 38103. 901-529-0098.

EIMAC 4-1000A new, (2), \$300 ea. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Want to Buy

Diodes, HVCA 1.5HV12K, 1x1x7" diode, need 2, want 6. L Griep-Ruiz, KRZA, 528 9th St, Alamosa CO 81101. 303-589-9057.

TURNTABLES

Want to Sell

Harris CB-1201 (2) w/micro-rak tonearms, BO. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-296-3979.

RCA 16" transcription players, 3 sp, 16" tonearm vertical & lateral playheads (2), \$500/both, you pick up. R Bellavia, WSBG, 4949 W Belmont, Chicago IL 60641. 312-282-9722.

Technics SH-15B2 TT bases (2), prime cond, \$100 ea. P Remaker, WOHG, 3905 Spruce St, Philadelphia PA 19104. 215-898-9553.

QRK Studio Pro's (2) w/Micro-Trak arms, \$125 ea. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

QRK 12" studio TTs, (2) w/Rek-O-Kut arms, gd cond, \$150 ea. P Combs, Only Son Prods, 2316 Forrest Home Ave, Dayton OH 45404. 513-236-2340.

Technics 1500MKII w/factory arm, like new, \$245. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Technics SL1800 MK 2, needs chip & minor repair, \$75. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

QRK 3-speed TTs (4) w/QRK tonearms, no cartridge shells, \$100 ea plus ship. S Sibulsky, KVNI, POB 308, Coeur d'Alene ID 83814. 208-664-9271.

Russco RTA-12 tonearms (2), \$360/both. T Fernandez, WKXY, POB 2500, Sarasota FL 33578. 813-366-4422.

Russco Cue-Master (2) w/tonearms, Stanton 680 cartridge & preamps, gd cond, \$150 ea. C Fries, KSOY, Box D, Dearwood SD 57732. 605-578-3533.

Russco Studio Pro, brand new, \$350. B Marshall, WT Studios, 2025 S 900 E, Salt Lake City UT 84105. 801-486-4977.

Technics SP10 MK II, \$500. R Gray, Aray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-6941.

Lead screws for Presto 6N 224/104/106 lines per inch, all \$135. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Rek-O-Kut CVS12 TT speed variances, \$165. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

QRK 12C w/Rek-O-Kut tonearm, \$125. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

Russco Studio Pro w/Micro-Trak 303 arm, \$175; QRK 3-sp TT w/Micro-Trak 303 arm, \$150. W Laughlin, KDCV, 2636 N 56th, Lincoln NE 68504. 402-466-8670.

Technics SP15 w/base, \$500. H Quinton, BRT Recd, 275 E Oakland Pk Blvd, Ft Lauderdale FL 33312. 305-925-7117.

TV FILM EQUIP.

Want to Sell

Conrac AV12E (2) TV tuner w/manuals, \$50 ea; Vital VI-500 color processor w/manual, \$100; RCA PK330 (2) B&W cameras, vidicon studio cameras, w/zoom lenses. B Humphreys, Utah St University, Dept of Telecomm, Logan UT 84322. 801-750-3133.

Projector, 16mm, Singer Graphex, TV shutter, like new. N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

RTI film edit/evaluator, TV2000 w/quick-trac & defect evaluation, \$5400; RTI film editor, Cinescan II, \$2700; RTI film cleaner, \$1800. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

GE PE-24 color film camera (2), \$1000; RCA TP-6 projector w/spare TP-6 for parts, \$1000; RCA ENG camera, TK-76C, \$3000. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Want to Buy

Philco Cinescanner TV bdct projector. DMT AV, Box 9064-RW, Newark NJ 07104. 201-484-5291.

VIDEO PROD. EQUIP.

Want to Sell

Channel Master 7408B ch 8 RF AGC amp, \$50; Quanta character gen, Sel 7-3, \$4000; Microtime TBC T-100, \$3500; Microtime video processor 2100, \$2700; custom news set, anchor desk, credenza, etc, \$3500. J Fuehrer, NTV Network, Box 220, Kearney NE 68848. 308-743-2494.

