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Class A FMs Still Seek Boost

by David Hughes

Washington DC ... Some owners of Class A FM stations, who have been campaigning for a blanket Class A power increase, say the FCC's 29 December decision to allow their stations to upgrade to Class B or C status will not solve increasing interference problems.

The decision removed the Commission rule requiring that 20 of the 80 FM channels be reserved for Class A use only with a maximum power of 3 kW and antenna height of 100 m (HAAT).

The FCC said that it originally reserved the Class A channels to "ensure the availability of FM allotments to smaller communities."

However, as a result of the Docket 80-90 proceeding, which created approximately 700 new FM allocations, many of which are located in small communities, the FCC said it determined that the Class A reservations are no longer necessary.

Despite the removal of the Class A reservations, the Commission said it "declined to consider amending its rules to provide for a blanket increase in power."

Joel Rosenberg, an attorney with the FCC's Allocations Branch, said the blanket increase was "outside the scope" of the rulemaking proposal.

Rosenberg added that if the Commission does address the Class A blanket power increase, it would have to examine possible engineering and interference problems as well as how the across-the-board hike would affect international FM agreements the US has with Canada and Mexico.

However, Class A owners maintain that a blanket power increase is the only way their stations, according to current technical rules, will be able to fight interference.

Class A stations will not be able to take advantage of power hikes to Class B or C because FMers are already "packed coutour to contour" in most areas, according to Nutmeg Broadcasting President Mike Rice, who serves as the chairman of a group called Connecticut Class A Broadcasters.

Rice said that Class As, instead, want a blanket power increase to 4 kW and 125 m (HAAT). Simply removing the Class A reservations on the 20 channels "won't do a darn thing for Class A's in New England or the eastern US where they are jammed in pretty tight already," he said.

John Barger, senior VP for Clear Channel Communications, which owns one Class A FMer, said according to a recent study his firm had conducted, only 9.4% of all Class A stations could "potentially avail themselves" of the FCC's decision to remove the Class A restrictions.

"We want to see the FCC, instead, redefine the power and height limits for Class A's," he said.

While Barger said he supports a Class A hike to 4 kW/125 m, he said he would rather see a 6 kW limit, with the height remaining at 100 m (HAAT).

Many Class A facilities, particularly those in metropolitan areas, face zoning and other environmental restrictions if they want to increase their tower height, both Barger and Rice said. Barger maintained that the 6 kW level at 100 m would provide the same coverage as 4 kW at 125 m.

"In short, we'd like the FCC to allow Class As to double their power," Barger said. "It would create no more interference than is permitted under Docket 80-90 or with the educational (band) standards."

However, Rice admitted that the increased power could cause a slight increase in co-channel interference in fringe areas. But he said most of the Class A owners he had talked with would not mind the added co-channel interference if the adjacent channel interference problems in their main coverage areas could be remedied.

Rice said the existing power levels are not sufficient to prevent interference from Class B operations' first adjacent channels, particularly during certain atmospheric conditions, and "side banding" interference that occurs even relatively close to the transmitter.

"A power of 4 kW or higher would rid us of much of the interference," Rice said.

Both Rice and Barger said they wanted to study the FCC's order on the ruling, which had not been released at **RW**'s press time.

Barger said his firm may file a petition for rulemaking with the Commission to request the blanket power boost.

FCC docket number is MM 86-144. The changes affect FCC rule section 73.206. For more information contact Joel Rosenberg at the FCC, 202-634-6530, Mike Rice at Nutmeg Broadcasting, 203-456-1111, or John Barger at Clear Channel Communications, 512-734-7301.

Daytimers Get DST Relief

Washington DC ... The FCC has proposed establishing a 50 W minimum power pre-sunrise authority (PSA) power level to aid daytimers that will lose a key hour of AM drive time in April, when daylight savings time (DST) is extended three weeks.

The Commission's plan, which was announced 8 January, was expected by NAB Daytimers Committee Chairman David Palmer, who predicted in the 1 December issue of **RW** that the FCC would, in the near future, grant DST relief to daytimers.

"I'm delighted with the news," said Palmer, VP/GM of WATH, a daytimer in Athens, Ohio. "This is essentially what happened in 1973 when the government extended DST in response to the energy crunch."

Palmer maintained that while he would have liked to see a higher PSA minimum than 50 W, he said the limit was "realistic. To expect more than what had been done in the past would be folly."

The Commission's proposal comes in response to the DST extension passed by Congress in July 1986. Starting this April, DST will start on the first Sunday in April, rather than on the last Sunday, as had been the practice.

That means sunrise will come one hour later during that three week period. Many owners of daytimers were upset that they would lose an hour of full power AM drive time because of later sunrises.

According to the proposal, daytimers with PSA authorizations of less than

(continued on page 6)

Fowler To Quit FCC

Washington DC ... FCC Chairman Mark Fowler submitted his resignation 16 January. According to reports, he gave no reason for the action, which will take effect this spring. He has been chairman since 1981.

Fowler, who led the Reagan administration's "deregulation" campaign that resulted in the removal and easing of a wide range of the Commission's technical regulations, provided no indication that he had another job lined up.

Although FCC officials would not comment, industry sources indicated that former White House staff member and current Commissioner Dennis Patrick would be his most likely replacement.

For more details, including reaction to the resignation, see the 15 February **RW**.

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Regulatory News

FCC Seeks Minority Comments

by David Hughes

Washington DC ... The FCC is reassessing its female/minority ownership policy, and is postponing action on applications for distress sales that relate to that policy. The Commission is also asking for comment to determine if current practices relating to the policy should be kept.

> *The FCC 'may depart from this principle if we find that the ... goal of promoting diversity of programming ... is promoted by granting preferences to minorities ...'*

In a Notice of Inquiry, issued at its 17 December meeting, the Commission said the US Court of Appeals for the District of Columbia "prompted" it to "assess the constitutionality of its comparative preference and minority distress sale policies."

The specific policies in question relate to: (1) the application of racial, ethnic and gender preferences in comparative proceedings for broadcast licensees; (2) the administration of its minority distress sale policy; and (3) the issuance of tax certificates for broadcast station sales to minorities.

The FCC said it wants to receive comments on "the nexus between these minority ownership policies and increased program diversity," along with assertations of whether its comparative preferences, distress sales and minority tax certificates should be retained.

During the initial comment period, which will last until until April, and the reply comment period, which will extend through June, the FCC said it will "defer action on all pending or future applications for distress sales persuant to minority ownership policy."

While noting that equality, "without regard to race or gender ... is the law of the land," FCC Chairman Mark Fowler said that the FCC "may depart from this principle if we find that the Commission's goal of promoting diversity of programming and viewpoints is promoted by granting preferences to minorities or women."

However, Fowler, who has advocated the elimination of minority preference policies at the FCC, maintained that the Commission's current proceeding "is designed to ascertain whether such a nexus exists."

"In the long run, however," he added, "our society will be better served by adherance to equal treatment for all Americans under the law."

Commissioner James Quello, in support of the minority preference policies, said that he is "not inclined to question the wisdom of continuing our minority policies if they are constitutional."

Yet, he maintained that he "cannot quarrel, however, with my colleagues' desire to seek comment on whether these policies are indeed accomplishing the worthy objectivies that they were designed to achieve."

In related news, the Broadcast Capital Fund (BROADCAP), a private, nonprofit venture company founded in 1978 by the NAB to assist minorities in the acquisition of stations, announced in December the approval of a $300,000 investment to Davis Broadcasting of Columbus, GA.

The funds will go toward the purchase of two AM/FM combos located in Columbus and Augusta. BROADCAP said this brings the organization's total committments to $7.8 million in 20 radio and TV properties.

BROADCAP also elected board members and officers in December, with Berkshire Broadcasting Company President Donald Thurston as its new chairman. The group also formed a planning committee to consider the direction of BROADCAP during the next five years.

For more information on the FCC's minority policies contact Bob Ratcliffe at 202-632-5414; the docket number for the latest action is MM 86-484. For more information on BROADCAP contact John Oxendine, president of the organization, at 202-429-5393.

Featured this issue

FCC Clips

Public Station License Modifications

The FCC, 2 January, proposed modifying its rules relating to the "issues-programs" list for noncommercial educational broadcast licensees.

The planned changes involve replacing the present requirement with a quarterly list of programs that have provided a station with its most significant treatment of community issues for the preceding three-month period.

Existing rules require noncommercial stations to place in their public files every three months a list of at least five to 10 community issues addressed by the station during the preceding three months.

While considering identical rules for commercial licensees, the US Court of Appeals found that an illustrative issues-programs list did not further the Commission's stated regulatory goal of relying on effective public participation in the license renewal process, according to the FCC.

The Commission said the rule change will bring the noncommercial rules in line with the court ruling.

FCC docket is MM 86-499. Contact Barbara Kreisman at 202-632-7792.

Experimental Service Changes

On 31 December, the FCC relaxed license posting requirements for Experimental Broadcast Service (EBS) stations, which are licensed to research advanced technologies for the broadcast industry.

The relaxed posting rule requires only that the original or a clearly legible photocopy of the station license be available at the EBS station transmitter site. The original license does not have to be posted on site, as previous rules required.

The change is contained in docket MM 85-225. For more information contact Hank VanDeursen at 202-632-9660.

Engineering Policy Branch Head

J. Bertron Withers, Jr., has been named chief of the Engineering Policy Branch of the Mass Media Bureau's Policy and Rules Division.

Withers has held numerous positions with the Commission—most recently as an attorney in the Common Carrier Bureau's Mobile Services Division. He has also worked with the Common Carrier Bureau and the Office of Chief Engineer, now the Office of Engineering and Technology.

As chief of the Engineering Policy Branch, Withers will be in charge of formulating and revising engineering technical rules and regulations.

In another personnel change, Susan Steiman has been promoted to deputy associate general counsel, Administrative Law Division, of the FCC's Office of General Counsel. Steiman had been assistant general counsel.

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

Circle Reader Service 37 on Page 20

Stations Support Studio Plan

by David Hughes

Washington DC ... Most broadcasters who filed comments support an FCC plan to remove the main studio and studio origination rules, which would allow stations to relocate their studios outside their city of license without the need for an "Arizona waiver."

In comments filed with the FCC in December and January, many broadcasters agreed with the NAB that competition and technical advances, such as satellite and microwave links, have "changed the manner in which broadcasters conduct their business."

The NAB called the Commission's local studio and program origination rules an "unwarranted government intrusion into a broadcast licensee's program discretion."

"The location of a station's main studio does not necessarily determine its responsiveness to its community of license," the association concluded.

October proposal

In October 1986, the FCC proposed "modifying or eliminating" the rules that now prohibit licensees from moving their studios outside of their city of license without prior FCC permission.

The Commission's proposal came in response to a campaign launched in June 1986 by an ad hoc group of 14 radio station licensees calling themselves the Arizona Justice Committee (AJC) that petitioned for the removal of the regulations.

The FCC's current rules require a radio station's main studio to be located in its community of license, with more than 50% of the station's "non-network" programming originating from that studio or elsewhere in the community of license.

The rules were formed in order to ensure that a local community has access to a station's main studio. Stations can obtain an "Arizona waiver" to build studios outside their city of license if they agree to provide at least 51% of their public affairs programming from within the city of license.

In its October proposal, the FCC said the "modification or elimination of these rules would result in wider discretion for all broadcast licensees in situating their main studios and in choosing programming to serve their audiences."

Broad support

Support for the repeal of the studio and program origination rules came from large and small broadcasters alike.

For example, Dorsey Eugene Newman, licensee of WHRT, a 250 W daytimer in Hartselle, Alabama, commented: "Our public, those served by our local station, communicate with us principally by telephone. If after our phone conversation, further communication is desired, we meet at a convenient place to have coffee and talk face to face."

Greater Media Inc. noted that "with increasing spohistication and portability of tape recording equipment and even live broadcast equipment, the actual point of electrical origination of a program has become largely meaningless in evaluating service to the city of license."

CBS also supported the FCC proposal, however it said the Commission should devise "a policy statement requiring broadcasters to maintain an office readily accessible to their communities of license."

The NAB also maintained that broadcasters must "ensure that the public does have access to a station licensed to its community."

The National Telecommunications Information Administration (NTIA), the arm of the Department of Commerce that sets communications policy for the Executive Branch, said the studio rules "are not needed to ensure broadcasters will be responsible to their service areas."

However, not all broadcasters supported the removal of the studio rules.

State College Communications, which operates WRSC in State College, Pa., and WQWK in University Park, Pa., said that "stations which are licensed to serve other communities should be required to maintain studios in those communities."

"The physical presence of a studio serves a vital local function which an 800 (telephone) number cannot replace," State College added.

State College also stated that "market forces will not satisfactorily regulate local radio (and) will not keep main studios where residents want them." It maintained that the removal of the studio rules "will not achieve a fair, efficient and equitable distribution of radio facilities."

Final FCC action on the issue is expected during late winter or early spring. The docket number is MM 86-406. The rule changes involve rule sections 73.1125 and 73.1130. For more information contact Terry Haines at the FCC, 202-632-7792, or Greg Skall, the AJC representative, at 202-861-1500.

NRSC Standard OK'd

by Alex Zavistovich

Las Vegas NV ... The National Radio Systems Committee (NRSC) on 3 January authorized the NAB and EIA to publish an interim voluntary preemphasis-deemphasis standard for AM transmission and reception.

The committee formally adopted and authorized publication of the interim standard at a special meeting before the Las Vegas Consumer Electronics Show, according to NAB staff engineer Mike Rau, a NRSC member. Rau said that the standard, which had been approved in draft form before the NAB's Radio '86 show, was "far and away" supported by the group.

Included in the standard are a 75 μS AM broadcast transmission preemphasis and a complementary 75 μS receiver deemphasis, a 10 kHz AM transmission bandwidth provision and a five-year review stipulation.

Rau said the interim measures will next be submitted for formal standardization by the American National Standards Institute.

The NRSC recommended publication of the interim voluntary standard as soon as possible.

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

Editor's note: **RW** *will take a closer look at the NRSC interim voluntary standard and issues surrounding its implementation in the 15 February issue.*

AM Auctioning Seen as Trend

by Alex Zavistovich

Baltimore MD ... The announced auctioning of WYNC-AM, Yanceyville, North Carolina, one of several stations to be placed up for bids recently, has prompted some industry observers to suggest there may be a trend towards auctioning of AM radio broadcast properties.

At **RW**'s press time, WYNC, a 2.5 kW daytimer broadcasting on 1540 kHz, was slated to be sold 15 January by Michael Fox Auctioneers, Inc., a national auctioning company based in Baltimore, MD.

According to Fox spokesperson Rebecca Joseph, WYNC, which serves the Yanceyville-Roxboro, NC and Danville, VA market, will be sold "in bulk," including its FCC license, real estate and broadcast equipment.

The station's GM, A. Thomas Bowes, said he was divesting himself of his AM holding because he plans to establish a Docket 80-90 FM station in nearby Semora, NC. Bowes opted for auctioning because, he said, it was faster and more lucrative than a broker-negotiated sale.

Focus on AM stations

Robert Sczepanski, Fox's radio marketing coordinator, said there may be an increase in the auctioning of AM radio properties. Recent studies show 72% of the total radio audience listens to FM rather than AM, he said, although "in terms of the number of stations on the air, it is almost the other way around."

Auctioning has been chosen by many station owners because of the rapid turnover such a sales method offers, Joseph commented. In contrast to a private sale, which may take many months to complete, an auction usually takes place no longer than six to eight weeks from the signing of an auction agreement.

Fox began auctioning broadcast properties in May 1986, when it sold WNTR-AM, Silver Spring, MD for an estimated $755,000, Joseph said. In July, the company auctioned WMTG-AM (now WMET-AM), Gaithersburg, MD, followed in November by WCSE-AM, Myrtle Beach, SC, and WSES-AM, Raleigh, NC. Each station was sold for under $1 million, Joseph noted.

At press time, WENZ-AM, Highland Springs VA, and WCCR-AM, Brentwood, TN, were also to be added to the Fox auction schedule.

"Selling the farm equipment..."

Americom Media Brokers President Thomas Gammon, acknowledged that auctioning may be an emerging new trend in broadcast sales. However, he said, auctioning of the type Fox was taking on "is like auctioning farm equipment, where they are handling AM loser stations which are in bankruptcy and must be sold."

Tony Rizzo, a media broker with Blackburn and Co., added that "people going to an auction are looking for a deal." Some of the auctioned properties would not be taken on by a broker, he claimed.

"You would not see a class B FM station going up for auction," Rizzo said.

Still, Sczepanski dispelled the stereotype of "an auction on the courthouse steps," noting that auction transactions are no longer regarded as a "path of last resort" for financially disadvantaged companies.

Not all of the auctions arranged by Michael Fox Auctioneers were distress sales, Joseph pointed out. Two of the sales were arranged by financial agencies, she said, while station owners represented the other half.

Sczepanski added that station owners who are not using auctions for distress sales can protect themselves by setting a "reserve price" before the auction.

Increased demand for auctions

The success of auctioneering firms like Michael Fox, Gammon said, is a function of the profitability of smaller AM stations.

"The profitability of those (AM) stations has continued to sink over the past 10 years," he maintained, "and buyer demand diminishes with profitability." Gammon concluded, therefore, there may be an increased demand for Fox's services.

He added that some brokers are successfully using some auctioning principles, in so-called "professional auctions." Brokers present a detailed offering memorandum to potential buyers, who then make bids on the property. At the end of the bidding period, Gammon maintained, the owner and broker determine the winner of the auction.

Gammon said his company recently concluded a professional auction of four FM radio stations, a transaction which netted approximately $38 million.

Another brokerage strategy, called "negotiated bid selling," has some of the characteristics of an auction sale, Gammon noted. In negotiated bidding, the broker works to strike a deal with each party in a large pool of potential buyers. The brokers look for the best deal from each, he said.

For additional information, contact Robert Sczepanski at Michael Fox Auctioneers, 301-722-3334, or Thomas Gammon at Americom Media Brokers, 202-737-9000.

Few Changes to FCC Fee Plan

Washington DC ... Land mobile groups whose applications require frequency coordination will have the option of paying new FCC fees prior to or following successful coordination.

This is the major change in the FCC's fee collection policy, unanimously approved by the Commissioners in late December.

Other than the land mobile decision, the fee policy was left "pretty much unchanged," according to Brent Weingardt, attorney in the FCC's Office of the Managing Director.

Weingardt admitted in December that reconciling fee collection and frequency coordination was a problem because fees attached to the coordinators' applications are considered government money and must be submitted within three days.

Since then, Weingardt said, the FCC ruled that land mobile applications and fee filings must be submitted within three days of coordination to the Treasury Department lockbox bank in Pittsburgh, PA.

If a land mobile group enters into an agent agreement with a frequency coordination committee, the applicant may submit a single check to the committee to cover both FCC and coordination fees.

The fees, a provision of the Budget Act of 1985, are listed in Section 8 of the Communications Act, a schedule of charges which the FCC maintains are applicable to many of their permittees or licensees in private radio, mass media and common carrier services.

FCC fee charges for broadcasters include $2,000 and $1,800 for major CPs by AM and FM stations, respectively. Comparative modification hearings and comparative license renewal hearings carry a fee of $6,000 for each application designated for hearing.

Applications in the special emergency radio and public safety radio services are exempt from the charges, Weingardt said.

According to the FCC, fees listed in the schedule of charges will be modified every two years after the enactment date of the Budget Act, based on the percentage change in the Consumer Price Index for all Urban Consumers. Unless the change equals at least $5, the FCC noted, there will be no adjustments to fees under $100.

Weingardt stressed that the schedule of charges will not go into effect immediately. Applications or filings already on file with the FCC before or on the 1 April implementation date will not require a fee, unless the application is subsequently designated for hearing.

For additional information, contact Brent Weingardt at the FCC: 202-632-3906.

Clarification

An article in the 1 January issue of **RW** on the FCC's refusal to change the 2 March deadline by which Class B and C FM stations were to have upgraded their facilities or risk a downgrade should have mentioned that affected stations did not have to actually have completed an upgrade by the deadline, only that they had to have filed for one.

For more information on the upgrade plan contact Mark Lipp at the FCC: 202-634-6530.

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).

AM Hi-Fi

Dear **RW:**

There's a lot of talk these days about AM stereo and/or AM hi-fi. I personally think that hi-fi would be the most interesting, but as we all know, if the spacing between the AM channels is not expanded, and stations were to broadcast 15 kHz of audio, they would interfere with each other (as some probably do already).

I have read a very interesting idea in a newsletter, *The CGC Communicator*, dated Sept. 1986, that we received from Communication General in San Diego County, and I think it deserves more nationwide attention. Here it is in full:

"AM RADIO: In a positive turn of events for AM radio, industry experts are finally concentrating on noise reduction and fidelity improvements as issues that are more important than stereo. One suggestion of our own is to use the quadrature stereo channel to extend the fidelity of an AM station instead of using it for stereo purposes. Put 0-7.5 kHz info on the conventional "L+R" channel, and the 7.5-15 kHz info on the "L−R" channel. Existing receivers would receive conventional lo-fi AM. New specially designed receivers would combine the channels to produce a single 0-15 kHz hi-fi output."

But, let me add, the (few) already existing AM stereo receivers would still be able to tune in and, the only strange twist would be that they would have 0-7.5 kHz on one speaker and 7.5-15 kHz on the other. Could I have some response from AM-ers?

Dennis Pieri
Technical Consultant
Bext Inc.

Low-fi AM future?

Dear **RW:**

I have always been interested in radio. Listening to it, DXing it, and reading about it, following the ratings of stations in Detroit as well as many other markets.

When my favorite local station went off the air in February, 1984, due to financial difficulties, my interest quickly turned to fanaticism. I read every book and magazine on the subject that I could find, talked to many people in the radio industry, as well as to many ordinary people (the people that must listen to a radio station if it is to survive.)

After two years of nonstop magazines, phone calls, and visits to electronics stores, I have come to the conclusion that many of the AM "Improvements" proposed in this and other publications are, in fact, lost causes.

If the NRSC gets what it wants, low fidelity AM stereo with no incentives on receiver manufacturers, broadcasters, or the public, AM radio is dead, along with tens of thousands of jobs in broadcasting and production. Then there is the disastrous NRSC idea of *reducing* frequency response, in this age of increasing importance on high fidelity, to protect weaker (read skywave) signals from adjacent-channel interference. AM stations will lose talk audiences when they have to filter out the consonants.

I am not saying that the NRSC is trying to kill AM radio to increase FM ratings, I believe the intentions of the NRSC are good. Apparently the NRSC believes that with a stereo standard and a preemphasis curve, people will rush to the stores to buy AM stereo receivers so that they can listen to low-fidelity simulcasts of stations they can already hear in high-fidelity on their FM stereo receivers.

Like last winter's *Challenger* tragedy and the Tacoma Narrows Bridge fiasco of 1940, this is a case where the intelligent and experienced engineers making the decisions are put in power to do so because they are unrealistically optimistic.

Standards for high-fidelity techniques will not be chosen by retired engineers who are losing their high-frequency hearing. The standard will be chosen by the consumers who buy the receivers because they can hear the difference. They have already chosen the standard: FM stereo. Surveys indicate that the majority of people say they intend never to switch to an AM station.

The problem with AM stereo is not the lack of a single standard mode. Having more than one system did not kill records after World War II, the industry quickly learned to produce three-speed phonographs. The problem is that the public simply refuses to have anything to do with AM stereo. If the public wanted AM stereo, the receiver manufacturers would have embraced multimode (or dual mode) AM stereo receivers.

A glaring example of the disinterest in AM stereo is found here in the Detroit area. Every AM stereo station within 120 miles of here uses the same AM stereo system, the system that is heard on every AM stereo receiver in existence. The number one (Arbitron) station in Detroit uses it. But AM stereo receivers are unmarketable here, even when retailers mark the prices down to lower than those of comparable FM-only stereo receivers.

The public wants high-fidelity, 24-hour, local radio. FM stereo provides this whereas AM does not. The public thinks AM stereo is a joke because it is not aware that AM stereo could be capable of delivering very high fidelity. Useful programming in high-fidelity stereo is the improvement that AM needs.

As for the suggestion that skywave service is the saviour of AM radio, let's look at the circumstances. First, there is overwhelming evidence that people will reject stations in other cities even if the signals are perfect. Second, has anyone reading this ever listened to an AM band skywave?

You will hear noise, fading and co-channel interference from stations thousands of miles away. Even the best skywave signals are ruined by fading to a point where there is no listenership potential. The reasons are too numerous to go into here, but the ionosphere is an imperfect and unreliable reflector at these frequencies.

The electronics industry cannot pass off AM stereo to the consumer as being "high-tech" because it is the technology of the 1950's. The fact that it was not introduced when it should have been is in the past and cannot be changed now. If AM stereo had been introduced earlier, it would have been readily accepted by the public and would have grown up along with technology to improve it, just like the compact audio cassette, which was originally produced for voice recording but with stereo, new tape formulations, and noise reduction has become an important music medium.

The last thing I want to do is paint a pessimistic picture of the future of AM radio. I still believe that AM stereo has a good chance of becoming an important second radio medium. In major markets it can mean the availability of classical music, foreign language and talk programming, in medium markets it is oldies and beautiful music, and possibly ACR.

In small markets, it could make the difference between a top 40 station and an A/C station as compared to just a single top 40 station. The evidence is overwhelming that there is more public demand for spectrum than FM alone can provide (most notably the high acquisition prices of FM's).

But before AM can make a comeback, it must be marketable to the public. This means full range stereo with a noise reduction system, AM stereo in all stereo receivers, and end to same-market simulcasting, and a massive advertising effort by broadcasters to convince the public that AM is worthwhile and that the people should do away with their bias against AM radio "just because it's called AM".

Robert Grant, KD8EN
Detroit, MI.

The Fowler Years

The resignation of FCC Chairman Fowler provides a good occasion to take time out to evaluate the changes in the broadcast industry during his tenure.

The Fowler years ushered in a new spirit of deregulation, a laissez-faire approach to broadcasting which has its supporters and critics. Some changes have been rightly praised for reducing the burden on broadcasters, while other decisions have come in for their share of criticism.

On balance, Fowler's move to deregulate the industry has been beneficial. In government, the "less-is-better" approach is a good one, and in many ways it has served the radio industry well.

But there is one area where a more relaxed atmosphere has not always helped. At some stations, deregulation has been taken as permission to lower technical standards, thus affecting station performance, and perhaps even causing increased interference.

Engineers have understandably been unhappy about decisions which have had a negative impact on their jobs, and are wondering if Fowler intended to allow "deregulation" to become a euphemism for lax technical standards.

Radio station ownership, more than TV station ownership, might benefit from more forced attention to engineering issues. The technical plant needs to be protected, or the result will be chaos.

The Commission needs to take a look at technical areas where they have loosened requirements over the past few years. Where standards have fallen by the wayside, remaining rules need to be enforced, with increased penalties if necessary.

Broadcasters are operating in an atmosphere of deregulation that has been constructed during the Fowler years. Whatever the result of the his departure, a new, less stringent environment now exists.

Station owners are learning to self-regulate, and this is fine. It is still incumbant on the FCC, though, to insure that in deregulating they haven't allowed poor technical practices to proliferate. If that happens, the consumer will ultimately bear the burden.

—RW

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FCC May Auction Off Licenses

by Alex Zavistovich

Washington DC ... In a move which supporters contend will help reduce the federal deficit, the FCC may soon be using auctions rather than comparative hearings or lotteries to assign licenses for the use of nonbroadcast spectrum.

The auctioning proposal is part of the Reagan administration's 1987 budget, released 5 January, according to Ed Dale, spokesman for the Office of Management and Budget (OMB). Dale said the proposal still requires legislation.

Peter Pitsch, chief of the FCC's Office of Plans and Policy, said the budget plan is "basically the same" as the spectrum auctioning proposal put forth by FCC Chairman Mark Fowler in his 1 October 1986 speech to Congress. In that speech, Fowler supported auctioning of common carrier and private radio licenses to generate revenue for the US Treasury and to expedite the licensing process.

During his presentation, Fowler suggested that auction revenues for mobile assignments, excluding cellular licenses, could be as high as $2 billion. Dale maintained that the budget proposal is expected to generate $600 million in federal revenues in 1988.

No affect on mass media

The budget stipulates that "auction authority will not affect the terms of the licenses awarded, and will not apply to licenses awarded in any medium of mass communications, or for public safety or amateur services."

According to the provisions of the auctioning proposal, only unassigned spectrum for non-mass media services (such as common carrier cellular, private multiple address and low power television) will be affected.

NAB VP/Government Relations John Summers said the auction plan has "some merit." He noted, however, that measures should be taken to ensure that the program "does not involve, or will never involve, the auctioning of broadcast frequencies."

Summers added that there ought to be a provision in the proposal which would keep the government from "purposely reallocating broadcast frequencies to services where they can be auctioned."

Pitsch dismissed industry fears that the spectrum auctioning plan might set a precedent for allocations in mass media.

"The Commission has no discretion to consider mass media (in the proposal," he said.

Pitsch also maintained authority to auction spectrum will not affect its allocational policies. Under auctioning, licensees will have no greater or fewer legal rights and obligations than they would have if they had won assignment by lottery or hearing.

Disposition of licenses

The budget statement said that "public auctions will capture the true value of the license and give taxpayers a return for the use of the spectrum." In the past, applicants involved in comparative hearings tried to improve their chances by spending money on the preparation of applications, money which was lost following the hearings, Pitch said.

Although not directly addressed in the budget, members of Congress had suggested that spectrum auctioning as proposed by Fowler might lead to short-term, high risk investment of FCC licenses, or that the policy might favor investors who are financially capable but not necessarily the most appropriate.

Fowler responded that concerns that auctioning might lead to concentration of ownership of FCC licenses are "misplaced." He indicated that licensees already have some freedom to resell their authorizations. Therefore, "neither comparative hearings nor lotteries will greatly change the ultimate disposition of licenses if there is the opportunity for resale."

For additional information, contact Peter Pitsch at the FCC, 202-653-5940, Ed Dale at the Office of Management and Budget, 202-395-3000, or John Summers at the NAB: 202-429-5456.

Daytimers Get DST Power Increase

(continued from page 1)

50 W, or those that do not qualiity for a PSA level, will be able to operate at 50 W starting at 6 AM during the three week period in April.

The Commission maintained that the 50 W PSA level would apply only from "the first Sunday in April" to "the last day of April."

Daytimers already authorized to operate with more than 50 W PSA powers would continue to do so, the FCC said. They would not be affected by the ruling.

Louis Stephens, of the FCC Mass Media Bureau's International Branch, said that not all daytimers with less than 50 W PSA or no PSA would be able to utilize the 50 W minimum, however.

"The 50 W PSA minimum is subject to the condition that no international agreements are violated," he said. Therefore, some stations, particularly those near the Canadian and Mexican borders which could cause interference beyond US borders with their 50 W PSAs may be excluded from the plan.

Stephens also said that there is a possibility that the FCC may not be able rule on the plan by April, considering the comment and reply comment time periods. In that case, he said, the Commission would implement an "interim change" that would allow stations to use the 50 W limit even though the FCC had not officially approved the plan.

While affected stations will not have to apply to have the PSAs raised to 50 W for the three week period, they must wait for formal notification from the Commission. The FCC said it "intends to perform the necessary calculations and to issue authorizations to all affected stations in time for use next April

At **RW**'s press time, no comment or reply deadline had been set. However, Stephens said that a mid-February comment deadline would be likely.

The issue is contained in FCC docket MM 87-3. For more information contact Louis Stephens at 202-254-3394.

Ampex for Sale by Parent Co.

by Alex Zavistovich

Morristown NJ ... Allied-Signal Inc. recently announced its intention to sell audio-video systems manufacturer Ampex Corporation and six other firms in its Electronics and Instrumentation Sector, a move which Allied officials say will help finance continued research in core businesses.

Several European and Japanese firms are reportedly interested in purchasing Ampex.

The decision to sell, announced in December, was prompted by Allied's desire to concentrate on its aerospace, automotive and engineered materials projects, according to Allied-Signal spokesperson Mike Ascolese.

In addition to funding work in those areas, Ascolese maintained that proceeds from the sales would be used in the company's share buyback program and to "reduce debt."

Other Allied-Signal firms affected by the sale include Sigma Instruments, Inc., Amphenol Products, Linotype Group, MPB Corporation, Neptune International Corporation and Revere Corporation.

Cutbacks in staff

Allied-Signal's decision follows a November 1986 announcement by Ampex to impose a 10% staff reduction at its Audio-Video Systems Division facility at Colorado Springs, CO. The division's GM Donald Bogue attributed the cutbacks to "consolidation taking place in the US television broadcast industry combined with the company's improved manufacturing efficiencies."

But Ampex Audio-Video Systems Division spokesperson Dave Detmers dismissed any connection between the cutbacks and the sale announcement. Allied chose to liquidate its electronics holdings because they "didn't fit the profile of the company, not because any are poor performers," he stressed.

Allied expects to sell all of the businesses, the combined annual sales of which total over $1.5 billion, by the end of 1987, Detmers added.

At press time, Ampex, whose own annual sales exceed $500 million, was being considered for purchase by several electronics firms, including major European and Japanese manufacturers, Detmers and Ascolese confirmed.

Detmers acknowledged that Ampex may encounter some difficulties in being purchased by a non-US company, because of US military contracts with its computer, data and tape divisions. Still, he stressed, the company will be sold as a whole; it will not be split into separate divisions.

Asking price not set

At a "high-level" meeting in early December, Ampex executives refused to speculate on an asking price for the company, Detmers said, although he noted that such figures are usually "some multiple of the company's total revenue."

Industry rumors of a "management-led leveraged buyout" of the company were denied by Detmers, who said the option "was not seriously considered."

For additional information, contact Dave Detmers at 415-367-4423, or Michael Ascolese at 201-455-4674.

Marantz Purchased

Chicago IL ... Marantz Company, Inc., a California-based consumer audio and video firm, has been acquired by Dynascan Corporation, a Chicago electronics manufacturer.

The transaction, announced in late November, involves a cash tender offer of $6 per share of outstanding shares of Marantz common stock according to Dave Allen, Dynascan's VP/Finance.

Dynascan markets a variety of electronic products, including B&K Precision test and measurement equipment and Telemotive industrial radio remote control systems.

Before the tender offer was made, Dynascan said it would purchase 488,350 shares of Marantz common stock from the company's founders, Joseph Tushinsky, Fred Tushinsky and Nathan Tushinsky.

The stock, also to be purchased at $6 per share, represents a 21% ownership interest in Marantz.

Marantz has approximately 1.8 million shares of common stock in addition to the Tushinsky brothers' shares.

According to letters of credit for which both Marantz and Dynascan will be liable, Marantz will obtain up to $3 million for "working capital." Dynascan will have the option to acquire up to 1.6 million newly issued or treasury shares of Marantz common stock at $5.625 per share.

Allen said that Marantz, after the tender offer, will become a wholly-owned subsidiary of Dynascan. The company will retain its name and its California headquarters, he stated, and the management structure will remain the same.

For more information, contact Dave Allen at Dynascan: 312-889-8870.

Getting Edge on Frustration

by John "Q" Shepler

Rockford IL ... It's showdown time. Mr. Know-It-All Program Director has just stormed out of the transmitter room, slamming the door so hard the plaster cracked. Well, that's his problem.

Last week you told him to keep his miserable fingers off the processing. You're sick and tired of him and his crew of tone-deaf imbeciles screwing up your perfectly tuned system.

But, you've fixed him now. The adjustment pots don't do anything because they've been clipped and replaced with fixed resistors. And that takes care of that, right?

Not yet. In a few minutes you're standing next to your adversary in the Station Manager's office. You're both red in the face. There are accusations and counter-accusations. You can feel the stomach acid start to churn. You tense up further. You've got to beat this guy.

Now the Station Manager takes over. He pulls rank and tells you both to shut up. He paces and lectures for half an hour. Then he tells you to put the equipment back in working order. "Box it up and send it back," he orders. "Put the old limiter back in."

Stunned, you head quietly back to the shop. Just as quietly, the PD hurries back to his office.

John Shepler is a broadcast consultant, teacher, writer and former CE. He can be reached after 8 PM at 815-654-0145.

Guess who won? Nobody. Now you have to get rid of equipment you worked on ordering for six months. You'll probably never have cordial words with the PD again. In program meetings with management, he'll be quick to reiterate every little technical problem, as if the station were about to go silent.

Q-Tips

It will be hard to justify any new equipment this year, much less a trip to the NAB. You'll keep running from studio to studio just to stop all the whining about noisy pots and cart machines that eat tapes.

Eventually one of you will leave. Then a new guy comes and it starts all over again.

This is what is called a lose-lose situation. You stuck it to yourself in order to stick it to someone else. In the end, you fixed the other guy, but it made your situation worse, not better. You probably would have been better off to move the processing to the PD's office, offer to hire a high-priced consultant to help him adjust it, and buy the poor guy a few beers to boot.

After a few weeks of unproductive fiddling, he would have begged for help. What choice does he have? He can't complain to management, because you're already bending over backwards.

If the consultant comes in, he'll probably tell them to buy more equipment, not less. You win either way. Now, isn't this an improvement?

Ever see one of those tractor-pulls at an indoor stadium? They chain a couple of thousand horsepower back-to-back and rev 'em up. The smoke and dust make the air thick enough to eat. You can't see anything 'til it's over, and then—there they are—still chained together roughly in the middle of the stadium.

For some reason, we like to take the tractor-pull approach to life. *You floor the accelerator so you can beat the car ahead to the next stop light. Things aren't working out? Start pointing fingers right away.*

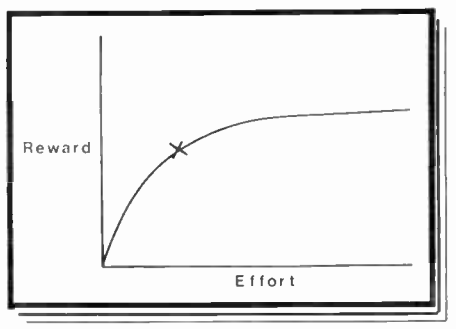
"Hey, boss, it's his fault, not mine." "We're doing it my way, no matter what!" Don't forget to spend lots of hours worrying about what they're saying behind your back. "Why doesn't the other guy cooperate?"

You're probably getting the idea that I don't like competition. It's not true. I love a good game. But, I don't like to play for real unless the prize is worth the grief.

A worthwhile competition is when you're one of 10 candidates for a chief engineering job that pays 25% more than you get now. A good contest is when the station owner offers an all-expenses-paid vacation to Florida if you go up a point in the next book.

OK, that's unrealistic. How about a tailgate party at the next NFL game?

Some of the most rewarding contests are those where everybody wins. Group efforts are like that. Often, you find that by helping somebody else improve their performance, you wind up getting helped yourself. That's called "synergy."



The end result is better than what you could all do individually. On the other hand, if you start arguing about who gets the bigger piece, everybody winds up ticked off and the total effort is dismal.

Aside from squabbling over things that don't matter, the big mistake we make is working too hard on things that will never pay off.

I was making my best pitch ever for a pay raise. The new studio was built, the air staff was happy, the equipment was humming. I was on a roll until the station owner pointed out a cold fact of life: "John, the job is only worth so much, regardless. Even the manager's job is worth just so much. Period."

I was crushed. It took months for those words to start making sense. In fact, I never did really understand this until I got into a supervisory position where I had to live with limited budgets. Yes, I got to fend off the same raise requests with the same argument. *Touche!*

Many people I know are frustrated because they won't accept the way things work. A particular task is worth just so much. How much would you pay somebody to mow your yard? Would it be worth $250 if they used a manicure scissors and did it perfectly? Of course not. You just want it mowed.

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Steering Clear of Frustration

(continued from previous page)

The lesson is: *don't overwork the problem.* Don't polish the transmitter every night after midnight and expect people to thank you for it. They just want it on the air, not dust free.

Don't buy a dozen extra cart machines as spares and expect the management to thank you. They want to show a reasonable profit, not be guaranteed that there will never, ever, be a cart machine missing for repair.

Don't spend 40 hours a week studying for a class so you can get an A+ instead of just an A and expect anybody at all to thank you. The fact is that few people expect perfection, and nobody appreciates it. So, don't knock yourself out trying to be perfect.

I'm including a little chart labeled "Reward and Effort" (see Figure 1). Notice that the curve looks something like an overloaded tube amplifier. For any given task, the higher up the curve you get, the more additional effort you have to expend to get any additional reward.

At some point, the job has been done "good enough." I suggest that that point is at the X, the knee of the curve. At that point, you're probably better off taking your reward and going on to something else.

You may have already guessed at how to improve your rewards. The answer is to put only the optimum effort into a project and use the rest of your energy for other things.

For instance, instead of polishing the transmitter every night, figure out a maintenance plan that pretty much ensures that the transmitter will stay on the air and look reasonably clean . . . but no more than that.

Take the time left over to set levels in the production studio or put new pinch rollers in the cart machines or something else. The transmitter won't trip off much more often than if you babysit it constantly, and the people who use the other equipment will get very happy.

The trick is to balance dozens of reward/effort curves so that you put the optimum effort into each job, but don't waste time trying to achieve perfection or overplease people who have no capacity to appreciate your efforts. I once heard this definition of quality: "Good enough is perfect."

Find out what is "good enough." Do that, and maybe a touch more, because you're extra talented. Then get on to the next task.

A lot of time we get caught in the mode of reacting to everything. Something goes wrong and we fix it. Something else goes wrong and we dash over and fix that. In other words, something has to happen before we take action.

An alternate plan is to become a driver of events. You decide what you want to happen and then try to influence situations to make sure it happens. Sometimes all the driving you have to do is to simply ask for what you want. At other times, you'll have to take more drastic action.

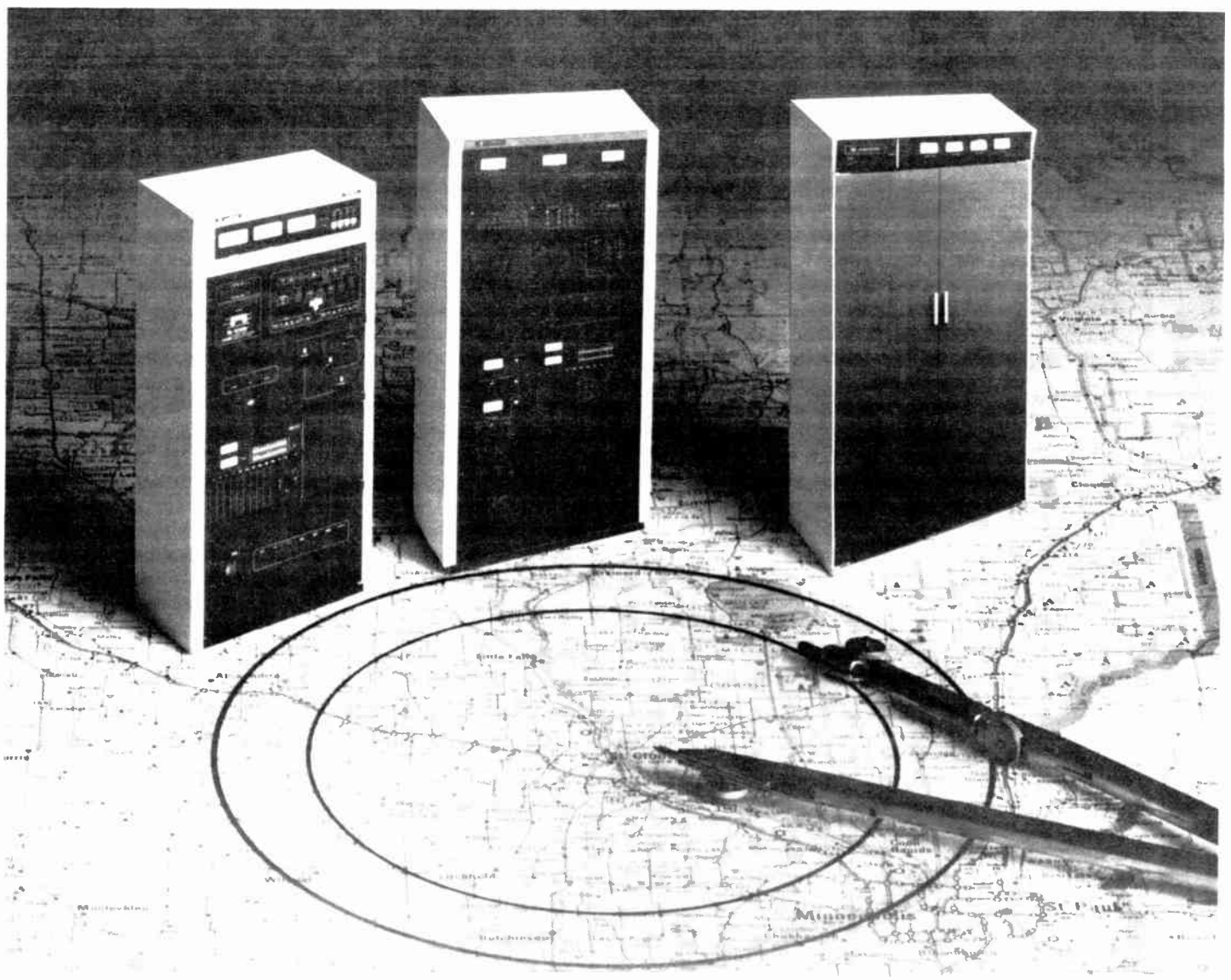
Many people are afraid to rock the boat. They feel lucky to have a job. Even a month or two of no income would push them into bankruptcy. They are living on the edge of disaster.

The worst part of being in this position is that you have no options. You must dance when other people say to dance, because it's dance or go down the drain. If you are going to drive situations, you must get out from under that axe hanging over your head.

Your first objective is to build an independence fund of several months' to a year's living expenses, bare bones. Figure exactly what you need for the essentials of rent, utilities, food, etc. The monthly figure is your "nut." Start squirreling away $10 here and $20 there until you have several times your nut locked away in a savings account or bonds.

This modest financial backing will automatically make you a lot less timid. Even if the worst happened, you could survive until the next decent opportunity came along.

Knowing this, you can start working on getting what you want without worrying about what everybody else thinks. Just the added security of knowing you could walk away from the situation at any time will boost your energy level and help you get going in the direction you choose.



Share New AM Info With Staff

by Ralph Chambers

Miami FL ... Considering the current developments in AM stereo—including the NRSC transmission standards, the Texar petition submitted to the Commission and the soon-to-be-released NTIA report—I thought it a good idea to share some important information about AM stereo with the sales staff and key program people at our AM stereo station.

The following is the bulk of two memos given to each Account Executive and Program Director of our station. Included with the first memo was the latest information about the above-mentioned industry proposals and involvement, plus a copy of an AM stereo question-and-answer book available from Motorola and some miscellaneous advertising material for a few AM stereo receivers, some of which we have begun handing out to interested consumers at the various local events where we demonstrate AM stereo.