Lexicon 1200 time compressor/expanders, change program running time w/o changing pitch, interfaces w/variable speed ATR's, VTR's, Telecines, used w/90-day factory warranty, 1200B, \$3500; 1200C, \$3590; Demo, \$6900; new, \$9500. Call Lexicon Sales, 617-891-6790.

Power supply for BVU-800, used, BO or trade. 516-489-1071.

Audio Kinetics 310 synchronizer, \$4500; BTX 4500 synchronizer, \$400. Eido, Natl Vid Cir, 460 W 42 St, NY NY 10036. 212-279-2000.

Panasonic NV8170 & 8200 video camera w/access, \$500 for set. M Russell, Sherwood Comm, 1310 Industrial Hwy, Southampton PA 18966. 215-357-9065.

Edutron CCD 2h-4 TBC, \$1500; DPS-1 TBC freeze frame & posterization, \$2250; Sony PVM 1900 color monitor, \$350. E Denke, American Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-8273.

Tek 527 waveform monitor, \$450; Dage 100641 B&W 8" monitor, \$100. B Weiss, KLSI, 1722 Main, Kansas City MO 64108. 816-474-6400.

Panasonic NVA970 time code edit controller, \$700. B Chapman, Video Effects, POB 6316, Napa CA 94581. 707-257-7669.

Sony BVG 100 time code reader gen, for parts only. 516-489-1071.

Want to Buy

Sony BVG 100 to be used for parts. Kosack, 516-489-1071.

Convergence 100 interface card & cable for Sony Type 5. G Sive, Video Connection, 31844 Ranch Amigos Rd, Bonfall CA 92003. 619-749-7662.

Tech manual (service) for video projectors, GE PJ7100 & PJ700. DMT AV, Box 9064-RW, Newark NJ 07104. 201-484-5291.

VIDEO TAPE RECORDERS

Want to Sell

NEC time lapse VCR, 3/4" R/PB up to 72 hrs, \$650; Panasonic 9500 3/4" VCR R/PB, \$900; IVC 1" portable VCR R/PB, \$850, plus UPS on all. J Baltar, Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Mitsubishi HS-347UR 1/2" VTR, \$250; Panasonic AG 6200 1/2" Pro VTR, \$1000. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.

Sony BVU 50, gd cond, w/AC power supply w/BP90, \$1500. G Sive, Video Connection, 31844 Ranch Amigos Rd, Bonfall CA 92003. 619-749-7662.

Panasonic NV8170 & NV8200 VHS rec/player, gd cond, \$500 firm. M Russell, Sherwood Comm, 1310 Industrial Hwy, Southampton PA 18966. 215-357-9065.

Sony VP2000 3/4" player & VO1800 recorder, \$95 ea. L Grazioplene, Grailen Research, 3532 N Main, North Java NY 14113. 716-535-7251.

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12300 Coppola Drive,
Potomac, MD 20854
301-762-2786

Panasonic MV9300A 3/4" VCR w/built-in UHF/VHF tuner, \$750/BO. R Branske, WLOO, 875 N Michigan, Chicago IL 60611. 312-440-3100.

JVC 3/4" PB only, works but needs minor repair, \$150. P Badger, WKRE, POB 220, Exmore VA 23350. 804-442-5000.

Want to Buy

Sony SLO-323 (10-20) decks, also parts. G Hobart, Pacific Comm, 1801 E 4th, Olympia WA 98506. 206-754-7081.

Sony SLO383, Beta 1 video recorder. J Smith, On Mark Eng, 11925 Woodland, Olathe KS 66061. 913-764-4226.

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TRW	Thomson-Mostek

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SOLID STATE TUBE REPLACEMENTS BY:

National

CATHODE RAY TUBES BY:

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FM AMPLIFIERS BY:

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ITT Varian

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718/646-6300

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Woodland Hills, CA 91364
Phone: 800/348-5580
818/347-5580

CENTRAL/CORPORATE OFFICE

Richardson Electronics, Ltd.
LaFox, IL 60147
Phone: 800/323-1770
312/232-6400

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Brampton, Ontario L6T 3T4
Phone: 800/387-2344
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