In the first memo, I covered some general information, and shared my experience with attitudes of some of the consumer salespeople I've come in contact with over the past several months while shopping for equipment.

In the second memo, I explained the issue of high frequency preemphasis, which a few "Golden Ears" have keyed in on and asked why it doesn't sound "just like" FM. I've explained to these few that the inherent IMD that exists in most AM transmitters is difficult to reduce, but the more we are able to eliminate it, the better we sound. I have made a number of modifications to both of our AM transmitters to reduce distortion, and have planned more changes.

Another important point deals with listening to AM stereo and how I feel we must be fair in our comparisons of AM stereo with other sound sources (FM, disk, tape, etc.). AM and FM are still two different types of transmission systems, both vulnerable to different types of interference, disturbances and anomalies that deviate from the ideal—none of which, I believe, tip the scales in favor of one or the other when it comes down to the final user and the many different listening environments that exist.

"To: Sales Staff
From: Engineering
Re: AM STEREO

With mixed interest beginning to build with regard to AM stereo, I thought it a good idea to hand out some material I have received to each of you, along with some pertinent clippings dealing with the key issues.

The future of AM stereo is important because it has brought with it the answer to one of AM radio's basic problems of poor fidelity (sound quality), which is mainly a product of the receivers. AM can sound just about as good as FM if certain technical standards (not known 40 or 50 years ago) are mandated for use as transmission and reception standards in the next few months. Various industry groups are in the process of trying to do this, but they of course still need us to help educate the buying public.

If enough interest is developed, or better yet, if the FCC or some arm of the Telecommunications Bureau declares a single system, as they should have done in the first place, then the receiver manufacturers will quite possibly implement wideband AM stereo into all of their receiver lines. If the above does not happen within a reasonable amount of time, the receiver manufacturers have shown interest in producing "continuous tuning radios" with wideband stereo that make no distinction between AM and FM.

The main reason you should understand some of the advantages of wideband AM stereo is to "pass on" a positive message to the people, media and consumer alike, you come in contact with. Various attitudes prevail in the marketplace about AM stereo. Unfortunately, there are those who speak negatively about it, yet actually know nothing about it!

I have found over the years with many of us, when we do not understand a particular subject matter or lack knowledge about certain things, tend to react negatively when confronted by others with these things, often just because we fear our "self esteem" will be threatened if we admit a lack of knowledge or understanding in the area in question.

As unfortunate as this is (for them), I have experienced this a number of times with some of the consumer electronics sales personnel. About half of them stock and promote AM stereo products, but the other half have not even heard of it. Yet they give the impression that it's not worth anything, seemingly because they don't want to admit they haven't heard about it yet, know very little about it or just don't stock any of it.

We need to make an extra effort to educate, especially these who know little or nothing about AM stereo, to overcome some of this unnecessary criticism. These people need to know that this is a job producer and that it is something *they* can profit from.

Out of the many people I have had the opportunity to demonstrate AM stereo to for the first time (engineering and consumer alike), none of them had a negative comment, and the general reaction with virtually all of them is "What a difference" and "It really sounds good!"

Criticism is fine, but not from someone who hasn't even heard about AM stereo, much less even heard AM stereo with their own ears.

At any rate, I hope you like the material. Feel free to ask questions and, especially, to see me for a demonstration if you have not heard how great we sound in stereo!

"To: Sales Staff
From: Engineering
Re: Listening to and comparing AM stereo

In light of the possibility that you may have a chance from time to time to hear or even "demonstrate" our AM stereo sound to various clients and/or consumers, it is important that you understand and hence be able to explain the apparent, extreme high frequency or sibilant sound of most AM stereo as well as mono stations when listening on a *wideband* AM stereo receiver.

Most AM stereo receivers manufactured from 1984 and on have a frequency response (sound quality) which is substantially wider (hence the term, wideband) then that of the average, outdated, AM receiver. This was done after many years of pressure from the broadcast industry to improve the fidelity of AM receivers and make them more compatible with FM. It was also done at this point in time to enhance the potential of AM

(continued on next page)

Ralph Chambers is CE at WCMQ, Miami. He can be reached at 305-854-1830.

Staff Should Get New AM Info

(continued from previous page)
stereo by presenting a dramatic, audible improvement when switching to AM stereo.

Some receivers actually force the bandwidth into "narrow" whenever the receiver is switched back to "mono" for two reasons; first, to reduce interference, for example when listening to a distant station at night, and second, to make the mono (old AM reception) sound comparatively "poorer" in the showroom, which I believe are both good reasons.

As new receivers become more popular and greater in number, each broadcaster will have to choose whether our high frequency equalization (i.e., preemphasis) will be optimized for the vast majority of conventional outdated receivers that are still present in the marketplace, or for the new wideband AM stereo receivers, or whether we will compromise somewhere in between.

One point I want to bring out is that the choice has, understandably, been for the majority (which will imply a relatively extreme preemphasis), and the newer receivers may sound somewhat strident or exceptionally bright when listening in stereo unless the tone controls are turned down to a comfortable level by the user.

If we broadcasters were to favor the newer receivers, implying less preemphasis and less compression (audio processing and limiting) to make our AM stereo sound "more like FM," then the majority of receivers would be deprived of some of the high frequency energy, and would sound both quieter and duller than they would with preemphasis and processing optimized for the old, dull AM sound.

This is why the National Radio Systems Committee, along with the EIA (Electronic Industries Association) and the NAB, are working with receiver manufacturers to establish a permanent set of transmission and reception standards for AM, as FM now enjoys.

So, when listening to AM stereo, remember to adjust the tone control (or equalizer, if the equipment has one) to make the received signal smoother and more to your taste (or, if you will, more like FM).

It must also be realized that, in light of the above, it is *not* possible to do fair A/B comparisons between AM stereo and FM stereo on most (if any) AM/FM receivers. To be fair, it is necessary to have two identical sound systems side by side, one tuned and adjusted for AM stereo and one tuned and *equivalently* adjusted for FM stereo, and both playing the same record!

A variation of this concept would be to again have *one common sound source* feed both an AM and an FM transmitter being received and monitored each by compatible receivers for each medium, with all tone controls set to flat (neutral, no boost or cut), each with preset volume to the same level, and then a switch to change from one receiver to the other.

Numerous comparisons such as this have been done thus far by all the groups involved in the marketplace, at conventions and in the laboratory. The experiments with home stereos have revealed very little (negligible) difference between AM and FM reception.

Comparisons in automobiles (since the frequency response of most FM auto receivers is limited to 12 kHz anyway) has been reported by test listeners as being the same (no difference). The average person cannot hear anything above 12,000 Hz. The highest fundamental (primary) frequency produced by any musical instrument, aside from electronic types, is about 4,000 Hz.

Personally, I believe we should emphasize the improvement of wideband AM stereo sound over old (mono) AM radio, rather then comparing it to FM, at least until the transmission and reception standards have been set, and until a substantial number (if not all) of the AM stereo stations convert their processing equipment over to the new 75 μsec preemphasis standard proposed by the NRSC and the receiver manufacturers begin producing receivers under these new standards and refilling the showrooms.

Thank you, I hope this information will help you enjoy AM stereo all the more."

75 μsec conversion successful

Just before this writing, I converted our station's AM stereo processor over to the newly proposed NRSC 75 μsec preemphasis curve, with excellent results. Even without a completely compatible receiver to monitor the eventual, "properly corrected" sound of the station, the resultant mono sound is still quite acceptable. With our processor's six-band limiter functioning as usual, and with the pre-processing I've always used, our mono signal seems fine.

If you have not seen a copy of the NRSC proposal, check it out as soon as possible. Kits for the various processors should be available around the first of the year.

I believe there are more then enough stations presently broadcasting in this country with AM stereo that are able to make a substantial penetration into their respective markets with diversified promotional campaigns at a nominal cost in 1987 that can do plenty to educate the general public and bring about the interest needed to make and keep AM radio an accepted information and musical entertainment source—and thus bring about the overall acceptance of the great sound of wideband AM stereo.

Won't Get Rich in Small Market

by Peter Hunn

Westport NY ... Come to think of it, I've never met anyone who was afraid of becoming wealthy. Had I ever encountered such an individual, however, my recommendation for an "overflowing financial phobia" cure would rest squarely on the suggestion that the fearful phobic seek employment at a small town radio station.

Though the pay envelope of a seasoned bucolic broadcaster seldom bulges, his/her memory is oft-times richly filled with work-related anecdotes suitable for the finest situation-comedy programs.

Many funny radio station stories begin to develop when the station management looks for a cheap way to make cheap repairs on old broadcast equipment. Little radio facilities are not made of money. Besides, the funds for the new desk and deep-pile carpet in the GM's office have got to come from somewhere!

One of my old GM's brand new carpeting was blue—and that made the announcing staff pretty sad, because that rug money could have been put to better use. For example, we really needed new turntables. One of our two ancient 16" models had a habit of skipping over two or three stanzas of just about every record on the Top 40.

Peter Hunn, a former FM station owner/operator, holds a Masters degree in Mass Communication, and has recently written a commercial FM station handbook which Tab Book Co. plans to publish this fall. He can be reached at RD #1 Box 1067, Westport NY 12993.

Quick and inexpensive

While listening to jumping records, and standing firmly on his carpet, the GM ordered the station engineer to come up with a quick, inexpensive solution. The technician suggested that new turntables were needed. "Total nonsense," exclaimed my leader, and he challanged the engineer to "think harder!"

Later that day, the station engineer taped a paper cup full of loose change onto the studio wall. Attached to the small container was a note that outlined how the coins were to be rested on the turntable's tone arms whenever a skipping record was played. "Use a nickel on the albums, and a dime and a nickel on the singles," noted that technical document.

Well, the manager was thrilled that complete repairs had been made for $0.15. During congratulations, the GM overconfidently assured the engineer that "when one thinks hard enough, a parsimonious patch is always possible."

A week later, the engineer was gone. He didn't pass away, he just finally decided that his sanity would be more ensured if he got out of radio and joined his brother-in-law's insurance agency.

"You know that old reel-to-reel tape recorder, in the production studio?" asked the erstwhile engineer (who was now my insurance man).

"The one that gives off green smoke whenever you press the rewind button?" I queried.

"Yeah, the one with its own ozone layer," verified my compatriot, who then recounted how the radio station GM commanded him to fix it cheap!

"That's when I knew that it was time to quit the broadcasting business," concluded the former radio tech.

Suddenly, I vaguely understood why the GM had asked me to glue $0.45 worth of nickels around the outer edges of the ailing tape machine.

So how cheap was he?

Next, I moved to a station that, in terms of worthwhile expenditures, made the previously cited operation seem like the grant-writing department of the Ford Foundation. The station management at this place simply refused to spend money on anything except electricity—and then only when a power company truck was seen entering the station driveway.

When staffers complained that the station restroom was out of bathroom tissue, the GM penned a caustic "bring your own" memo (written on the back of a piece of junk mail), but finally gave in to employee demands by regularly filling the bathroom with extra napkins that he pilfered from a nearby fast food restaurant.

When one of our six towers succumbed to sheer neglect and tilted to the south, rumor had it that the management seriously considered inexpensively redrawing the station's coverage map to include portions of the Sun Belt states, rather than pay to have the tower righted!

And, then there was the wasp invasion. The screen on this place's studio window had rusted away, and during a week of 100° weather, the window had to be cracked open. This is how all the wasps flew into the on-air studio.

When one of the aggravating insects stung me (in the middle of a live "funeral home" commercial), I begged the boss to spring for some bug spray.

"Oh, just keep the studio window closed," mandated the manager from his air conditioned office (with green carpeting).

This called for some drastic action against the darn bugs and boss. The solution was found in the station's nearly empty supply closet, where I located a half-used can of tub and tile cleaner. Opening the studio window, I let in the grouchy wasps and then let them have it with the spray can's thick, bubbly glop.

The stuff didn't kill them, but it did make them too heavy to fly. By day's end, the overheated broadcast room was filled with dozens of white, foamy wasps, each writhing in sync with the distorted tunes drifting through the ripped studio speaker.

Another kind of phobia

Interestingly, funny situations even pop up after one begins to operate his/her own small market radio station.

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Buzzer For Telco Line

by Ed Wilkie

Phoenix AZ ... Although I am the CE for an FM station with a Light Rock format; our sister AM station is a news/talk and sports format. As such, we do many remote broadcasts over the year.

Many of our broadcast lines remain installed for a considerable length of time, and are used only once every week or two. Now, this may come as a shock to some of you, but, sometimes when we go to check the lines prior to a broadcast, they are not active. We suppose it must be the work of Murphy Bell, since we know that Telco would not take a line without checking their records first.

After a few experiences like this, we felt it was time to put a signal on the line during periods of nonbroadcast use. It's true that there are some devices on the market that satisfy this need, but we needed one to fit the following criteria:

- Low cost
- Long life
- Easy to build
- Minimum parts
- Suitable output levels
- Expendable (Yes, some people still steal things)

A trip to the home library yielded a "neat" little oscillator circuit built around an LM 3909 IC. That circuit was breadboarded, changed, modified, fine tuned, etc., and the circuit shown in Figure 1 emerged.

From this circuit, one can expect the following performance:

- Frequency: approximately 500 Hz
- Output—Average level=−10 dBm to −12 dBm, and peak level=0 dBm to +2 dBm
- Battery drain: 160 μA
- Battery life: 2+ years (with D-cell alkaline battery)

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Figure 1.

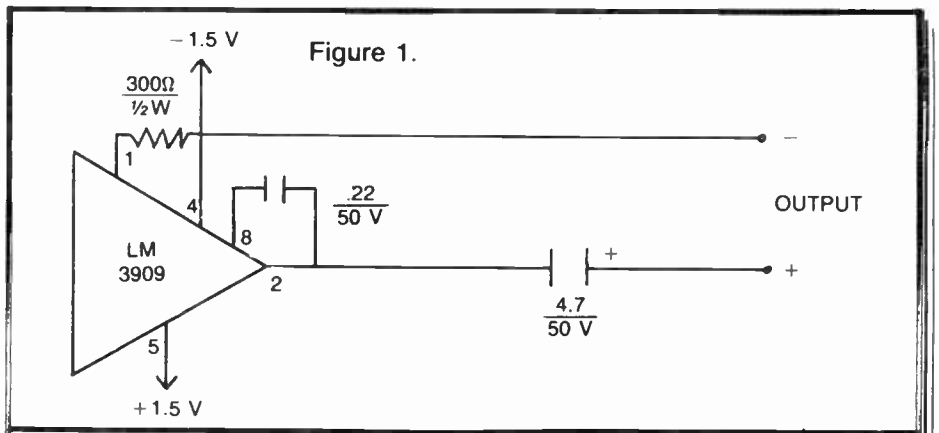
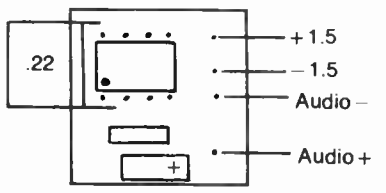


Figure 2.

Figure 3.



In addition, one can expect a waveform like that shown in Figure 2.

This little buzzer sounds so obnoxious that no CO tester in his right mind would remove or mess with the lines. We have found this to be true, and you will, too.

The four components mount nicely on a piece of perfboard measuring ¾"×¾". A piece of Radio Shack 276-149 will allow you to make many of these devices. The physical layout of the board looks something like that shown in Figure 3.

The next step was to mount a Radio Shack 270-403 D-cell holder to the metal top of a Radio Shack 270-231 utility box. Then two 5-way binding posts were installed in one end of the box. I put some electrical tape around the battery holder for insulation purposes, and then, with the battery leads and audio output leads in place, I used electrical tape to hold the circuit board in place on one end of the battery holder.

Now that everything is in place, do not forget to wire the audio leads to the binding posts if you use them, add one D-cell, flip the cover over, bolt the top to the case with the four screws provided, and *voila!*—one each T2YPOB (The 2-Year-Plus Obnoxious Buzzer).

We have several of these units in the field, some for as long as seven months, and have been very pleased with the results. We have not lost any lines or had any of these units stolen, so far.

If you need a smaller version, you could use "C" or "AA" alkaline cells. This would only shorten the length of continuous operation.

The total cost of parts should be less than $10, battery included.

No Way To Gain Riches

(continued from previous page)

Take my little upstate FM, for example. It was situated right in the middle of a tiny farming community.

Next door to the studio/transmitter building lived two very kindly, stout folks who apparently never quite understood the time restraints placed upon a lone radio station owner/disc jockey.

Every afternoon, at about 12:15, the postman would stop at our rural delivery mailbox (which was co-located on a cedar post with my portly neighbors' mailbox).

When the mailman had completed his task, I'd quickly start a record, rush to cue up another one, and then high tail it out to the mailbox.

At that point, the folks next door would begin their slow walk to the weathered box, in order to see what the postman had left them.

As soon as they spotted me, they'd always try to strike up a friendly conversation. Of course, with a three-minute record playing away, in the studio, I'd have no time to talk. I would just grab my mail, run back towards the station, and leave my neighbors yelling something about "the nice weather we've been havin'."

All of this went on for the better part of two years, until I was able to hire an afternoon DJ. Finally, I got to walk slowly to the mailbox. The overweight folks next door seemed amazed that I was actually standing there talking with them. They wondered why I didn't start dashing back to the studio.

When I explained about usually having to rush to and from the mailbox before my record ran out, their eyes widened.

"Oh, so that's it!" they exclaimed with genuine surprise. "We always just figured that you were afraid of fat people."

Advertisement

HI-FIDELITY AM STANDARD
APPROVED BY NAB AND EIA.

At the January 10th, Las Vegas meeting of the National Radio Systems Committee (NRSC), the membership approved a voluntary standard for AM broadcast frequency response. This standard promises to significantly improve audio fidelity on the AM band.

The NRSC is an industry technical group sponsored by the National Association of Broadcasters (representing broadcasters) and the Electronics Industries Association (representing receiver manufacturers). At a series of meetings over the last twelve months, the committee explored methods of improving fidelity in the AM band. Members of the Committee included major broadcast groups, receiver manufacturers, broadcast equipment manufacturers, and other interested parties. Attendance at the meetings included industry representatives from: NBC, Cap Cities/ABC, RKO, Group W, Viacom, Susquehanna, New City Communications, CRB Broadcasting, Motorola, Delco, Ford, Sony, Pioneer, Harris, TEXAR, Orban and CRL.

The purpose of the Committee was to find common ground between AM broadcasters and receiver manufacturers such that a frequency response standard for transmitting and receiving AM could be agreed upon.

A DEFINITION OF THE PROBLEM

Most people are aware that the audio response of AM is generally less than that of FM, but a surprising percentage have misconceptions about the major cause of the discrepancy. On average, the largest single limitation imposed on AM fidelity is that of the receiver. With an average bandwidth of just slightly over 3 kHz, the fidelity of most AM receivers is inferior to that of the telephone. Few listeners would consider placing a high-fidelity receiver on a table next to a telephone handset, and then listening to the music on another telephone at a distant location, but that is about what present AM receiver performance amounts to.

It is true that some AM antenna systems impose transmitted bandwidth limitations, as do some plate-modulated transmitters. But the number of stations where transmission bandwidth limitations cut off at a frequency lower than that of the receiver is extremely small. To verify this, one need only tune slightly off carrier on any AM music station on the band. High- frequency content, like cymbals, snare drums and castinettes will be found. Curiously, if tuning directly on the station's frequency, these instruments will seldom be heard. Further, those limitations imposed by the AM transmitter and antenna system need not be permanant. Pulse-width-modulated, Doherty and Ampliphase transmitters can, in theory, have frequency response equal to that of FM. Modern, computer-assisted, antenna design methods can usually cure the narrow frequency response of older AM antennas.

HOW WE GOT WHERE WE ARE

How we arrived at the present condition is a matter of some debate, but a reasonable model follows. Consider the effects of nighttime skywave propogation on wideband AM reception. A wideband receiver attempting to listen to the local signal of a Class IV station on 1230 kHz will also pass the carrier of a number of stations on 1240 kHz, producing a constant 10 kHz whistle in the speaker. Similarly, Ohio and Pennsylvania listeners attempting to receive the nighttime skywave signal of 890 kHz station WLS, Chicago, will also hear a 10 kHz beat note produced by the skywave carrier of 880 kHz, WCBS, New York. The converse is also true for listeners attempting to receive WCBS. The list of possible examples in endless.

To prevent this nighttime whistle, receiver manufacturers supressed the response of receivers 10 kHz on either side of the frequency tuned to. While there might have been some advantage to the use of 10 kHz notch filters, for a number of design reasons, it was often simpler to employ RF bandpass filtering and audio lowpass filtering. While this may have compromised the audio fidelity more than was actually necessary, few listeners complained. Before the blossoming of television, much of AM programming was talk, including the likes of Gracie and George Burns. Listeners also had little else to judge by, as the frequency response of 78 RPM records was seldom full spectrum. Even during the AM rock heydays of the 60's, with little to compare against, few people were conscious of the missing upper octaves.

Then, as FM took hold in the 70's, listeners became aware of what wider frequency response could mean. Even where listeners and advertisers were slow to notice the difference, FM promotion and sales departments were quick to point out the technical superiority of their product. Conscious of the fact that FM's were using this technical advantage as a sales tool, AM's sought to equal FM's high-end performance. To counteract the AM receiver's high-frequency roll-off, AM broadcasters implemented pre-emphasis in their audio chains. Seldom was a sophisticated shelving or peaking equalizer used. More often, a graphic equalizer or a single-pole network was pressed into service. The result often was that the engineer who adjusted the pre-emphasis to obtain 10 dB of boost at 10 kHz unintentionally increased the 20 kHz frequency response by 16 dB. While the 20 kHz response of most studios was significantly attenuated, 16 dB was sufficient boost to bring even low-level signals up to an interfering level. The 20 kHz audio showed up as "monkey chatter" interference on stations 2 channels up and 2 channels down the band.

This led to a greater incidence on car-buyer complaints that the radios in their new automobiles were being interfered with. Receiver manufacturers attempted to eliminate the interference by further narrowing the received bandwidth. This required broadcasters to increase the amount of pre-emphasis even more, causing more interference, and a vicious circle was formed.

BREAKING THE CIRCLE

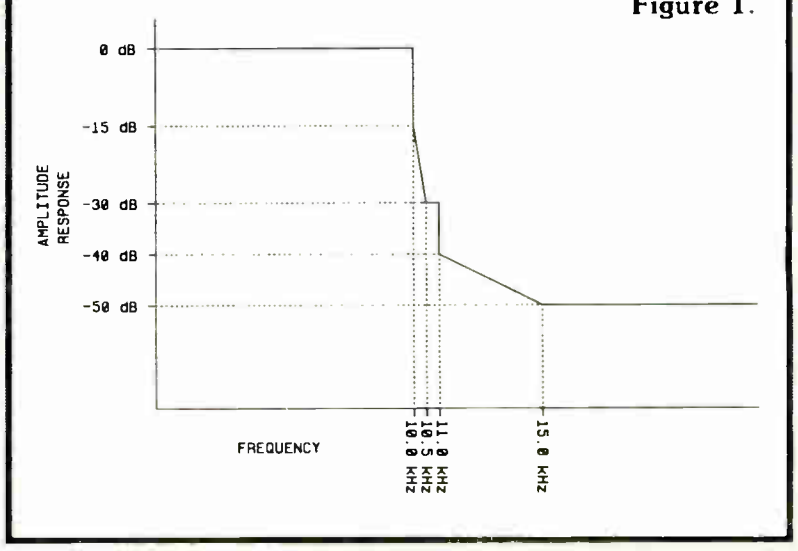
The FCC's AM allocation standards (usually) separate daytime contours such that stations separated by 10 kHz are not able to interfere with each other, even though they may be transmitting wideband program material. Unfortunately, the same cannot be said for AM stations separated by 20 kHz. Because second adjacent stations can be much closer to each other than can be first adjacents, an AM station which transmits audio spectra wider than 10 kHz can destroy a significant portion of the listening area of another station removed by 20 kHz.

For this reason, the NRSC's voluntary standard, which will be described below, includes a "brick wall" filter at 10 kHz. There are those who will immediately point out that this does not bring AM up to technical parity with FM, and that a 15 kHz filter should have been chosen. It will serve no purpose to recount in strict detail the lengthy debate which the Committee gave this point. It was an item discussed, investigated, modeled, proposed and counter-proposed over many meetings. Suffice to say that the 10 kHz filter is the optimum which can be implemented with the existing AM band. To implement a meaningful 15 kHz filter would literally require reallocating the entire AM band, going back to 1922 and starting over again.

In defense of the 10 kHz standard, one needs to differentiate between specsmanship and actual performance. It is a documented fact that the ability to hear high frequency material decreases with age. Most adults over 30 years of age have minimal ability to hear above 10 kHz. In addition, regardless of what fancy name is attached to your mega-dollar car stereo, unless it has metallic-domed tweeters, it's response above 10 kHz is almost nil. Most cardboard speaker cones are simply too compliant to accurately reproduce high-frequency signals.

All of which is a roundabout way of saying that an average listener, on an average stereo receiver, will be hard pressed to differentiate between an AM station and an FM station in a blind A/B comparison.

Figure 1.



WHAT'S IN THE STANDARD?

The most apparent method for achieving a standard might be to simply install the 10 kHz transmission filter and be done with it. Receivers also would be flat to 10 kHz and then implement their own brick-wall filter. Real world considerations suggest a better method. While a brick-wall filter, when designed with sufficient care, can be musically pleasing, those filters having sufficient rejection and being most suitable for the mass- produced, consumer market are usually musically undesirable. A much more musically transparent filter would have a rounded rather than square passband. To compensate for this roll-off, the committee's transmission standard includes a pre-emphasis specification.

While this may sound like re-entering the earlier described vicious circle, there are three differences: 1) the NRSC pre- emphasis specification is coupled to a brick-wall lowpass filter at 10 kHz so that efforts to boost the 9 kHz component do not inadvertently result in enhancement of 18 kHz material, 2) the receiver roll-off rate is 6 dB, compared to a typical 18 dB roll- off rate in present receivers, and 3) the corner frequency of the receiver roll-off is higher.

The committee selected a modified 75 μS pre-emphasis. It begins its boost at the same frequency and rate as the FM pre- emphasis standard (See Figure 73.333, Figure 2, in an old copy of Part 73 of the FCC Rules). It tracks the FM curve up to approximately 6,000 Hz, where the AM curve will then begin to level off to a shelf.

This pre-emphasis, coupled with the 10 kHz low-pass filter response shown in Figure 1, constitutes the NRSC's voluntary AM frequency response standard. As before, it would serve little purpose to recount, in detail, how each breakpoint and supression level was selected by the Committee. One can be assured; however, that the filter specification was the subject of much heated debate that lasted over several months and several meetings. It is the result of numerous revisions, changes suggested by many Committee members, and an attempt to reconcile many conflicting constraints imposed by transmitters, receivers, and filter technology.

WHO SHOULD IMPLEMENT THE STANDARD?

It is important to note that the standard is the work of an industry group and is therefore strictly voluntary. It is not promulgated by the FCC and does not carry the force of law. Strictly speaking, no one is legally required to adhere to the standard. So long as one continues to comply with the occupied bandwidth limitations in FCC Part 73.40(a)(12) through 73.40(a)(14), he is 100% legal.

From a practical point of view, it is in the best interest of every AM broadcaster to implement the standard within the 1987 calendar year. The ability of receiver manufacturers to produce and sell 10 kHz bandwidth receivers is dependent on AM stations uniformly restricting their bandwidth to 10 kHz. A small percentage of stations who would continue to radiate spectrum beyond 10 kHz may be all that is needed to kill public reaction to the new wideband AM receivers. In short, the future ability of AM radio to compete with FM on a more equal basis is within its own grasp; they control their own destiny.

Cost to each station to implement the standard should be minimal. All three audio processing manufacturers represented at the NRSC meetings indicated that they would make available conversion kits which would be retrofitted into their existing equipment in the field. Stations are thus able to purchase replacement circuit boards instead of an entire new system.

The NAB is anxious to know the rate of implementation of the new standard. (So are the receiver manufacturers.) To minimize the effort necessary from a station to inform the NAB of conversion, the NAB has made a pre-printed, pre-addressed postcard available to all audio processing manufacturers. One blank card will be included with each retrofit conversion kit and with each new processor shipped which complies with the standard. When the installation of the equipment is complete, a station representative need only fill in the station information on the card, check the box indicated, and drop the card in the mail. An accurate tally of the number of stations who have converted will enable the NAB to best advise receiver manufacturers of when it is appropriate to introduce wideband AM receivers.

Note that the card does not contain any information about which make of equipment you have installed, in case you consider that information a competitive secret. It indicates only that you have installed one of the systems known to meet the standard.

For more information of the NRSC voluntary AM response standard, contact Mike Rau at the NAB at (202) 429-5339, or contact TEXAR at (412) 856-4276.

TEXAR

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Review of AM Multichip Paper

by Robert D. Streeter, PE

Ft. Wayne IN ... Tokyo Sanyo Electric Co, Ltd introduced a single chip multisystem AM stereo decoder IC a short while ago.

Relatively little information about this IC has been made available to the broadcaster. There have been only brief references to the performance and technology of the decoder in the broadcast trade press.

A scientific paper by Sanyo IC engineers discussing this multisystem AM stereo decoder was published recently in the IEEE *Transactions on Consumer Electronics*, August 1986.

A review of the article and comments on the IC performance are presented here. This review will supply some basic information relating to the Sanyo IC and AM stereo operation.

What's new

A few years ago Sony (not Sanyo) produced a "multiple system detector" IC and marketed a receiver series with this IC (the SRF-A100 and -A1) for AM stereo signal reception. The Sony receiver was warmly received by the broadcasting community.

A natural question is: "What's new with the Sanyo IC compared to the Sony IC?"

One of the more interesting new features of the multisystem IC decoder does not involve AM stereo at all. This decoder is claimed to contain a monaural upper sideband/lower sideband operating mode. This could permit control of nighttime adjacent channel interference for monaural reception.

The USB/LSB mode is claimed to use a fully synchronous detection system for amplitude and angular modulation.

Bob Streeter is president of AM Stereo, Inc., a firm specializing in stereophonic engineering. He has over 10 years experience in AM stereo. He may be reached at PO Box 6677, Fort Wayne, IN 46896.

Broadcasters and the FCC have been interested in the use of fully synchronous detection for some time, and this is one of the first IC devices to have available such fully synchronous (in-phase and quadrature output) operation.

Sanyo cites a measured (attenuated) adjacent channel carrier beat (whistle) of about -30 dB resulting from the detector properties. No other performance information is presented.

According to Sanyo, this operating mode is not compatible with AM stereo system use. No information is included relative to sideband selection methods.

Synchronous receiver detection for monaural use has also been considered as a method of improving the reception of AM stations in the null regions of directional antenna patterns.

Past efforts have considered only an "in-phase" synchronous detector signal for this purpose.

There has been little work done regarding using fully synchronous USB/LSB monaural detection as an aid in reducing the disturbance caused by AM directional antenna patterns.

The Sony (not Sanyo) AM stereo detector IC utilized an envelope detector and a quadrature synchronous detector, although it did have a USB/LSB detection process.

The Sony detector would not be fully representative of the performance that a true fully synchronous (I and Q) detector could provide.

The IC manufactured by Sony utilized one detection technology for all AM stereo systems. The phase shift system required for the "ISB" stereo system was a separate circuit, and manually activated. There was no pilot tone recognition of any kind.

The Sanyo IC decodes three AM stereo systems: the Motorola (C-QUAM) system, the ISB (Kahn/Hazeltine) system, and the AM/PM (PMX or Magnavox) AM stereo system.

The IC selects the AM stereo system to decode by sensing the pilot tone, thus only systems with unique pilot tones (not duplicated by other systems) can be accommodated. If any circuit could be said to be the heart of the multiple system AM stereo decoder, it would be the multiple system pilot tone detector.

Sanyo has recognized many of the problems that can plague a multiple system pilot tone detection system. A malfunction of the pilot tone detection system would have serious consequences to the consumer.

Perhaps the worst malfunction would be the recognition of a co-channel beat as a stereo pilot tone. This represents a condition where stereo decoding is attempted when monaural is actually the correct decoding mode.

Other malfunctions could result in monaural operation during a stereo broadcast. Sanyo has taken measures to reduce the chance of all types of pilot tone malfunctions.

Sanyo has included the ability to recognize the pilot tones for three frequencies: 5 Hz, 15 Hz, and 25 Hz. The pilot tone detection system features a digital filter technique for each pilot frequency, signal state checks (signal lever, PLL lock, etc.), and an interlocking circuit that precludes more than one pilot signal being active.

The digital circuitry will allow a single cycle of pilot tone loss for any of the systems without dropping the stereo detection mode. This permits very minor disturbances to the pilot tone without causing a stereo/mono switch transient.

For comparison, the Motorola C-QUAM IC will tolerate seven consecutive disturbed pilot cycles prior to loss of stereo lock.

The typical performance cited by Sanyo for this 30 pin IC detection system shows a monaural THD of 0.3% and a monaural S/N of 63 dB using a modulation level of 50% at 1 kHz and an IC signal input of 92 dBu.

The same conditions for stereo detection yield THD readings ranging from 0.5% (AM/PM) to 0.8% (ISB). Separation is reported as 30 dB for all three systems. The S/N ratio ranged from 54 dB (C-QUAM) to 52 dB (ISB).

The modulation level cited above is straightforward for the monaural case. For stereo, the level could refer to the individual channel modulation level or to the envelope modulation level.

Sanyo defines the stereo modulation in terms of the individual channel modulation level. Thus, the above stereo performance measurements were made at 25% envelope modulation (and 25% L−R modulation, yielding 50% channel level).

This is a low stress test condition, but quite similar to the 30% modulation test level used in the receiver industry for many years.

It should be remembered that these figures represent direct signal injection to the detection IC. The degradations of normal consumer receivers are not included in the performance summary above.

The Sanyo detection process utlilzes the same "comparison and feedback" technique for L−R detection that Motor-

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Sanyo AM Multichip Reviewed

(continued from page 15)
ola employed in the MC13020P C-QUAM AM stereo decoder. It is discussed in the NAB Engineering Handbook (7th Ed, p 3.2-41, fig 2).

This C-QUAM audio recovery method appears to be the preferred detection technique for the C-QUAM signal format. Under laboratory conditions, this detector would be expected to perform just like the Motorola IC.

There is one technical feature of C-QUAM detection that is not discussed in the Sanyo article. This very important item is called modulation noise control.

It is necessary to prevent the C-QUAM "1/cos" corrector in the L−R circuit (or its equivalent) from expanding the instantaneous noise floor during negative modulation peaks of the envelope signal.

A Motorola patent (4, 170, 716) specifically covers the principles and techniques involved, and states that the expansion should be 12 dB maximum instead of the (up to) 80 dB available from a limiter circuit. The expansion action is a function of the amount of stereo (L−R) in the signal.

Actual field performance of the IC could be disappointing if large 1/cos corrections are not prevented inside the IC in some way. Large corrections could be accomplished by limiting the 1/cos control signal or by designing a 1/cos corrector with a low expansion capability.

The Sanyo article makes no mention of any form of gain (expansion) limitation for the 1/cos corrector.

Sanyo indicates that the phase locked loop (PLL) used for L−R audio and pilot tone detection is driven from a limiter. Unless special measures are taken, the PLL will be contaminated with noise (and/or interference) during negative envelope peaks.

This phenomenon is related to the noise modulation effect discussed above, and was originally called "clicks and pops" several years ago. Since the PLL is used for the local regenerated carrier reference for detection in all systems, any degradation in the PLL would effect all systems. Loop bandwidth limits would probably place most of the disturbance in the sub-audio region, where the pilot tones are.

The contamination of the PLL signal is not likely to be noticed under laboratory or strong signal conditions, even in normal consumer products.

ISB detection

Sanyo has developed a novel detection process for the ISB AM stereo system. It involves compensation of the distortion created by a synchronous quadrature detector as a result of the ISB system. In this manner, the circuitry used for the detection of the C-QUAM signal can be employed for the ISB signal.

The compensator uses a carrier level cancelling circuit on the envelope detector output, which is multiplied with a scaled version of the quadrature detector output. The output of the multiplier is subtracted from the output of the quadrature detector.

The resulting L−R signal is claimed to have low distortion, and measurements are presented indicating L−R distortion levels about −35 dB at 60% envelope modulation for a single channel stereo (L) test signal. Distortions as low as about −48 dB (25% envelope modulation, R channel) are reported.

The measured distortion data follows the calculated performance of the analytical model within a few decibels from 20% to 60% envelope modulation (L or R channel).

The Kahn/Hazeltine AM stereo transmitted signal normally has a deliberately introduced second order harmonic audio signal in the L−R path (NAB Eng Handbook, 7th Ed, p 3.2-48, eqn 1). The Sanyo mathematical analysis of the new ISB detector operation did not include this second harmonic signal in the signal to be detected.

In view of this omission and the excellent matching between the measured and calculated performance of the IC, it would be interesting to see if the test generator used by Sanyo for the ISB signal was producing the correct Kahn/Hazeltine AM stereo signal or some other form of ISB stereo signal.

Previous comments about control of the C-QUAM 1/cos corrector range apply to the ISB detection process, since Sanyo uses the 1/cos corrector as part of the ISB detection process.

Large expansions in negative envelope modulation peaks will create an instantaneous noise burst, which will be reshaped, but not eliminated, by the ISB phase shift networks.

The IC automatically selects the phase shift networks required by the ISB system based on the correct sensing of the 15 Hz pilot tone. The phase shift networks are also selected for the USB/LSB monaural operating case.

PMX detection

The PMX (Magnavox) audio detector is almost a no cost addition to the IC, since all the necessary audio detection circuits are present as a result of the requirements of the other AM stereo system detectors in the IC.

The design is capable of excellent laboratory and strong signal operation, but does not use the preferred (best) PMX

(continued on next page)

Circuit Tests 1 kHz, 4 kHz Freq. in Field

by Steve Hnat

Thompson CT ... Many broadcasters today are taking advantage of telephone frequency extenders. Along with these devices is the necessity for spot frequency checks at 1 kHz and 4 kHz and for initial setup.

An alternative to dragging along a ridiculously large piece of test equipment is the simple test oscillator shown in Figure 1.

Simple construction

The circuit may be constructed with or without the line driver stage, and will fit neatly into a box slightly larger than a pack of cigarettes.

Without the driver, the circuit will deliver +10 dB into a 600 ohm load at less than 0.1% THD.

For more information, call the author at Hnat Hindes: 203-935-9066.

C1 and C3 should be either silver mica, polystyrene or polycarbonate types. R3-R6 should be 1% RN55 types. The circuit will work with 5% resistors; however, chirping may result if tolerances are too erratic.

The components shown will produce frequencies of 1 kHz and 4 kHz ±2%, which is more than adequate for checking frequency extenders.

Other frequencies may be selected by plugging into the expression:

f=0.159/RC

Where f=frequency in hertz, R=(either shunt or feedback) resistance in ohms and C=capacitance in mF.

R1 and R2 may be substituted with a fixed 300 ohm resistor which will provide a fixed level of approximately +10 dB.

The circuit is also well suited for field servicing cart machines and for spot frequency checks on equalized broadcast loops.

Figure 1.

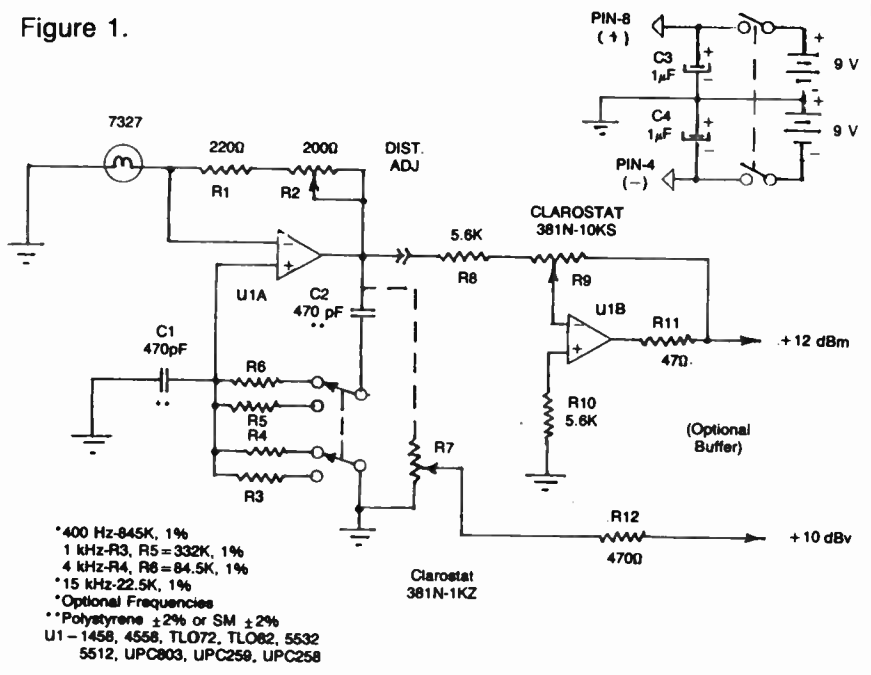

Table 1.

Circuit specs

Max output (with driver)	+17 dB +12 dBm (600 ohm)
THD @ +12 dBm	0.05%
Frequency tolerance	−1.8%, 4 kHz −1.2%, 1 kHz
Current drain	5 mA
Battery life	96 hours (with driver) (Approximate)

AM Stereo Chip Review

(continued from previous page)

detection method. The National Semiconductor LM1981 IC, introduced in 1982, contained better noise burst control (via the excess phase detection circuitry) than is provided by the Sanyo IC detection.

Sanyo could have made use of a simple modification of the C-QUAM detector to provide excellent PMX detection. In C-QUAM, the 1/cos detector drive is derived from a comparison between the envelope L+R and in-phase synchronous signals.

Changing the comparison to one between the in-phase detector synchronous signal and a fixed reference level (not the L+R signal) provides excellent PMX L−R detection, as in patent #4,466,116. It is still necessary to control the 1/cos corrector expansion range to control modulation noise.

The PLL tracking bandwidth is changed for the PMX detection, since the pilot tone is a third "channel" of information, rather than being included as part of the L-R audio signal.

Sanyo has introduced a first generation signal package IC for the automatic detection of three different AM stereo signal formats. Many functions have been incorporated into the IC in an economic and ingenious way.

The Sanyo article reviewed here presents the Sanyo engineering concepts in a logical and readable manner. Skilled engineers are encouraged to obtain a copy of the article for a more detailed explanation of the IC and its functions.

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Stations Need Control of Wires

by **Fred Baumgartner**

Englewood CO ... There is a whole bunch of wire in your station that has little to do with getting sound (or pictures) on the air. It doesn't carry power, sync or anything else "important."

The wire I'm talking about is used to communicate status: of machines, networks, people. Often this needs to be communicated to the talent without being seen or heard by the audience. These are the *annunciator* lines.

They indicate when the cart is almost over; the transmitter is off air; the night bell is being pushed; the phone line is ringing; the tower lights are on; the news guy wants you to play the next drop; the auxiliary studio is on the air; the AP, the UPI or the weather line is in alert; the EBS or the weather receiver want you to pay attention, and on and on.

In 10 years, there'll be even more.

Successful stations handle the annunciator functions well; failing stations almost always "blow" this. They install as few lines as necessary in whatever format seems appealing when enough programming or management pressure lands upon them. However, a station cannot possibly perform better than the information available to its on-air people.

We have all seen the station with a few colored 120 VAC lamps that indicate what have you. While this is a good beginning, it is *not* where our business is today.

Station standards are important. If our audio wasn't balanced 600 ohms at 0 dB, and our video at 1 V(P-P), or whatever the station standard is, patch bays would be useless, maintenance a super headache, and documentation an order of magnitude more important (as if it wasn't important now).

Likewise, standardization of annunciator functions is important.

I suggest that the annunciator lines conform as follows:

- Maximum voltage (Off state) is 28 V;
- Minimum (On state) is 0.7 V positive;
- Maximum data rate is 2 bps;
- Total annunciator line current is less than 100 mA.
- Short-term (less than 100 msec) information is meaningless.

What this means is that the "On" or "line activated" state means that the line is pulled to within 0.7 V (one solid state device) of ground and in the "Off" state the line "floats" at just shy of the highest supply voltage, which is less than 30 V.

Also the data moves at "human" rates, which is to say very slowly. It also means we do not protect against short-term irregularities like transient noise or small propagation delays in multiplexed signals.

Furthermore, I suggest that you consider using the same standards for control lines as for annunciator lines. After all, the only difference is that control lines speak to machines instead of people. But be careful; machines without proper signal processing often can see and react to short-term signal transients and trash.

There are several benefits to this architecture that at first may not be apparent. First, all simple logic functions can be performed by diodes.

Second, within reason, the load or indicators' running voltage can be defined by its supply instead of the control line voltage.

Third, the line is relatively free from noise and transients.

Fourth, the line interfaces well with mechanical devices (switches, relays), solid-state devices (transistors, optoisolators and solid-state relays) and TTL (gates and computers).

Fifth, it is safe and meets code without primary wiring precautions (120 VAC is not safe by comparison).

Sixth, once the control line function is named, large numbers of output and input devices can be added.

Figure 1 shows a "typical" annunciator or control line. The section on the left is protection. This entire section is tied to the central station ground. I assume that the station uses either a star-or spine-grounding scheme.

More to the point, no matter how insecure this point is, it is defined as "earth." The protection circuit should be as close to this point as possible. The 24 V MOV (MOVp) limits any induced voltage swing to less than about +35 V at the central ground point.

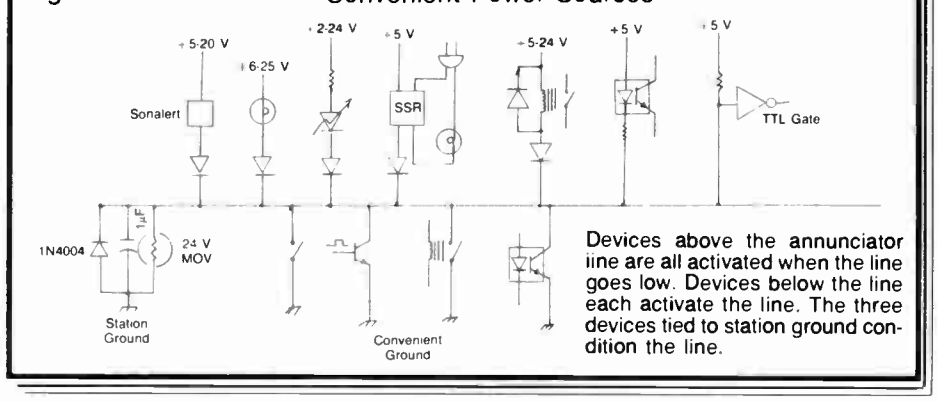
The diode (Dp) limits any negative (or reverse) voltage swings to 0.7 V, which is fine, as there is no data carried by anything less than +0.7 V. This protects against negative swings caused by inductive loads like relays becoming de-energized and releasing negative spikes.

The 0.1 capacitor Cp removes the remainder of the impulse noise as well as any RF that is generated along the annunciator line. The entire protective circuit can be duplicated at any point along the signal path, if required, by long cable runs or divergent ground systems. In the vast majority of systems, once is enough and often far more than required.

On the other hand, a lightning hit may

(continued on page 20)

Figure 1. Convenient Power Sources



Fred Baumgartner, a frequent contributor to **RW**, *is manager of Technical Operations for KWGN-TV, Denver, and former CE of WIBA, Madison, WI. He can be reached at 303-740-2883.*

Interest Slim in CE as Career

by Tim McCartney

Boise ID ... With all the current talk about engineers moving into management, it's time to talk about moving into engineering in the first place.

One problem is that there seems to be little interest among today's electronics students in our field.

And, then there's the GM who moves into engineering. You don't hear much about this route, which I'd like to talk about.

My entrance into the field began the day my CE suddenly resigned. No fulltime replacements were available, so I settled for a highly experienced engineer willing to spend about one day a week with us and be on-call for emergencies. The rest was up to me, and the process began there.

Much to my surprise, engineering was a lot more fun than management! CEs talked about new equipment, sound quality, coverage patterns, wiring concerns, making improvements—all the things which were the most exciting portions of radio. They didn't talk about personnel changes, income problems and expense problems.

Why is it that all of the engineers with whom I had worked never communicated this joy to me? I suspect that they had not had the opportunity to compare their field to management, and just didn't know how good they had it.

With a good assistant GM at my side bucking for a promotion, I was in both the perfect and rare situation to learn engineering while keeping my position as GM.

So, I took the 18-month correspondence course in broadcast engineering from the Cleveland Institute of Electronics and reviewed my questions with the contract engineer. I obtained practical experience working on the real-world needs of the station.

A few years of this provided the background necessary to become a part-time CE for the prestigious Minnesota Public Radio network while pursuing a master's degree in training and human resources development.

This was the right background to move to a growing university-based public radio station as their fulltime CE.

Not only is engineering fun, but it has the management routine beat on most counts. These factors include:

- Better career opportunities in the long run;
- A pleasant combination of working with people and working on individual projects;
- Available certification from SBE;
- Involvement in the local SBE chapter;
- Publications such as RW, which allow us to communicate far better than do most professions;
- Engineers' willingness to train others; and
- Participation in a dynamic and growing field.

So, the career switch was right for me.

But, if I'm so sold, why aren't today's electronics students?

At Boise State University, one electronics instructor told me that broadcast engineers aren't doing much of a selling job on the profession to the students. He considered this a shame, because he personally found the broadcast end much more interesting and satisfying than the popular computer route that students are taking. He felt that students would agree with this philosophy if given the right information from us.

Part of me says, "Yes, let's sell them on our field!" The other part enjoys the current shortage of broadcast engineers and wants it to continue. So, the whole of me reasons that a few talented electronics students deserve the attention of those of us in the field.

This dilemma raises the larger question of whose responsibility it is to ensure that there will be a new generation of broadcast engineers. Is it ours? Is it the GMs? Is it the electronics schools?

Without an answer to these questions, it seems that our field lacks the necessary component of direction. With the many changes taking place, ranging from fulltime to contract engineering, this lack of direction is not surprising.

Perhaps this question belongs on the agendas of meetings of engineers, managers and electronics teachers. It's one we all need to decide for ourselves and then contribute toward an eventual decision.

Tim McCartney is CE at KBSU, Boise State University, Boise, ID. He can be reached at 208-385-3663.

Status Wire Control Needed For Stations

(continued from page 18)

change your mind on all of that.

Once we have protected the line from excessive voltage excursions (−0.7 to +35 V) we can deal with input and output. Inputs universally deal with items that draw the annunciator line down to within 0.7 V of ground.

These are current sinks, and for *my* standard, sink lOO mA or better.

In cases of long annunciator lines with many outputs or high current output devices, a 1 A current sink may be necessary.

A 2N2222 or small "sugar cube" relays are fine in the 100 mA range.

If the 1 A range is necessary, a larger relay or 2N3055-type transistor is required. Also one should begin to pay attention to bigger (lower-gauge) wire.

From Figure 1, it is obvious that the annunciator line in its "off" state sits at pretty near its highest load or output voltage.

In practice, I recommend that each "on air" room of a building have a 50-pair punch block (100 lines) "daisy-chained" to the rest of the "functional" rooms. There are seldom too many or too few individual lines for control and annunciation in a typical plant.

My favorite system is to use dual 25-pair or 50-pair Ma Bell lines into punch blocks set up to spread 100 individual lines into each studio.

I have also used 8-line rotor cable and term-strip in ultra-small stations . . . which is OK, if you have to do it this way.

Punch blocks are Ma Bell's way of dealing with lots of wires.

These are very advantageous as far as time and material are concerned. (If you do not know about punch blocks, check them out with your local telephone folks, or with your favorite equipment distributor.)

Output, or indicator, devices need only be sensitive to a line that approaches 0.7 V of ground when "on."

All kinds of devices, as indicated in Figure 2, can deal with that parameter.

Steering diodes

At this point I need to introduce steering diodes. Every diode in Figure 1 is a steering diode. The diodes prevent supply differences from appearing as commands and route commands to the correct location.

In Figure 3, diodes allow a common switch to activate two lines. In Figure 3, either of two annunciator lines activates the same output. In either case, more inputs or more outputs are easily-achieved with more diodes, which of course are cheap.

I will make a recommendation as far as diodes go; 1N4004s have 10 times the current carrying capacity needed, and even better reverse voltage safety margin. Buy them in strings of 1,000 (which doesn't last all that long) and the price is low.

Even with 100 lines of annunciator running through the plant, there are times when compressing the data to run on fewer lines is advantageous.

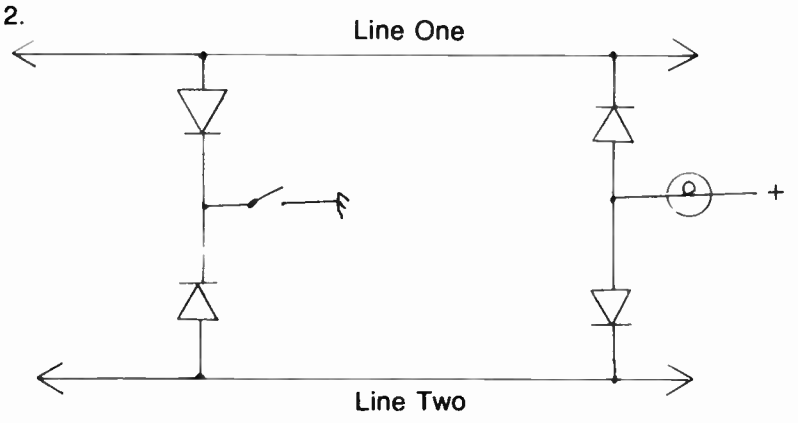
The same diodes above can be organized as in Figure 2 to form a multiplexer. Here 15 annunciator functions are squished into four lines.

Obviously the matrix can be expanded or reduced in size to meet your needs as well. The output of the matrix is binary and the values of each line then are 1, 2, 4, 8, 16 etc.

Here is a case in point. A station has a CBS "net alert decoder." The decoder hears those little "birdies" at the beginning and end of every program segment and translates them into a number between 1 and 15 (0 is the "nothing going on" state or "reset" in CBS-speak).

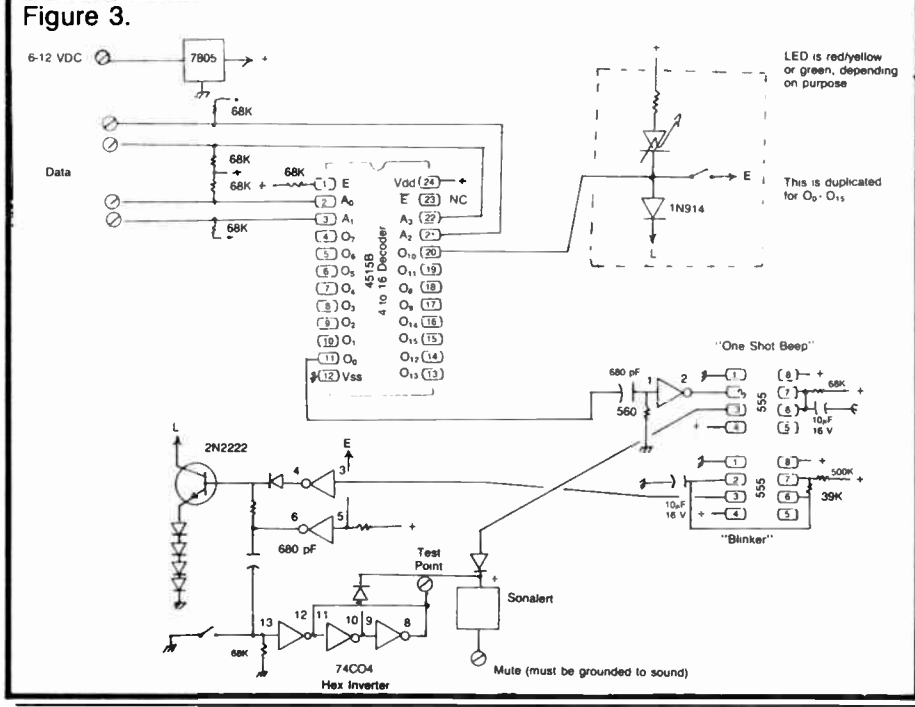
These network-originated annunciator signals indicate the beginning and end of programs, commercial cutaways, bulletins, closed-circuit program information, special feed information and, of course, the end-of-the-world stuff.

Figure 2.



Either line one or line two will light lamp. Switch will activate (draw low) both lines.

Figure 3.



The decoder spits out a short beep every time a signal is sent, and a continuous series of beeps if the called-out signal is of an important nature. The display indicates a number between 0 and 15, and a lookup table tells you what it means.

The rear apron has 100 mA (normally open) open relay contacts for each signal condition, and a separate binary output weighted just like the matrix in Figure 2. This binary port and a small power supply are meant to drive a number of remote annunciators.

They also sell boxes that read the binary and emulate the main box, except the lookup table is a piece of printed plastic that slides into the box so it can't be seen. CBS can change the meaning of the numbers at will, as they did when they added RadioRadio. They then send a sticky tag with the new lookup tables to affix over the old.

Suppose the station also has a second network, Mutual. MBS has a similar annunciator system which uses two-tone sequential "birdies" to indicate one of seven messages. Rather than sell a single decoder box, MBS sells individual cards that close a relay when they hear their respective signal.

(continued on page 23)

Subscription/Reader Service Forms

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February 1, 1987 Issue Use until May 1, 1987

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4. Combination AM/FM station
5. Network/group owner
6. Recording studio
7. TV station or teleprod facility
8. Consultant/ind engineer
9. Mfg, distributor or dealer
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C. Engineering
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003	023	043	063	083
004	024	044	064	084
005	025	045	065	085
006	026	046	066	086
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
016	036	056	076	096
017	037	057	077	097
018	038	058	078	098
019	039	059	079	099
020	040	060	080	100

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Tests for New STL

by John W. Vance

Atlanta GA ... In designing a microwave or STL system, it is often necessary to go through a number of changes and check many options and "what if"-type situations. Instead of having to spend hours pondering over path loss charts, checking line loss, antenna gain, etc., much time can be saved with a simple computer program to do the work for you.

The program shown in Figure 1 was written in BASIC on a Tandy 1000. It should run on any IBM-compatible or with only minor changes on any computer in BASIC.

The program prompts for input data as to frequency, transmitter output in watts, antenna gains, line loss, path distance and required receiver sensitivity. It gives a screen printout of the received signal strength and fade margin.

A hardcopy printout of all of the parameters is also available. If desired, an additional module could be included to compute the antenna gain from the frequency and antenna diameter.

John W. Vance is assistant director, Engineering and Technical Services, for Georgia Public Television. He can be reached at 404-656-3759.

```
10 CLS
20 PRINT "MICROWAVE PATH CALCULATIONS"
30 PRINT "50 OHM SYSTEM"
40 INPUT "PATH FROM, TO                    ";A$
50 INPUT "FREQ. IN GHZ                     ";F
60 INPUT "XMTR. OUTPUT POWER IN WATTS      ";WT
70 INPUT "XMTR. ANT. GAIN IN DBI.          ";T
80 INPUT "RECR. ANT. GAIN IN DBI.          ";R
90 INPUT "PREAMP GAIN IN DB, IF USED       ";PA
100 INPUT "XMTR. LINE LOSS IN DB.          ";TL
110 INPUT "RECR. LINE LOSS IN DB.          ";RL
120 INPUT "MISC. LOSSES    IN DB.          ";ML
130 INPUT "REQ. REC. SIG. IN MICROVOLTS    ";V
140 INPUT "DISTANCE IN MILES               ";D
150 M=V/10^6
160 P=4.342945*LOG (WT)+30
170 DB=8.685889*LOG(M/.2236)
180 PL=96.6+(8.685889*LOG(D))+(8.685889*LOG(F))
190 RS=P+T+R+PA-TL-RL-ML-PL
200 FM=RS-DB
210 PRINT "....................................................."
220 PRINT "XMTR OUTPUT IN DBM IS ",P
230 PRINT "REQUIRED INPUT IN DBM IS ",DB
240 PRINT "RECEIVED SIGNAL IN DBM IS ",RS
250 PRINT "FADE MARGIN IN DB IS ",FM
260 PRINT "....................................................."
270 INPUT "IS PRINTOUT DESIRED, Y OR N ";X$
275 PRINT "....................................................."
280 IF X$="N" THEN 40
290 LPRINT"================================================="
300 LPRINT
310 LPRINT "MICROWAVE PATH FROM ";A$
320 LPRINT
330 LPRINT"FREQUENCY IN GHZ IS",F
340 LPRINT"DISTANCE BETWEEN SITES IS ",D" MILES"
350 LPRINT"XMTR. POWER IN WATTS IS   ",WT
360 LPRINT"XMTR. POWER IN DBM IS     ",P
370 LPRINT"XMTR. ANT.GAIN IN DBI IS ",T
380 LPRINT"RECR. ANT.GAIN IN DBI IS ",R
390 LPRINT"PREAMP GAIN IN DB IS      ",PA
400 LPRINT"XMTR. LINE LOSS IN DB IS ",TL
410 LPRINT"RECR. LINE LOSS IN DB IS ",RL
420 LPRINT"MISC. LOSSES IN DB ARE    ",ML
430 LPRINT"PATH LOSS IN DB IS        ",PL
440 LPRINT"REC. SENSITIVITY IS ",DB
450 LPRINT"RECEIVED SIGNAL IN DBM IS ",RS
460 LPRINT"FADE MARGIN IN DB IS",FM
470 LPRINT "*************************************************"
480 GOTO 40
```

Antenna Gain Help

by John W. Vance

Atlanta GA ... The program shown in Figure 1 can be used to compute the approximate gain of a parabolic antenna for microwave or STL if the manufacturer's exact data is not available.

It inputs frequency and antenna diameter in feet and outputs approximate gain in reference to isotropic and dipole antennas.

John Vance is assistant director, Engineering and Technical Services, for Georgia Public Television. He can be reached at 404-656-3759.

```
10 CLS
20 PRINT "PROGRAM COMPUTES APPROX. GAIN IN DBI"
30 PRINT "AND DBD OF PAROBOLIC ANTENNA"
40 PRINT "-------------------------------------"
50 INPUT "FREQUENCY IN GHZ                  ";F
60 INPUT "ANT. DIA.IN FT.                   ";D
70 G=(8.6859*LOG(D))+(8.6859*LOG(F))+7.5
80 A=G+2.15
90 PRINT "ANT. GAIN ,DBI ",G
100 PRINT "ANT. GAIN ,DBD ",A
110 PRINT "====================================="
```

Math for Microwave

by John Schneider

Seattle WA ... The program shown in Figure 1 produces a lot of useful information for its short size.

This program allows you to calculate the Fresnel Zone clearance requirements for a microwave path, and then print it in table form.

This is usually a tedious process as it requires a separate calculation for every point in the path, hence it is a natural task for the recursive-loop capabilities of a computer.

The program is written in MegaBASIC, which is a derivative of North Star BASIC, but it should be easy to translate to another syntax.

John F. Schneider is president of RF Specialties, Seattle, WA. He can be reached at 206-363-7730.

```
1000 Rem   CALCULATE STL FRESNEL ZONE CLEARANCE
1010 Rem  WRITTEN BY JOHN SCHNEIDER, RF SPECIALTIES, 8/29/86
1020 Rem  WRITTEN IN MEGABASIC BY AMERICAN PLANNING CORP.
1030 Dim G$(35);Rem  DIMENSION USER STRING FOR 35 CHARS.
1040 CLS;Rem  CLEAR SCREEN

1050 Rem ***** ENTER DATA SECTION *********
1060 !tab(10),"FRESNEL ZONE CALCULATOR";!;!;!;Rem
     '!' IS SHORTHAND FOR PRINT
1070 Input "How Long Is STL Path In Miles?  ",L
1080 Input "Calculate Fresnel Zone For Every ? Miles:  ",I
1090 Input"Frequency In mHz:  ",F
1100 Input"Report Prepared For:  ",G$
1110 P=0;Input "Hard Copy", Y$;If Y$="Y" then P=1;If Y$="y" then P=1

1120 Rem ****** PRINT REPORT SECTION **********
1130 CLS;Rem  CLEAR SCREEN
1140 !#P tab(10),"0.6 FIRST FRESNEL RADIUS TABLE"
1150 !#P tab(10),  "==============================";!#P
1160 !#P "Path Length:  ",L," Miles"
1170 !#P "Frequency:  ",F," mHz"
1180 !#P "Report Prepared For:  ",G$;!#P
1190 !#P "DISTANCE FROM XMTR:",tab(30),"FRESNEL CLEARANCE:"
1200 !#P "------------------",tab(30),"------------------"
1210 For X=0 to L by I;Rem  INCREMENTS X BY THE VALUE OF I
1220       H=1316*sqrt((X*(L-X))/(F*L));Rem  CALCULATE FRESNEL CLEARANCE
1230       !#P,%"5F2",tab(5),X," Mi.",tab(35),H," Ft.",;Rem  %"5F2" IS PRINT
           FORMATTER; SAME AS 'PRINT USING ##.##'
1240       If X<>L/2 then 1250;!#P tab(45),"<<< MID POINT",
1250       !#P
1260 Next X
1270 !#P;!#P;Input "Do Again?  ",Y$;If Y$="Y" then 1040;If Y$="y" then 1040
1280 End
```

```
                0.6 FIRST FRESNEL RADIUS TABLE
                ==============================

Path Length:    8 Miles
Frequency:    948.5 mHz
Report Prepared For:  Radio World

DISTANCE FROM XMTR:          FRESNEL CLEARANCE:
-------------------          ------------------
          .00 Mi.                      .00 Ft.
         1.00 Mi.                    39.97 Ft.
         2.00 Mi.                    52.33 Ft.
         3.00 Mi.                    58.51 Ft.
         4.00 Mi.                    60.43 Ft.  <<< MID POINT
         5.00 Mi.                    58.51 Ft.
         6.00 Mi.                    52.33 Ft.
         7.00 Mi.                    39.97 Ft.
         8.00 Mi.                      .00 Ft.
```

Automation Circuit Starts FM Recorder

by Kenneth Blake

Stockton CA ... We record several five-minute network newscasts each evening. The recorder is unattended as the night operator is occupied with both AM and FM duties.

In our case, the recorded newscasts are not aired, but the commercials therein are carted separately for later broadcast. The recorder, which is located in the production room, is of the Ampex AG-440 series.

> *The FM automation equipment contains circuitry by which external devices can be activated.*

The FM automation equipment contains circuitry by which external devices can be activated, the starting times of which are programmed in the memory to occur when desired by means of the internal real-time clock. This operation is initiated by the enabling of a BCD-to-decimal decoder for approximately 200 msec.

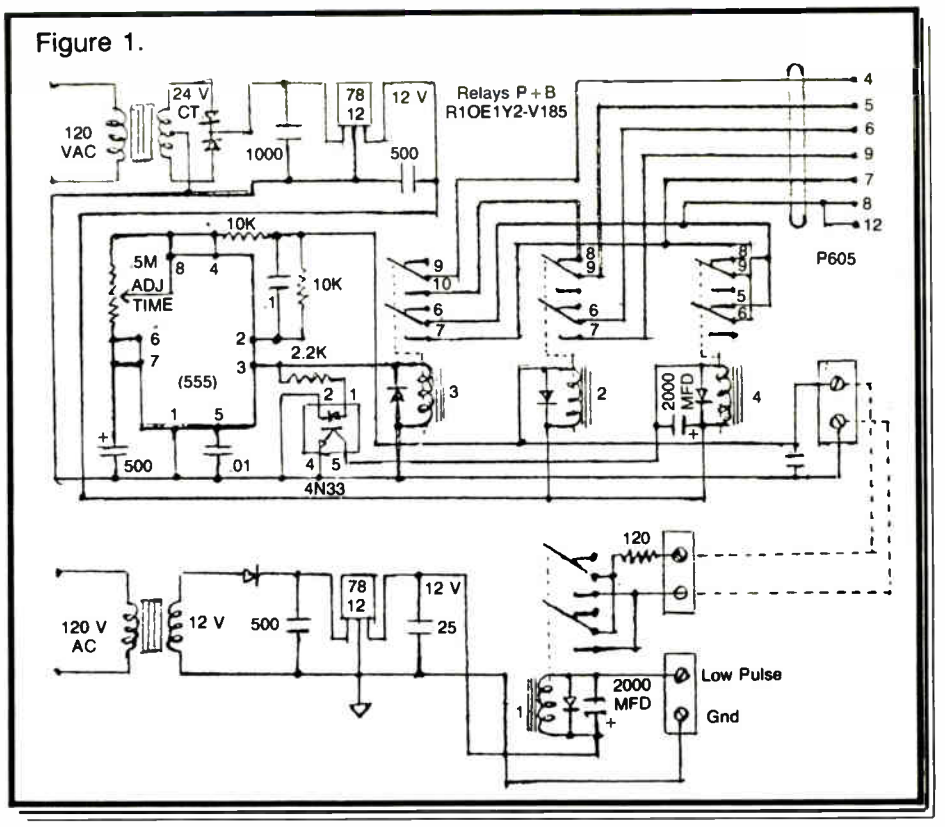
The selected output is low when active, and operates an external relay in the conventional manner for circuits of this type (open collector). The relay is located within the automation cabinetry, and its dry-contact closure is carried to the production room unit on a pair of wires. Thus, our recorder is started by the FM automation and stops after the interval set by the timing adjustment.

Before leaving for the day, the production personnel loads a tape on the recorder, routes network program to it, and places it in the ready mode.

As shown in Figure 1, P-605 is the remote-control plug which mates with J-605 on the recorder chassis. The functions of the relays are as follows:

- Relay #1: Activated by a Low from the automation, closing Relay #2 and starting the timer, which closes Relays #3 and #4. The On period of relay #1 (and, coincidentally, Relay #2) is augmented by the large-value capacitor across its coil, ensuring the start of the tape deck by Relay #2 which, when released, initiates the Record function.
- Relay #2: Starts the Play function (Pins 6 and 9 on P-605) while its contacts 8 and 9 open the Record circuit to Pins 4 and 5 on the remote plug. When Relay #2 is then released by Relay #1, its NC contacts 8 and 9 make the closure across Pins 4 and 5 of P-605, which puts the Ampex in the Record mode. (The recorder design dictates that Play *must* be started *before* Record can be activated.)
- Relay #3: Remains on for a period predetermined by the 555 timer adjustment. It completes continuity for the Off function with contacts 6 and 7 and, for the Record function, with contacts 9 and 10. It stops the deck when released by the timer because Relay #4 is held on a bit longer with its NC contacts open.
- Relay #4: Its timed On period is the same as Relay #3, but its opening is delayed slightly after #3 at the end of the timed period due to the large capacitor across its coil. Optoisolating the coils of Relays #3 and #4 allows Relay #3 to drop out instantly and stop the deck when its contacts 6 and 7 open. Then, following this, Relay #4 drops out, restoring normal "common" circuit continuity, and placing the recorder in a Ready (standby) mode for the next Start/Record command.

Figure 1.



Ken Blake is CE of KJOY/KJAX, Stockton, CA. He can be reached at 209-948-5569.

Stations Need Control of Wires

(continued from page 20)

Now we need to get these signals to a lot of places. Obviously the on-air studios—both AM and FM—are in need. In this case, an automation system is interested in when "network" things start and stop.

Traffic needs to know when the closed circuit stuff is on for last-minute changes. News needs to know when bulletins come down, a good PD wants to know when the network lines carry gossip and new program promos. Sports needs to know when sports stuff is on. Master control and the AM and FM backup studios ought to have access, too, to ensure smooth programming.

OK, so not every station has that much real estate to cover (it happens that WIBA does). In real life, when a bulletin comes down, as many places as possible receive the information. Nothing is tougher on the news station than missing a major fast-breaking story; multiple access to data helps ensure that someone will get it.

Now there are CBS' 15 and Mutual's 7 signals, or, for network annunciation alone, 22 lines. Those who thought skeptically of the 100 lines I asked for above must realize that more than 1/5th have been used for a rather simple purpose. Where are the EBS receivers, off air, door bells, cue lights, etc., going to go?

To start with, let's reduce the 22 lines to 7 by using the binary (4 lines) supplied by the CBS decoder and using a matrix (inputs 1 through 7 in Figure 2) to produce 3 lines of MBS data. One of the things we have to be careful of here is that no message occurs simultaneously with another on the matrixed lines.

Of course, CBS will send only one signal at a time, as will MBS but both may send a simultaneous signal (i.e., the program-start cue at the top of the hour). Thus, we need to separate the CBS from the MBS lines and use 7 lines instead of 5, even though 5 lines can carry 31 signals and we only require 22. Likewise, the door bell and teletype alarms, etc., need to be unmultiplexed, as they are not guaranteed to be nonsimultaneous events.

As you read the companion article, you'll see a number of reasons for which I am ready to reinvent the wheel (besides it being easy). Figure 3 is a slick device that eats binary data and displays it in readable form. It is intended to take CBS or similar (cut it in half and it's a decoder for MBS) and make it understood by people.

Since I built this more than a year ago, I have a message to those reading this article: *Do not build my circuit*. But, do understand why I did what I did and use that information to do something a whole lot better.

The circuit

Now the circuit. The 4515 is a CMOS IC with 24 pins that converts binary into 16 individual outputs. Pins 1 and 23 are treated as they are so that the chip will always decode; they are meant to clock the chip or enable it once data settles down. Since our standard is "human" and very slow, we don't care.

Each output drives an LED through a 1K resistor for current limiting. Also each is fed through a steering diode and switch to an "emergency bus" which we will use to sound a Sonalert. These switches (which are cheap, 8-section DIPs, and which just happen to line up nicely with the 4515's pins) can be changed as the line assignments are changed.

A second diode matrix does a most brutal thing. It forces all of the chip's output lines low to light the LEDs all at one time. The 2N2222 does that trick with not a whole bunch to spare. I suspect that there are chips with lamp test functions that will do the same. On the other hand, this was in the junk box and it is cheap and available.

The LEDs are selected by color and lens style. Red, green and yellow are the only real LED colors, and diffused or clear are the only real LED lenses (circular T1-3/4).

The colors and lens style are selected to indicate the various functions and their relative importance from a distance. Engraved shorthand explanations of each LED indicate the meaning of the message. In my box, I use two rows of 8 LEDs and small letters.

Every time the message changed from 0—the non-message state, to anything—a message state, a pulse is fed to the first 555 timer, which stretches the pulse and uses it to set off a Sonalert for about a second.

The lower portion of the drawing, as shown in Figure 2, provides short pulses to the LED logic circuit so that when the device is in emergency mode, all of its LEDs flash and its Sonalert will sound continuously. Recall that the emergency mode can be set to any numbers.

When this happens, the called-for indicator stays on, all others flash and the device sounds unless it is in mute. Mute must be grounded in order for the device to sound—and it is best grounded through the microphone mute relay or circuitry. Since it is already diode steered, any line going to ground when the microphone isn't on is fine.

The reset button resets the flip-flop made of 74C04 gates to stop the sound.

Obviously the building blocks are what is important here. On the other hand, the diagram does lay out a slick, CBS-type annunciator, or other such annunciator. Believe me, it is more often than not cheaper to build than to buy the "real" thing.

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Circle Reader Service 22 on Page 20

RadioWorld

Broadcast Equipment Exchange

AMPLIFIERS

Want to Sell

Bogen C-100 100 W solid state PA amp, $60. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

McIntosh MC30, excel cond, $75. J Pascale, 3 Stanley Pl, Hauppauge NY 11788. 516-265-8283.

McMartin TBM 2500C FM RF amp. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

Crown D-75 stereo 35 W/chan power amp recently factory checked, $275 or BO plus shpg. B Defelice, CK Cable FM, 621 Bishop, Bridgeport CT 06610. 203-336-5606.

McIntosh MC30 excel cond, $85. J Pascale, 3 Stanley Pl, Hauppauge NY 11788. 516-265-8283.

Kenwood KA-9X 240 W, stereo integrated amp, excel cond, $200. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Crest P2501 2 rack spaces, 130 W/ch RMS at 8 ohms, $525. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

Hafler 220, rack mounted, 130 W/ch, tripled pwr supply wire, $375. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

Russco 2B phono preamps (2) w/o PS. H Konig, WAYN, 6001 Cass, Detroit MI 48202. 313-661-0896 (M&W, 11-1 PM).

Marti TA-66 25 Hz amp, $100. R Miller, WRVI, 815 W Dean, Virden IL 62690. 217-965-3388.

Altec Voice of Stars amp, rack & case, perfect, $35. D Olson, POB 479, Island Heights NJ 08732. 201-929-0694.

Stanton 310, new, flat/NAB switching plus individual gain & high-freq adjustments, $130/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Technics R&B SU-300MC for use w/moving coil phono pickup cartridges, like new, $60/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Schafer stereo PB preamp, goes w/Ampex G440, $75. C Cornett, Cornett Tech Srvs, 3127 Bailey, Lincoln MI 46146. 313-928-6238.

Want to Buy

Melcor 1731's. A Bertiner, Crystal Studios, 1014 Vine St, Hollywood CA 90038. 213-466-6452.

Fisher & Heath Dynade ST34 & Mark 6. M Disch, Select Snd Srvs, 427 W Capital, Heartland WI 53029. 414-367-5719.

McIntosh, Marantz, Dynaco Quad, Audio Research, etc, amps; WE, Tannoy, Altec, EV, JBL, Hartsfield, Olympus, Harness, Laguna speakers; Thorens, Fairchild turntables; WE tubes & microphones. Lapine, 10919 Oasis, Houston TX 77096. 713-723-5281.

Dynaco ST35 & MK III. M Disch, HumanKind Software, 427 W Capital Dr, Hartland WI 53029. 414-367-5719.

ANTENNAS & TOWERS

Want to Sell

Phelps Dodge isocoupler, 25 kW rating tuned for 94.7 MHz FM & 1260 kHz AM, is retunable, $100; RCA BSH-8 horizontal antenna w/tuning & mounting hardware, tuned to 94.7 MHz, horizontal, BO. A Branch, Allen Audio, POB 1979, Decatur GA 30031. 404-325-7847.

Collins (Harris) G5CPM-4 CP FM antenna on 102.3, 1-5/8" connections & mounting hardware, $3500; Andrews coax approx 600' & connectors, $4000; ERI isocoupler from 1K AM, needs teflon spacers replaced, $500; complete package, $6000. J Atkinson, KCAB, POB 89, Dardanelle AR 72834. 501-968-4949.

Shively 6810 6 bay, new in '80, call for price. B Thacher, WSIP, Box 591, Paintsville KY 41240. 606-789-5311.

Cablewave 1-5/8" air, 100' on spool, $500. J Verkest, WFCL, POB 269, Clintsville WI 54929. 715-823-5128.

Harris FML3E, 106.3 MHz w/isocoupler Kintronic FMC7.5, avail 4/87. S Brown, WHBY, POB 1519, Appleton WI 54913. 414-733-6639.

Raytheon antenna tuning unit, will customize for 1 kW or 5 kW to buyers freq & ant impedance, 1 kW $500, 5 kW $700. C Stuart, C & R Stuart, POB 1236, Susanville CA 96130. 916-257-2702.

Phelps Dodge HFMLMP-2 2 bay antenna, 91.1 MHz, 10 kW, $300. P Russel, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Castle dual phaser 3, (2) complete in 2 rack spaces, very low hrs, 4-16 stage phasing, $325. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

Andrew 1-7/8" rigid line, 50 ohm, 3500' at 20' per section, EIA flanged, excel cond in warehouse, will sell all or part, BO. E Milian, New Continental Bdctg, 180 NW 59th Ct, Miami FL 33126. 305-261-1637.

Phelps Dodge CPFMHD10 10 bay w/heaters, 90.9 MHz on ground, mint cond, BO over $10,000. B Bierman, Toccoa Falls College, Toccoa Falls GA. 404-886-6831.

Cablewave HCC-300-J50 heliax 3" w/3-1/8" EIA fittings, 350' on spool, ready to ship, $3500; also 50' length, $500. G Ramsey, WQSF, POB 180, Williamsburg VA 23187. 804-874-3696.

ERI isocoupler 25 kW, 3-1/8" EIA fittings, $3900; non-insulated hangers & adaptors, $300; RCA DSC-6 elements only, $1200. G Ramsey, WQSF, POB 180, Williamsburg VA 23187. 804-874-3696.

Delta AMC-1 Mdl D13-44-2 mod controller. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

RCA MI-19089-2C flanges, 3-1/8", new (8), $275 ea. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Crouse-Hinds FCB-12 tower beacons for 2-620 W lamps (w/o red filters; Harris ERI FMS-5, 5-bay CP FM antenna at 106.5 MHz. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

PiRod Mdl 60 1100' tower complete w/EGG strobe system, like new cond, 4 yrs old, zone A tower can be mod for TV pylon, still standing near Corinth GA, $160,000. X Zapis, Transworld Bdct Corp, 1729 Superior Ste 401, Cleveland OH 44114. 216-621-9300.

ERI FMC-7B 7 bay FM antenna, Harris dual Cycloid II, circ polarized, center fed, can be 6 bay, $4000 FOB Blythe CA. J Mayson, KIMB, 2222 Kansas Ave Ste L, Riverside CA 92507. 714-682-2222.

ERI G5CPS 5 bay FM antenna for 94.7 MHz, $4000. M Raby, WFBQ, 6161 Fall Creek Rd, Indianapolis IN 46220. 317-257-7565.

AM tower, 150' self supporting w/four legs, approx 7' sq base w/insulators, tower is tapered, right angled steel, obstruction lights, currently on ground, avail immed, BO. C Thornton, WAGE, 711 Wage Dr, Leesburg VA 22075. 703-777-1200.

Phelps-Dodge, six sections, 3-1/8 rigid line, 50 ohms, flanged both ends, $250 ea; (4) 3-1/8" elbows, $125 ea. J Seaman, WFLY, POB 12279, Albany NY 12212. 518-456-1144.

Kintronics FMC 7.5 isocoupler tuned to 92.7, like new, $750. E Fears, KHBN, POB 31235, Jackson MS 39206. 601-981-4245.

Harris FMH-11AC FM antenna, 11 bay, 4 yrs old, w/top shorting stud, in storage, tuned 107.7 MHz. R Roiseland, KMAJ, Box 4407, Topeka KS 66604. 913-272-2122.

Want to Buy

Rohn 55G or 65G tower sections, or Tri-ex T-20 or T-26. A Emerald, Emerald Entrp, 8956 Swallow, Fountain Valley CA 92708. 714-962-5940.

Bogner UHF TV antenna, B4u, B8u, B16u, low & medium power input series, any chan, will consider old translator band (70-83). J Powley, WIIM TV, 1536 Logan, Altoona PA 16602. 814-943-2607.

Tower, 250-300' self-supporting, extra heavy to support many sidearms, standing or on ground. M Cromwell, Comm Engr, 1000 27th Ave SW, Cedar Rapids IA 52404. 319-364-0271.

FM 4/5 bay circular polarized antenna. J Bruce, Thoen Comm, 407 N Swenson, Stamford TX 79553. 714-761-4377.

AUDIO PRODUCTION (OTHER)

Want to Sell

Cetec prod room/remote console set up, (2) TTs, 5 chan mono board, amps, speakers & cabinetry, $2000. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Garron STE-100 phase enhancer, similar to Howe Phase Chaser, 10 yrs old, works, $250/BO. H Landsberg, Henry Engr, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

SAE 5000A impulse NR unit, excel cond, $115. B Busetti, Lizard Recdg, 1124 W 2nd St, Florence CO 81226. 303-784-3540.

dbx subharmonic synth. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

Eventide Monster Mat RD 780 (2), $300 ea or $500/both. R Dietterich, WLTJ, 1051 Brinton, Pgh PA 15221. 412-244-7600.

UREI Vidigraf 970, bargraph display gen. up to 32 chan, orig box w/manual, $300/BO. A Tucker, Foothill Prod, 70 W 83rd, NY NY 10024. 212-877-0973.

Shintron 346 audio dist amp, 1 input, 6 balanced outputs w/manual, $150; Shure M610 feedback controller, new, $75. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Orban 422A studio Optimod, mono w/manual, BO. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

Audisar custom built 3 rack space panel w/3 high quality Audisar mic splitter transformers, plus 1 direct box type transformer, ground lift switches, Switchcraft XLR ins & outs, great for remotes, $150. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

Lexicon 1200 audio time compressor/expander, mint cond (2), $5000 ea. I Kaufman, Natl Recg, 460 W 42nd, NY NY 10036. 212-279-2000.

Eventide Harmonizer 949 w/upgrade, 1 yr old, perf cond, $2600. K Stephens, KTUX, 4615 Monkhouse, Shreveport LA 71109. 318-635-9999.

Misc gear inc: consoles, cart machines, R-R, TTs, generator, & much more, call for details. C Condron, KMGR, 5282 S 320 W, Ste D-272, Salt Lake City UT 84107.801-264-1075.

AKG BX20E1, smooth, transmission line reverb, 2 chan w/remote, excel cond, $1800. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Audio gear inc: limiters, xformers, mixers, amps & much more, call for details. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Fairchild 659 Reverbertron II. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Orban 516EC 3 chan sibilant controller, 23 hrs total use, $400/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Jasoni TAS-1000 prototype audio tape analyzer, $285. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Technics SH-8065 1/3 octave EQ, mint, $250. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Gates remote amp w/telephone, VU meters, preamps, parts, connectors, 1-5/8" coax connectors. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

Eventide BD931, SN: 931A-4086, 3.2 sec 15 kHz audio delay, new, w/manual, $1400. K Harnack, WPAD, 1700 N 8th, Paducah KY 42001. 502-442-8231.

Shure M610 feedback controller w/rackmount, gd cond, $95. CK Bucy, Cisco Snd, Box 16583, Lubbock TX 79490. 806-763-3537.

UREI Vidigraf 1970 bargraph display gen, $300/BO. A Tucker, Foothill Prod, 70 W 83rd, NY NY 10024. 212-879-0973.

Orban 8100A/ST studio chassis for 8100A, $600. B Anderson, WRCN, 72 W Main, Riverhead NY 11901. 516-727-1570.

Comex ABC Network command decoder for talk radio. B Korngald, Box 2621, Savana GA 31402. 912-355-9926.

Eventide BD955 digital delay, 7.5 kHz, 6.4 sec, 2 yrs old, only used 1 yr, $2000/BO. D Sharp, WKAI, 119 W Carroll, Macomb IL 61455. 309-833-5561.

Sony R-R, (3) portable, solid state elecs, $35. J Lipski, KIQO, POB 1456, Lompoc CA 93436. 805-865-6536.

AUTOMATION EQUIP.

Want to Sell

Comex 25 Hz tone sensor (dual). S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

SMC 250 Carousels, (2) older units, $250 ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

SMC remote control system, DP4 data terminal, time announce, 3 Carousels, output card rack, PDC4 super click, PS20A digital switches, silent 709 ASR w/dual cassettes, DP2 controller, RAC30, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

IGM Carousels (4), (3) IGM R/R racks & extras. K O'Mally, WLRW, Box 3369, Clamagne IL 61821. 217-352-4141.

BGM decks & Cavousel (3), w/telco remote ctrl, sequencer, 2½ Hz gen, 2 racks, $3000. T Trott, Pepco Cable Radio, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

SMC 792, BO. L Thompson, WCLT, Box 800, Newark OH 43055. 614-345-4004.

Cybrix automation system w/spares, BO. D Howard, WMHE, 4665 W Barcroft, Toledo OH 43615. 419-531-1681.

Harris 9003 (4) IGM Go-Carts, 1 BE triple deck cart machine, (2) ARS1000 Otari's, (2) CRT control stations w/battery backup & charger, BO. T Bondurant, WMAG, POB 2208, High Pt NC 27261. 919-882-0995.

Harris System 90 automation, complete system, excel cond, BO. H Allegood, WALG, POB W, Albany GA 31702. 912-436-7233.

Gates SC-48 automation system, 3 racks, (2) 250RS Carousels, Criterion '55, (3) Criterion single plays, clock, printer, fader, etc, PBs were operational when removed from service, $4000. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Cetec 7000 level 2 extended memory, VEL logger, realtime clock, (2) 48 tray Audiofiles, extra source cards & manuals, $17,000. G Ramsey, WQSF, POB 180, Williamsburg VA 23187. 804-874-3696.

IGM stereo Go-Cart 42, (3) ARS100DS reproducer, Anidex printer w/stand, IGM source cards, (3) for Go-Cart 42 w/random select, (3) for ARS100 w/25 Hz cue, (3) for cart decks w/logging, 1 for live studio, other IGM parts avail, BO all or part. C Gustafson, WKZO, 590 W Maple St, Kalamazoo MI 49008. 616-345-2101.

Allison/Valley People Gain Brain (2) plus LX100 power supply, peak & RMS limiting, $400 for all 3 items. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

SMC Carousels (2), $250 ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

IGM 48 tray Instacart, mono, needs work, BO. B Brown, WPRS, Box 367, Parris IL 61944. 217-465-6336.

Autogram 581A, Autogram brain, (6) SMC Carousels, (2) time announcers, BO. C Veers, WBHT, Box 198, Brownsville TN 38012. 901-772-3700.

IGM R-R & Carousel, clock & net switcher w/rack & misc equip, $3500. K O'Malley, WLRW, POB 3369, Champagne IL 68121. 217-352-4141.

Harris R-R source interface cards for System 90 or 9000 (2), #995-7867-001, $150 ea. C Bryson, Comserve, 93 Robinhood Dr, Zeliemople PA 16063. 412-776-5204.

IGM System 700 w/digital PDP8/M computer & remote entry console, call for details, $13,000 takes all, J Whitmer, WNBS, POB 1340, Murray KY 42071. 502-759-1300.

Microprobe 100 automation programmer w/manual & cables, looks nice, $950/BO. J Whitmer, WNBS, POB 1340, Murray KY 42071. 502-759-1300.

Control Design CD-28 automation system, (4) Scully LJ-10, (4) Carousels; Extel; CRT, more, mostly junk, gd for parts only. J Seaman, WFLY, POB 12279, Albany NY 12212. 518-456-1144.

RW Broadcast Equipment Exchange

AUTO EQUIP . . . WTS

Harris System 90, comp w/3 racks, programmer, remote console, (4) ITC 750 reels, (3) stereo SMC Carousels, 2 Harris single play cart decks, Extel printer, 1024 event memory & lots more, $10,000/BO. K Harnack, WPAD, POB 450, Paducah KY 42001. 502-442-8231.

IGM 48 tray mono Instacart, includes IGM Mk I remote controller, $6000/BO. P Finken, KHHT, Box 1686, Minot ND 58701. 701-852-0361.

Schafer GLS7000 stereo, interface w/music networks, 2 Audiofiles, $23,000. E Reynolds, WTJZ, 553 Michigan Dr, Hampton VA 23669. 804-723-3391.

IGM 78 tray Go-Cart, excel cond, stereo, $2900/BO. D Workman, KPPL, RR 1 Box 203, Stockton IA 52769. 319-785-6069.

Want to Buy

Cetec 7000 w/4 R-R & multicart decks. C McCarthy, KNCQ, 2551 Park Marina Dr, Redding CA 96001. 916-244-9700.

Tone gen, 25 Hz. T Welch, WROD, 991 Daytona Bch FL 32105. 904-253-0000.

CAMERAS (VIDEO)

Want to Sell

Norelco PC70 cameras w/lenses, CCU, etc. H Casteel, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Servo zoom lens for Hitachi FP-10 camera, 10:1, 16-160mm, f2.2 w/macro, excel cond, $250. G Odell, The Film Group, Box 9, Wethersfield CT 06109. 203-527-2972.

Hitachi FP-20 w/10:1 zoom lens, carrying case, RCU & cable, AC power supply, shoulder pod, operating cond, BO. M Taylor, AliMar Prod, 274 County Rd, Tenafly NJ 07670. 201-569-1717.

Panasonic WV3890B (2), also have RCU's & cable to match, $1500 ea. L Sharp, KZOK, 200 W Mercer #304, Seattle WA 98109. 206-281-5600.

Sony VO3800 w/AC300 & Sony DXC 1640 all w/battery, mint, $1500 for pkg. K Knowles, Box 12127, Tallahassee FL 32317. 904-575-6689.

Sony DXC-1640 (2) & CMA-6 CCU packages; one excel cond, $800 & one fair cond w/lots of use, $450; 50' 14 to 14 pin cable, $75, will consider donating before 12/31/86. R Weller, RSBS, 6117 Code Ave S, Edina MN 55436. 612-925-2162, aft 6PM.

Want to Buy

JVC KY 210 camera cables, studio access & CCU needed. C Moeller, M Video Prod, 2827 SE 2nd St, Ocala FL 32671. 904-694-4224.

Sony DXC3000 or equiv CCD camera. M Glaser, MRG Assoc, 2 Floyd Ln, Massapequa NY 11762, 516-489-1071.

JVC CCU & cable for use w/JVC KY2000 camera. J Owens, Asbury College, Wilmore KY 40390. 606-858-3511 X757.

Sony DXC 1210 & DXC 1600 Trinicon for Sony DXC 1210 needed, also viewfinder, any cond & DXC 1600 camera head for cabinet parts. C Lund, Cycle Snd & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

CART MACHINES

Want to Sell

Gates Criterion, 2 w/rec amps, sec & tertiary tones, 1 w/all tones, 1 w/stop tone only, spare electrs, $250 ea or BO plus shpg. B Defelice, CK Cable FM, 621 Bishop, Bridgeport CT 06610. 203-336-5606.

Tapecaster 700P mono, $100. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Sparta mono 800 R/P in working order, $150. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

BE 500 mono play, table top, $100. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

BE tape winder w/timer, carts (200) various lengths, $200; Model 400 cart tape, new on hubs, $75; (150) teflon washers, $20; 1 box of pads, $5. R Eaton, WFHC, 158 E Main, Henderson TN 38340. 901-989-6000.

Gates Criterion mono play, $250. P Ramsey, KOWB, POB 1290, Laramie WY 82070. 307-745-4888.

ICA stereo R/P Rapid Cue, $450; (2) mono in one rack, $250 for both. F McCall, Performance Srvs, 1521 W St Marys Rd, Tucson AZ 85745. 602-323-0901.

ITC 3D stereo PB w/new heads. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Mono play heads (tape) for ITC 3D machines, $60 ea or $145/all; (5) 2 trk stereo play heads for ITC R-R decks, Vikron 5742, $50 or all for $200. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Collins 642E1 twin tape PB (2), $400 ea. M Matius, WSSA, POB 832, Monroe GA 30260. 404-361-1570.

ITC 99-A, stereo, R/P. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Collins Twintapes w/record amps, BO. L Thompson, WCLT, Box 880, Newark OH 43055. 614-345-4004.

RCA RT-7 (5) cart decks. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

ITC SP Premium series mono, mint, BO. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

ITC RP Premium (3), R/P mono, $1000 ea. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-748-1450.

Spotmaster 400A RP, mint cond w/manual. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

Tapecaster X700RP mono w/sec tones, $425/BO. B DeFelice, CKSN Cable Radio, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

RCA RT-7 (2) type record amps. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Tapecaster 700RP cart machine,, $300. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

ITC Mono RP in vgc. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

Tapecaster X700RP (4) mono, currently in use, $700/BO. A Searfoss, WIIN, 2707 Atlantic Ave, Atlantic City NJ 08401. 609-348-4646.

Want to Buy

ITC triple deck mono, must be in gd working cond. D Voss, KADR, RR1 Box 86, El Kadar IA 52043. 319-245-1400.

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.

BE5300 stereo or ITC 3 deck w/record amp. S Wentzloff, WCXT, POB 448, Hart MI 49420. 616-873-7129.

ITC RP Series, 3 tone high speed cue detector card, also mono amp card. C Lund, Cycle Sound & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

BE Spotmaster 500C recorder plug-in relays & plug-in cards. C Lund, Cycle Sound & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

MCI 2 chan repro chassis for JH-110B recorder, $600/BO. H Landsberg, Henry Engr, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Ampex mono R-R w/Inovonics 375 elect, $350. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

ITC 850 2 trk, some spares, $550 or BO plus shpg. B Defelice, CK Cable FM, 621 Bishop, Bridgeport CT 06610. 203-336-5606.

Telex 230 mono FT w/record elect. S Brown, WHBY, POB 1519, Appleton WI 54913. 414-733-6639.

ITC tape cabinets for 750/770's roll arounds. S Brown, WHBY, POB 1519, Appleton WI 54913. 414-733-6639.

Atlantis stereo cassette w/Dolby, $150. P Ramsey, KOWB, POB 1290, Laramie WY 82070. 307-745-4888.

Revox PR99 1 yr old, excel cond, $1500; Revox A77, perf cond in portable case, $850. R Furby, KGAL, POB 749, Albany OR 97331. 503-926-8683.

Ampex AG-350, 2 trk stereo, 7.5-3.75 ips, gd cond in Ampex console, $750 plus shpg. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Teac X10-R 1/4 trk stereo/reversing 3.75-7.5 ips, $300. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Wollensak stereo cassette HS duplicator, 1 master, 5 slaves, recently rebuilt, excel cond, $1500. W Weagant, Command Prod, 107 ICB Bldg, Sausalito CA 94965. 415-332-3161.

Telex 300 stereo reel master, 3 in shell slaves in roll around rack, vgc, $1600/BO; Telex 300 stereo loop master w/Ampex 350 R-R slave, vgc, $2200/BO; Electro Sound cassette winder, gc, $500/BO. W Brassell, Brazro Recdgs, 1215 N Concord, Chattanooga TN 37421. 615-892-5995.

Ampex AG 440-B 1" 8 trk w/servo in roll around console, vgc, $4800/BO; Teac 80-8 8 trk, vgc, $1650/BO. W Brassell, Brazro Recdgs, 1215 N Concord, Chattanooga TN 37421. 615-892-5995.

3M Wollensak cassette dup, gd cond, $500. R Eaton, WFHC, 158 E Main, Henderson TN 38340. 901-989-6000.

Scully 280, 2 trk stereo, 7/5-3/75 ips, gd cond, wood console avail free, plus shpg. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Nakamichi 680ZX 3-hd cass deck, front panel bias for 3 types, auto azimuth adjust, $550. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Ampex 8 trk/4 trk/3 trk, Neumann U47/Pultec, $3500. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Ampex 4 trk/3 trk 7.5-15 ips, Neumann U47 w/PS & stand, $2550. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Ampex 4 trk 15-30 ips, Neumann U47 w/PS & stand, $1850. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Ampex 8 trk AG350-8 w/sel sync, Neumann U47 w/PS & stand, $2150. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Ampex recorders inc: 8, 4, 3, 2, full, 1/2 trk & more, call for details. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Pioneer RT-909 10-1/2", 3-3/4, 7-1/2 ips auto rev, excel cond, $300. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Ampex 440B 1/2" 4/2 trk servomotor 15/7.5, vgc, $1800. D Hewitt, Remote Rcdg Services, 20 Kennedy Pkwy, Munsey NY 10952. 914-425-8569.

Otari MX7000, 1/2 trk stereo & 1/4 trk play, excel cond, $300 w/manual. M Mattews, Rockwell Collins, 3318 Shield Ln, Galand TX 75042. 214-996-6844.

Ampex AG-350 1/2T head assy, spare motor, pinch roller, Inovonics 375 elec, gd cond, manual, $600 ppd UPS. G Finerman, Advanced Media, 17 Hillcrest, Suffern NY 10901. 914-368-1143.

ITC 850, (2) 2 trk R/P on roll around stands, gd appearance & great working cond, $950 ea. D Byrd, WZGC, 603 W Peachtree, Atlanta GA 30308. 404-881-0093.

Sony TCD5 field cassette recorder, Sendust & ferrite heads, w/leather case, $350. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

Scully 100 24 trk w/16 trk heads, over $3000 worth spare parts, full doc, 15 & 30 ips, w/meters, $11,000. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Ampex AG350-8, 8 trk w/Selsync, Neumann mic U47 w/PS & stand, $2150; Ampex 4 trk 15-30 ips w/Neumann mic U47, $1850; Ampex 4 trk, 3 trk, 7.5, 15 ips w/Neumann mic U47, $2550. Mr Oliver, Lynn Oliver Studios, 304 W 89th, NY NY 10024. 212-874-0274.

Ampex 8 trk, 4 trk, 3 trk, Neumann U47, Pultec EQ, EQP1A, $3500. Mr Oliver, Lynn Oliver Studios, 304 W 89th, NY NY 10024. 212-874-0274.

Akai GX220 R/P, gd cond, 1/4 trk, $100. T Ford, WBVR, POB 298, Nasselville KY 42276. 502-726-3555.

Teac 7030 stereo, handles 10-1/2" reels, BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Ampex AG-350 w/o heads, BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Scully 280-B signal chassis, complete, gd cond, BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Otari MX5050 2 SHT, 7.5 & 15 ips, new heads, belt, excel cond, $995. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

RCA RT-21 R/P, handles 10" reels. H Leupp, KFRY, Box 1738, Bismarck ND 58502. 701-223-0900.

Ampex 350 tube electr, unknown cond, $75/BO. C Larko, Audio Prods, 230 Gaskins Bldg, 124 W Washington Blvd, Ft Wayne IN 46802. 219-424-2405.

Ampex 350 transport, FT heads, very clean, $200/BO. C Larko, Audio Prods, 230 Gaskins Bldg, 124 W Washington Blvd, Ft Wayne IN 46802. 219-424-2405.

Ampex AG 350 elec unit, $50/BO. C Larko, Audio Productions, 230 Gaskins Bldg, 124 W Washington Blvd, Ft Wayne IN 46802. 219-424-2405.

Ampex 600 FT, old tube type, $100/BO; Ampex AG350 transport, 2 trk heads, fair cond, $200/BO. C Larko, Audio Prods, 230 Gaskins Bldg, 124 W Washington Blvd, Ft Wayne IN 46802. 219-424-2405.

Uher 4000 Report, 2 trk stereo w/battery, power unit & mic, BO over $300 or trade. F Harrell, WZYC, 1400 Ocean, Beaufort NC 28516. 919-728-2019.

Ampex E65 portable case, 7-1/2 ips, built in amp & speaker, vgc, BO. D Hastings, WKYB, Box 1000, Hemmingway SC 29554. 803-558-2558.

TD700 rack mount, 3 motor drive 3 speed full trk solonoid operated 10-1/2" reels, BO. D Hastings, WKYB, Box 1000, Hemmingway SC 29554. 803-558-2558.

Ampex AG500 stereo 1/2 trk w/elect, $250; AG500D 4 trk w/elect, $550. F McCall, Performance Srvs, 1521 W St Marys Rd, Tucson AZ 85745. 802-323-0901.

Magnecord 1022 (2) w/electr, 1/2 trk, $250 ea; (2) 1022's w/o electr, $150 ea; spare elect, $100. F McCall, Performance Srvs, 1521 W St Marys Rd, Tucson AZ 85745. 602-323-0901.

Presto 825 1/2" & 1/4" head assembly w/dual amps & case, $75. P Russel, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Tascam 80-8, rack mount, w/DX8, cords, Teac patch bay rackmount, 2 reels new tape, Teac alignment tape, manuals, vgc, $2100. B Busetti, 1124 W 2nd, Florence CO 81226. 303-784-3540.

Ampex ATR102 15 & 30 ips, 1/4" half trk, vcg, $5200/BO. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

Otari MX-7000, 1/2 trk stereo, 3-3/4, 7-1/2, 15 ips inc rec/PB amps, $450. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

ITC 750 stereo recorder; Ampex 351 reel deck w/mono heads & Inovonics 375 solid state R/P elec. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

Ampex 352 PB stereo, Ampex elect, BO. P Finken, KHHT, Box 1686, Minot ND 58701. 701-852-0361.

Ampex 352-2 stereo P/R w/Inovonics 375 elec, BO; Ampex 352 mono P/R, w/Inovonics 375 elect, BO. P Finken, KHHT, Box 1686, Minot ND 58701. 701-852-0361.

Gonnsett G50 swap Nortronics cart alignment tape for R/R align tape 7.5" reel, stereo. R Koch, WQFF, Box 5195, Greensboro NC 27435. 919-273-1385.

Nagra III (2), bought overseas, gd cond, $800 ea or $150/both. Mr. Eng, Aust Bdctg Comm, 1 Rock Plaza, NY NY 10019. 212-755-1177.

Otari ARS1000 (2) mint cond, 6 mos old, must sell, BO. B Williamson, WHVW, 435 Violet Ave, Hyde Park NY 12548. 914-471-9500.

Ampex 440A elec, also Teac 505 tube elect 2T w/¼T play, 3-3/4 & 7-1/2 ips, needs some work, BO. R Tilkens, Ambient Recdg, 9622 52nd Ave, College Park MD 20740. 301-982-9288.

Ampex 601 in portable case, mono tube-type, BO. D Hastings, WKYB, POB 1000, Hemmingway SC 29554. 803-558-2558.

Otari MX 5050B (4), excel cond, $1100 ea. M Dibennedetto, Colony Comm, 401-277-7845.

Revox A77, $400; Pioneer RT-701, BO. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

Ampex 350 (4) mono, all in cabinets, in excel cond, BO. N Schnapf, Assoc Recording Studios, 10 Swirl Ln, Levittown NY 11756. 516-796-3698.

Scully 280 R-R 2 trk in Ruslang cabinet, gd cond, $595; Ruslang R-R cabinet, excel cond, $175. B Levine, The Flamingo Network, 411 S Woodward Ste 502, Bham MI 48011. 313-642-7426.

Revox PR99 MKII, brand new (3), BO. J Hebner, KVXO, E 2211 W Sprague, Spokane WA 99202. 509-534-1059.

Scully 14" PB R-R decks (2), suitable for prod or automation, excel cond, $500/BO. D. Workman, KPPL, RR 1 Box 203, Stockton IA 52769. 319-785-6069.

Tascam 32 (6) just removed from service, very clean. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-8751.

Want to Buy

Ampex 350 15 ips capstan motor & mono erase head, tech manual. D Brown, WBSN, 7929 Zimpel St, New Orleans LA 70118. 504-865-9812.

Used 8 trk recorders & consoles in gd working cond. K Nelson, MorningStar Stds, 1402 E 5th, Newberg OR 97132. 503-288-7431.

Pioneer RT2022/2044 must be in working usable cond w/ or w/o elec. C Larko, Larko Prod, 230 Gaskins Bldg, Ft Wayne IN 46802. 219-424-2405.

Tapesonic 70 TRSH stamped metal head cover, 15 ips bushing cast metal lower head cover, original knobs for electr & reel hold-down for 10-1/2 reels. C Lund, Cycle Snd & Video, 167 Madison, Waterbury CT 06706. 203-756-7761.

RW Broadcast Equipment Exchange

CONSOLES

Want to Sell

Vanco MM-7, stereo/mono audio prod/disco mixer, 2 mic inputs w/pan, 2 TT inputs, 2 line/tape inputs, cue buss, $125. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

Neotek Series 1, 16 x 8 x 2, hard-wired model, excel for mobile use, w/talk-back module, tape remote, etc, $6000. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

QRK Futura 6 slide pots, needs mod meter, BO. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5332.

Fairchild custom 16 x 8 x 2, $2000. J Maestro, FM Recdg Stds, 1351 Brook Ave, Bayshore NY 11706. 516-666-4560.

Spotmaster 4BEM50 4 mixer console, cable, bdct/news use, vgc, $500. Dave, 1727 Mass Ave NW #212, Wash DC 20036. 202-667-3276.

Ramko DC8-MS 14 input stereo, touch switches, w/manual & new pots, $700. T Trott, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Console Sound Workshop 1280-B, $1875/BO. W Brassell, Brazro Recdgs, 1215 N Concord, Chattanooga TN 37421. 615-892-5995.

McMartin B80252, 8 chan 24 input, needs work, $750/BO; Collins 9 chan dual output (3), $200-600/BO; RCA BC9 mono 4 mixer 22 input $500/BO. B Roberts, Van Priooyen Bdctg, 628 Mulford Dr SW, Grand Rapids MI 49507. 616-243-2026.

Gates Studioette, 5 mixer, 2 chan, operational when removed from service, $480; Gates President M6209A, 8 mixer, 2 chan, operational when removed from service, $960. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Russco 505 mono console, new, must sell, $1100. G DuBois, Liberty Snd, 217 N Begley, Soto TX 75115. 214-223-9795.

Harris/Gates Executive 10 ch stereo. K O'Malley, WLRW, POB 3369, Champaign IL 61821. 217-352-4141.

Micro-Trak 6618 stereo console, 6 chan, 18 input stereo/mono out, 10 W monitor amp, like new, $1500. M Jones, WIVK, 6711 Kingston Pike, Knoxville TN 37919. 615-588-6511.

Gates 9 chan, 2 prog amps, 5 mic's lines, 4 line level w/PS, newly painted, $500. J Corrigan, WELR, 216 Hope St, Providence RI 02406. 401-421-8100.

Ampro Microtouch 5 chan stereo, gd cond, $1500. M Persons, WCMP, RR 2, Pine City MN 55063. 218-829-1326.

Harris Mono 5, rebuilt, $950. M Matius, WSSA, POB 832, Monroe GA 30260. 404-361-1570.

Studiomaster 18 x 8 x 2, mic/line inputs, 3 band semi-parametric EQ, internal routing, Anvil case, Koss headpones, like new, $1800. B Busetti, 1124 W 2nd, Florence CO 81226. 303-784-3540.

Altec 600/600 sliding faders, 15 single, 1 double & double rotary, removed from operating console, entire lot for $50. I Kaufman, Natl Recd Stds, 460 W 42nd, NY NY 10036. 212-279-2000.

Ramko DC-8M 8 chan, 18 inputs, completely rebuilt, proof measure provided, $1200. C Bryson, Comserve, 93 Robinhood Dr, Zeliemople PA 16063. 412-776-5204.

Autogram AM8, BO. B Hughes, POB 649, Palestine TX 75801. 214-729-6077.

Langevin AM 16 preamp; AM 17 prog amp; EQ 251-A EQ's; PS 221 power supplies, mounting trays & instruction books, excel cond. B Anderson, Anderson Prod, 11557 Sunshine Terr, Studio City CA 91604. 818-769-6569.

Electrodyne/Cetec SM-9 modules, 9 switches, 8 buses, 1 solo button (20), BO. R Robinson, TNA, 10 George, Wallingford CT 06492. 203-269-4465.

Spotmaster stereo 5 chan w/preamp, schematics & manual, vgc, $900. K Harris, WPWC, POB 189, Dumfries VA 22026. 703-221-1124.

Soundcraft Series II, 16 x 8 x 16, $3500. T Bartlett, North Country Snd, 175 Bunker Hill Rd, Auburn NH 03032. 603-483-2662.

McMartin B-801, B-501, B-801 mono 8 ch w/spare parts inc B-501 mono 5 chan. R Gwyn, WLFA, Box 746, Layfayette GA 30728. 404-638-3276.

Want to Buy

Stereo console. J McPherson, WNDI, Box 545, Sullivan IN. 812-268-6322.

Parts for RCA 76B-2 Consolette, need service manual. L Scott Jr, POD 1729, Bartow FL 33830. 813-533-4654 eves.

Collins 212F-1 or individual amps for this model. T Spencer, WODY, POB 545, Bassett VA 24055. 703-629-2509.

DISCO & SOUND EQUIP.

Want to Sell

Blonder Tongue B9, $75; Pultec EQP1A, $950. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Altec-Lansing 600B, excel cond, closest to $90; Jensen C3781 ST 600 ohm line feed 15" duplex, closest to $120. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Allison Research Kepex 500 w/single card enclosure CM-001 in like new cond, both $150. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

E/V Klipsch, 290 lb, Georgian 1954, 15" bass, 3 horns w/worlds best folded horn Klipsch bass enclosure, mahogany wood, $290; (2) Fulton ESR-6 electrostatic tweeters, pro-modified, $75 ea; Harbeck electrostatic tweeter, both mid's & high's, also pro-modified, $75. J Pascale, 3 Stanley Pl, Hauppauge NY 11788. 516-265-8283.

E/V Klipsch 290 lbs, Georgian 1954, 15" bass, 3 horns w/worlds best folded horn Klipsch bass enclosure, real oak (2) & one mahogany wood, $290 ea; (2) Fulton ESR-6 electrostatic tweeters, pro modified sounds much better than original, gd sound, $75 ea; Harbeck electrostatic tweeter, both mid's & highs, also pro modified, $75. J Pascale, 3 Stanley Pl, Hauppauge NY 11788. 516-265-8283.

Dukan PA System, comp w/3 100 W amps, 6 trumpet speakers, all working tube units, BO. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

ADC Spectrum Analyzer, $125; Sansui RA-990 reverb amp, $85. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Symetrix 511 NR for any source, does not require encode/decode process, new, $450/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Eventide RD-770 w/dbx, 2 chan mono/stereo record/repro w/dbx to eliminate cart phase error, new, $450/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

AKG BX20 spring reverbs, $100 ea. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Oberheim synthesizer, (2) voice w/midi sequencer, $350. P Cibley, Cibly Music, 138 E 38th, NY NY 10016. 212-986-2219.

Mixers inc: Ampex, Altec, Sigma, call for details. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

UREI 530 9 band 2 chan graphic EQ, $250. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

Roseberry freq shifter, ±5 Hz, voice range, $50. R Robinson, TNA, 10 George, Wallingford CT 06492. 203-269-4465.

Carvin 2029 EQ (2) less than 1 yr old, 1/3 octave EQ's, $250 ea. R Dietterich, WLTJ, 1051 Brinton, Pgh PA 15221. 412-244-7600.

GLI 5990 production controller/mixer, new, factory boxed, shipped prepaid freight upon receipt of first $850 check. F Luppino Jr, Marketing Insights, 1445 Sunset Ridge, Glenview IL 60025. 312-729-2047.

Recording Studio, 8 trk, all pro gear, tape machines almost new, Scully, Neumann, Crown, McIntosh etc, sacrifice price, $7500 for all. WC Burchitt, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

EMT 140 reverb unit in gd working cond w/inst, you pick-up, $850. I Kaufman, Natl Recrd, 460 W 42nd, NY NY 10036. 212-279-2000.

MXR digital delay, $250. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

Valley People rack, 3 gain brains, one Maxi Q, excel $1000; Accesit noise gates 3 chan w/PS, $250. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

Want to Buy

SEAS tweeters to fit Dynaco A-35, new/used or blown OK, also working/blown A-35 speakers. A Tucker, Foothill Prod, 70 W 83rd, NY NY 10024. 212-877-0973.

SEAS tweeters, to fit Dynaco A-35 speakers, new/used or blown okay; also working or blown A-35 speakers. A Tucker, Foothill Prod, 70 W 83rd, NY NY 10024. 212-879-0973.

API 550, Pultec, Sontec EQ's. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

LIMITERS

Want to Sell

Harris MSP 90 AM limiter, needs work; (2) Harris Gates Solid Statesman FM limiters. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

Gregg Labs FM Tri-band audio processor, BO. M Hendrickson, KEEZ, Box 3345, Mankato MN 56002. 507-345-4646.

Dorrough DAP 310 AM, $600; Volumax 410 FM, mono, $300. R Dietterich, WLTJ, 1051 Brinton, Pgh PA 15221. 412-244-7600.

Dorrough 310 processor, BO. Joyce, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

IMP 3 audio processor, missing book, $1000. R Furby, KGAL, POB 749, Albany OR 97331. 503-926-8623.

Dorrough 310 DAP. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

UREI LA5 similar to LA4, w/rk mtg adptr, $300. E Helvey, Successtrax, POB 1357, Winchester VA 22601. 703-877-1191.

CRL SC-300 composite controller, BO. G Peterson, KGGG, Box 8205, Rapid City SD 57709. 605-348-1100.

Dorrough 310, gd cond, BO. B Reck, WPTL, POB 909, Canton NC 28716. 704-648-3576.

Orban 418A OptiMod-FM circuitry adapted for prod & rec apps, excel cond, $450/BO. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

CBS Ritz AGC amp (tubes). H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Gates Solid Statesman AM peak limiter. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Aphex Compellor, simultaneous compression, leveling & peak limiting, 14 hrs total use, $900. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Marti CLA-40A compressor/limiter amps (3), $150 ea. B Stuart, Radio Lassen, 3015 Johnstonville, Susanville CA 96130. 916-257-2121.

Fairchild 660, $325; Gates Sta-Level, $225. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Metron tube type compressor, $50. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Audimax 4450, gd cond, $400; Volumax 4111, gd cond, $300. D Byrd, WZGC, 603 W Peachtree, Atlanta GA 30308. 404-881-0093.

CBS Labs 4110 & 4150A FM Volumax & Audimax, $700/pr. B Stuart, Radio Lassen, 3015 Johnstonville, Susanville CA 96130. 916-257-2121.

Dorrough 310 audio processor; Harris MSP90 & 95 systems. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-748-1450.

Dorrough 310 comp/exp w/AM peak limiter card, tri-band unit, $700. A Caswell, C&G Bdctg, Box 171, Linden MI 48451. 313-735-4545.

Delta AME-1 AM mod controller (2), one complete, one for parts, $300/both. R Dietterich, WLTJ, 1051 Brinton, Pgh PA 15221. 412-244-7600.

DAP 310 AM Compressor/Limiter, looks gd, snds fine, just removed from service, $500/BO. J Whitmer, WNBS, POB 1340, Murray KY 42071. 502-759-1300.

Gates Sta-Level compressor, needs some work, $50 plus ship. K Harnack, 895 Mt Rushmore, Richmond KY 40475. 606-624-2181.

CBS Volumax 400 excel cond, $95, call after 6PM CDT; CBS FM Volumax Stereo 411, excel cond, call after 6PM CDT, $150. R Moen, Radio Srvs, 402-334-8767.

UREI BL-40 Modulimiter, appears to work fine, specs-out OK, w/manual, $300. K Harnack, WPAD, POB 450, Paducah KY 42001. 502-442-8231.

Orban 8100ST studio chassis for FM, $600; Orban 8100 AXTZ, 6 band processor for FM, $2000. H Ginsberg, WXXX, 150 Kennedy Dr, S Burlington VT 05403. 802-863-4487.

CBS Audimax Stereo, looks like 400 series, cond unknown, $200 plus ship. J Whitmer, WNBS, POB 1340, Murray KY 42071. 502-759-1300.

Volumax FM 4110 & Audimax 4450A, BO. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

Harris MSP-90 stereo AGC, $800/BO. R Dietterich, WLTJ, 1051 Brinton, Pgh PA 15221. 412-244-7600.

Harris MSP100 FM audio processor, recent factory updates, excel cond, $1200. J Gerlkey, KRES, 300 W Reed, Moberly MO 65270. 816-263-1600.

Harris MST90 tri-band AGC, limiters & main frame, $1000; Harris AM 80 mod mon w/175% PK indicator, $300. T Hawks, Radio Bdctg Srvs, Box 8316, Amirillo TX 79114. 806-372-4518.

Volumax 400; Volumax 411 stereo for FM; Dorrough DAP-310 FM audio processor, missing Lo EQ card, w/extra FM peak limiter PCB; Inovonics 215 processor w/chassis, pwr supply & basic output card. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

Aphex Compellor, $900. B Anderson, WRCN, 72 W Main, Riverhead NY 11901. 516-727-1570.

Want to Buy

Orban 8000A. J Howell, Howell's Audio, 521 Park St, Kingman AZ 86401. 602-753-3054.

MICROPHONES

Want to Sell

EV RE-15, vgc, $120. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Sennheiser MD4210, less than 1 yr old, $189 ea or $369/both. C Butler, 8709 Pinon Dr, Jacksonville FL 32221. 904-786-6363.

Large selection mics from Canon, RCA, Sennheiser, etc, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Bruel & Kjaer 4006 condenser mics, phantom powered matched pair, new, $1200/pr; (3) AKG C451 condenser mics w/assorted capsules, windscreens, PS & shotgun, etc, $750/lot; (4) RCA 77DX mics, recently rebilt by RCA, very nice, $400/ea; (4) RCA BK5B mics also recently rebuilt, very clean, $350/ea. P Chance, Div of Genetics, T2404 MCN, Vanderbilt Univ, Nashville TN 37332.

Electro Voice AC24M 2 chan phantom power supply, perfect shape, $100. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

Mics inc: Altex, E-V's, Shure, call for details. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Neumann U47 PS, stand/boom, $950; Altec 633 saltshaker mic w/stand, $225; EV 630, 635, 654, $220 ea. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Distributor Directory

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

Can't Find It? **Call 1-800-426-8434 For Immediate Action!** **Want To Sell It?**

RW Broadcast Equipment Exchange

MICS . . . WTS

Lavaller mic, gd for small room PA system, $100. M Elkins, WBQM, 1312 Riverview Ave SE, Decatur AL 35601. 205-353-7951.

E-V 664's (6), gd-excel cond; (2) E-V 626, mint cond, BO. J Phillips, All-American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

Parts for AKG C28A & STC 4126A mics, most outer shell parts vgc, $500 total. R Robinson, TNA Stds, Box 57, Wallingford CT 06492. 203-269-4465.

RCA boom stands (3), $200 ea plus ship. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Sony ECM56F (2) electret condenser, phantom or battery mic, $200 ea; Sony ECM33F phantom or battery power mic, $100 ea. J McComb, Boogie Bdct, 820 N Lasalle, Chicago IL 60610. 312-328-8494.

AKG 224E excel, $140. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

Luxo mic booms (3), $35 ea. H Ginsberg, WXXX, 150 Kennedy Dr, S Burlington VT 05403. 802-863-4487.

Shure, EV, Telex, M67, 635A, CS91A, $400 for all. S Strouf, Sound Inovations, 8705 Albien Ct, Tampa FL 33634. 813-886-3150.

Shure SM-81 condenser mics (2) plus AC PS to trade for 1 Neumann U-87. Shure's in mint cond. J Newman, Sound Results, POB 7703, Atlanta GA 30357.

Want to Buy

E-V RE20 mic. D Brown, WBSN, 7929 Zimpel St, New Orleans LA 70118. 504-865-9812.

RCA BK5B w/windscreens (2), gd working cond. F Spinetta, KCEA, POB 2585, Atherton CA 94026. 415-321-6049.

RCA MI-4094-B boom stand. F Spinetta, KCEA, POB 2585, Atherton CA 94026. 415-321-6049.

MISCELLANEOUS

Want to Sell

Rank 78 rotoverter 17.5 kVA, 208 V, 3 yrs old, $1500. J Verkest, WFCL, POB 269, Clintsville WI 54929. 715-823-5128.

Pelco pedestal mount w/controls for CCTV, $80; Ionics 200 W mercury ARC power supply, $55; Dukane microfiche reader, $45 plus UPS. J Baltar, Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Budd equip rack, tall w/rear door, like new, $200. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Soft drawn copper wire, approx 5000' of #10 for AM ground systems, $1800. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Stabaline EMT-4106C voltage reg, 6.6 KVA, new cond. T Smith, CCI Comm, 192 Lancaster Ave, Frazier PA 19355. 215-289-1725.

UTC LS141 transformers (3), 600 ohm primary, (2) 600 ohm secs, new/excel, $40 ea; Sylvania studio lamps, new, (9) EGK, EHK, BTL, (4) 176-018, 176-022, $7 ea. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Electrodyne SM-9 switch modules, (20) 1.5" wide, 7" long, 8 bus assigns & one solo button, BO. R Robinson, TNA, 10 George, Wallingford CT 06492. 203-269-4465.

Mono play tape heads for ITC-3D machine (3), $60 ea or all for $145; 2 trk stereo play heads (5) for ITC R-R decks, Vikron #5742, $50 ea or all for $200. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

ADC T-R-S 1/4" 2 x 26 (3); also T-S 1/4" 2 x 26, $250/BO each & wire. M McCarthy, KTVI Prod, 1116 Tamarack, Mt Prospect IL 60056. 312-640-8965.

Sparta Elec tech manuals, write for product wanted. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Misc gear including DC motor, spares for RCA 16mm film projectors; rectifiers; sound effect filter, old TV EQ instruction manuals, lens for RCA B&W camera and more, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

AEL 2201 exciter, $250/BO; AEL 2213 stereo gen, $200; CBX 4450A, $450; CBS Dynamax 400 mono, BO. D Howard, WMHE, 4665 W Barcroft, Toledo OH 43615. 419-531-1661.

Elgin 19522-22, new shape, $188; 19522-21 reconditioned, $150. T Keegan, KSP, Box 137, Maple Glen PA 19002. 215-646-5142.

Weston 2031 power meter for Continental Power Rock & FM, $45. D Peluso, DGP Consitants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Bud 16 space front face rails open frame rack, grey w/casters, $75. Cascade Recg, 2115 N Vancouver Ave, Portland OR 97227. 503-287-1662.

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 07014. 201-484-5291.

Plate transformer, 200-250 V primary, nominally 5160 V sec at 1 A, w/taps for 3600 & 4400 V, $500. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Cart racks, (3) 250 capacity wall-mounts, $125 ea; 15-25 capacity wire units, $15 ea, all in excel cond. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

Budd 77" equip rack, $150. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Powerstat T5007 variable auto xfmr, 230 V 2 phase primary, sec 115/0/115, 49 A. L Nixon, WTKV, 601 N Lee St, Valdosta GA 31601. 912-247-3333.

DEC Writer II, like new cond, $200. P Russel, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Calzone custom travel case for Otari MX5050B, never used, $150. S Kirsch, 2590 Hillside Ct, Baldwin NY 11510. 516-223-8878.

H/P rack clock, $25. D Olson, POB 479, Island Heights NJ 08732. 201-929-0694.

Sparta tech manuals for audio & RF products, write for product. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Nortronics heads (50) premium, 2050 1/2 trk mono R/P cue head, rear mount w/stand & nut, $10 ea. M Jones, WIVK, 6711 Kingston Pike, Knoxville TN 37919. 615-588-6511.

Nortronics heads (50), new, 3250 1/2 trk stereo/play cue, rear mount w/stand & nut, $10. M Jones, WIVK, 6711 Kingston Pike, Knoxville TN 37919. 615-588-6511.

Mitsubishi P50U printer for video, 3-1/4 x 4" printers from video inputs w/4 rolls of printer paper, demo use only, $75. B Watrous, Watrous Prod, 745 S Orange Ave, Sarasota FL 33577. 813-366-3316.

Misc gear: including oscillators; limiters; AM xmtr; printers; amps; consoles & much more, call for details. L Lindstrom, WPOK, 315 N Mill, Pontiac IL 61764. 815-844-6101.

Want to Buy

Book or copy for HB400D-HB410B. Simonsen, KHAT, Box 6066, Lincoln NE 68506. 402-423-1530.

Rack mount(s) for Panasonic TN-63 video monitors; rack mount(s) for Conrac ENA-12 video monitors. F Vobbe, WLIO, POB 1689, Lima OH 45802. 419-228-8835.

Vacuum crystal, 1490 kHz, for CCA AM100D or Harris BC1T xmtr. B Sitzman, IBC Engr, RD1 Box 312, Trumansburg NY 14886. 607-273-2970.

Sansui QS quadraphonic bdct equip, QSD-4, QSD-1, QSE-5B, etc, working or non-working. R Longseth, Sound Effects Plus, Box 349, Sioux Falls SD 57101. 605-339-1632.

Service manual for RCA 76B-2 console; any transcriptions including AFRS. L Scott Jr, POD 1729, Bartow FL 33830. 813-533-4654 eves.

Want to talk to anyone getting audio Hits from SA-9000 system. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Fixed mica caps, 002 5 kV, 510 μF (10), 120 μF, 3300 μF all at 2,500 V, .018 600 V, .01 10 kV, 2D21 tubes, $5 ea or you decide. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Deisel electric gen, around 50 kW. A Weiner, Weiner Bdct, 4 Second St, Presque Isle ME 04769. 207-764-8300.

MONITORS

Want to Sell

Harris M6659 mod mon; McMartin TBM 3700 FM mono; McMartin TBM 2200A FM stereo; McMartin TBM 2000B SCA monitor. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

McMartin TBM2200A, TBM3700, BO. L Thompson, WCLT, Box 880, Newark OH 43055. 614-345-4004.

Belar FMM-1, $625/BO; Belar FMS-1, $625/BO, gd cond. B Matta, Matteson/Drum Inc, 5001 Baum Blvd, Pittsburgh PA 15213. 412-683-2020.

McMartin TBM 3500/TBM 3000 working, $500; working tubes, many new receiving in new cond, SASE for prices. B Greenough, WNTE, Box 84, Mansfield PA 16933. 717-662-4600.

Belar AMM1, $750. B Jeffreys, WYBR, 2830 Sandy Hollow Rd, Rochford IL 61109. 815-874-7861.

Nems-Clark 112 phase monitor w/remote panel; McMartin TBM-2500 FM RF amp for mod monitor. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

Belar AMM-3 mod monitor, excel cond when removed, set for 1520. C Jednorski, WTRF, Box 248, Brunswick MD 21716. 301-694-8111.

Rust SFM 19 monitor, BO. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

Want to Buy

Type accepted AM mod monitors in working cond. J Coursolle, WCKK, 889 W Sunnyview, Oshkosh WI 54901. 414-324-4441.

EBS monitor, decoder/encoder, Gorman-Redlich CED or similar. J Powley, WIIM TV, 1536 Logan, Altoona PA 16602. 814-943-2607.

Aural TV mod monitor, mono, Belar TVM-1 or similar. J Powley, WIIM TV, 1536 Logan, Altoona PA 16602. 814-943-2607.

MOVIE PRODUCTION EQUIP.

Want to Sell

Large selection of movie/video prod gear, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Auricon Pro 1200 16mm, comp w/zoom, op & mag amp, tripod, new cond, BO; 35mm cam varible shutter, 3 motor, 6000' mag, 400' mag, zoom lens, new cond, BO or swap. L Meister, L Meister Prod, 312 River Rd, Nutley NJ 07110. 201-667-2323.

Want to Buy

Photosonics 70mm mdl 10 camera & drive take up motors, will pay full price. H Deans, Deans Prod, 170 Grand, White Plains NY 10601. 914-949-5920.

Flight Research 35mm mdl 207 pulse/sign camera, AKA multi-data, will pay full price. H Deans, Deans Prod, 170 Grand, White Plains NY 10601. 914-949-5920.

Zmar 180mm f1.3 refractor lens, will pay full price. H Deans, Deans Prod, 170 Grand, White Plains NY 10601. 914-949-5920.

RECEIVERS & TRANSCEIVERS

Want to Sell

GE MVP 20 W 2-way radios on 468.625, 2 mobile & one base w/antennas, manuals & access, $1800. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Marti RPT40 & BR10 on 161.64 MHz, 3-5 element yagi & phasing harness, trade for UHF gear or sell, 1 yr old. D Fertenberry, KVON, 1124 Foster, Napa CA 94558. 707-252-1440.

Marti RPT 1 W portable RPT xmtr on 455.70 & 455.80 MHz, AC or battery operation, $350. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

WWV rcvr, rack, perfect, $40. D Olson, POB 479, Island Heights NJ 08732. 201-929-0694.

REL FM tuner, original & pristine w/manual, $400. D Olson, POB 479, Island Heights NJ 08732. 201-929-0694.

Microwave Assoc VR-3X tunable receiver, $500. G Ramsey, WQSF, POB 180, Williamsburg VA 23187. 804-874-3696.

Technics ST-G5 quartz digital tuner, 16 presets, scan & memory, $120. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

JRC NRD-515, comm grade general coverage receiver, 96 ch memory unit, matching spkr & CW filter, mint cond, $900. G Finerman, Advanced Media, 17 Hillcrest, Suffern NY 10901. 914-368-1143.

Motorola UHF ENG system w/6 MX-300-S 5 W HT's, 6 Syntor 100 W mobile units, Spectra-Tac receiver & comparator, antennas, chargers, other access, system mod for wide audio bandwidth, 1 yr old, details avail. P Wells, KLZZ, 8665 Gibbs Ste 201, San Diego CA 92123. 619-565-6006.

Want to Buy

Sansui QRX Series quadraphonic receivers, working or non-working. R Longseth, Sound Effects Plus, Box 349, Sioux Falls SD 57101. 605-339-1632.

Drake R-7 or R-7A or Hammarlund HQ-150 or any Hallicrafter. B Securo, WCHL, 1721 E Franklin, Chapel Hill NC 27514. 919-942-8765 X102.

Sequerra FM1 & Scott 4410 non-working OK; Wayne Kerr R161 detector bridge 4-100 MHz. M Disch, Select Snd Srvs, 427 W Capital, Heartland WI 53029. 414-367-5719.

REMOTE & MICROWAVE

Want to Sell

Moseley TRC15, gd working cond, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

Modulation Assoc analog satellite mono audio receiver, $350. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

RCA BTR-30A remote control, 30 chan, Hallikainen & Friends TEL-172 digital telemetry kit, vgc, $1200. B Surratt, WINA, 501 E Main, Charlottesville VA 22901. 804-977-3030.

Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: __.

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Geary S. Morrill
Director of Engineering
Mid-West Family Stations
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48911

POSITIONS WANTED

Pro PD/MD, 19 yrs exper, looking for a home, all formats esp A/C, oldies. Dan Marks, Rt 1 Box 79B, Gladstone VA 21153. 804-946-2259.

News pro avail now, looking for small/med ND position. Phil, 216-882-3387.

Tech oriented person seeks bdct engr position. ISCET, CET, genrl, amateur license, HBO MDS exper, NBN CE, exper studio repair & maint. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Video tech desperately seeking a PT/FT position in Colorado, will take anything, salary req 18-20K w/benefits, 9 yrs exper, college grad, military training. S Smith, 9645 W Ohio Dr, Lakewood CO 80226. 303-985-7485.

Seeking group chief position, 19 yrs exper in major market (15 yrs as CE) AM stereo/DA, FM, STL, RPU, satellite, studio/Tx construction. FCC, SBE certified. Also commercial pilot. Write to: RW, POB 1212, Falls Church VA 22041. Attn: Box 12-1.

HELP WANTED

Studio/Xmtr Eng for small co-op group. WATD AM/FM in Marshfield, MA, WFAL-FM, Falmouth on Cape Code, & TIC, the Massachusetts Radio Reading Service for the Blind, needs tech help. Virtually all equip new. And the Massachusetts Coast is a great place to live & work! Must know studio equip, routine & emergency xmtr maintenance & can handle remote bdcts. Lots of work but also lots of fun & growth for the right person. Salary $18-20K plus benefits. Call Ed Perry at 617-837-1166 X234 or write WATD, Box AA, Duxbury MA 02331. E.O.E.

CE wanted for 3 station group, $18,000-24,000 depending on exper, must have AM/FM & automation exper. Ric Murphy, Calnevar Bdctg, 2332 Hwy 95, Ste A, Bullhead AZ 86442. 602-763-5227.

SALES ENGINEER WANTED

Rare opportunity with major equipment supplier. Strong radio engineering and sales background essential. Send confidential resume to Tim Schwieger.

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RW Broadcast Equipment Exchange

REMOTE . . . WTS

Moseley TAU-3 tolerance alarm unit, $250; Moseley DRS-1 selector unit, $250; Moseley DRS-1 status control terminal panel, $125. S Keating, Keating Tech Srvs, 18653 Ventura Blvd, Tarzana CA 91356. 818-708-7768.

Tek 485 scope 350 MHz, w/manual, $3500; Sencore SG165 stereo analyzer w/manual, $600. J Pancraty, Satellite Network Corp, POB 4080, McAllen TX 78502. 512-787-7855.

Marti RMC20 digital remote control, $800. J Verkest, WFCL, POB 269, Clintsville WI 54929. 715-823-5128.

Moseley TRC15 studio end, BO. Joyce, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

Modulation Assoc SCTC XP-1 down converter, $500. G Ramsey, WQSF, POB 180, Williamsburg VA 23187. 804-874-3696.

Isocoupler, 900 MHz, for use w/STL on AM tower, 2 mos old, $250. E Swicegood, WKXR, 919-625-2187.

Wegener MA satellite music network receiver, SMN Star Station format plus card to receive country format, also have satellite video system, $2000/BO. K Harnack, WPAD, 1700 N 8th, Paducah KY 42001. 502-442-8231.

Marti STL 8 (2) w/R-200/950 receivers, SCG8H subgen 39 kHz, (2) 4' grid Scala parabolics, all in gd operating cond, $4000 FOB Blythe CA. J Mayson, KIMB, 2222 Kansas Ave Ste L, Riverside CA 92507. 714-682-2222.

S-A dish/Series 9000 satellite system, receiver/DAT 32 for ABC network complete w/2 dual audio decoder cards & cue decoder, BO. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

Want to Buy

Video STL for LPTV, inexpensive. B Gray, K26BH/K38AT, POB 1838, Yucca Valley CA 92286. 619-228-1133.

Digital Set System for ABC, from dish to demod or separate equip. R Beaty, WBRB, POB 288, Mt Clemens MI 48046. 313-797-1400.

Moseley AW-15 or similar, phone line control, 8 sources min. F Vobbe, WLIO, POB 1689, Lima OH 45802. 419-228-8835.

Marti RPT 25 Systems remote pickup units, prefer RPT25. T Duffy, KOFE, 1525 Main Ave, St Mary's ID 83861. 208-245-4559.

Advanced Comm 7010, tuneable FM demod for Harris 6550 receiver, thumbwheel or DIP switcher, must be in excel working cond. D Voss, KADR, RR1 Box 86, Elkader IA 52043. 319-245-1400.

RPQ type accepted equip in 450 MHz band. R Morlino, WEQX, Elm St, Manchester VT 05255. 802-362-4800.

Dual audio decoder, 7.5 for Scientific Atlanta 7325 digital processing unit, will trade for 15 card. M Shannon, WAMJ, 1129 N Hickory Rd, Southbend IN 46615. 219-287-8375.

Flexible x-mission line, 1-5/8". A Weiner, Weiner Bdct, 4 Second St, Presque Isle ME 04769. 207-764-8300.

STATIONS

Want to Sell

Class A FM all new equip, bldg, great terms, only station in market, w/or w/o real estate, $149K. Joyce, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

Class A FM in Iowa for sale, will finance to right couple, $200,000. A Penfold, KOSG, 202 N 7th, Osage IA 50461. 515-732-5591.

AM 10,000 W, 1 MHz. D Hastings, WKYB, Box 1000, Hemmingway SC 29554. 803-558-2558.

Distress Sale, 1 kW AM, W Penn, great potential, great equip, incl real estate, $66,000. P Lenz, WEBG, POB 1580, Evansburg PA 15931. 412-898-3166.

AM station, 1 kW, FT, bldg, land incld, part ownership, 5K min, loc Ark. M Gotteeman, 3377 Solano Ste 312, Napa CA 94558. 501-856-2212.

Radio station, AM, 1 kW, only station in county. N Crum, WABV, Box 700, Abbeville SC 29620. 717-334-1833.

FT AM stereo station in top 100 markets, due to heart attack must sell, favorable terms to qual buyer, positive cash flow, on air 40 yrs, class B FM avail for combo-ing in 1987. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-8751.

Want to Buy

AM construction permit. P Hunn, Hunn Radio, RD1 Box 1067, Westpark NY 12993. 518-546-7985.

Small market AM or FM, will owner operate, all replies confidential. D Stebbins, KELK, POB 2574, Elko NV 89801. 702-738-7118.

STEREO GENERATORS

Want to Sell

Moseley SCG-4T subcarrier gen. K O'Malley, WLRW, POB 3369, Champaign IL 61821. 217-352-4141.

Harris MS-15, great cond, $800. D Byrd, WZGC, 603 W Peachtree, Atlanta GA 30308. 404-881-0093.

SWITCHERS (VIDEO)

Want to Sell

GVG 1600-1X switcher w/EMEM chroma key, serial editor interface, excel cond. P Scholes, Ardent Teleprod, 2000 Madison Ave, Memphis TN 38104. 901-725-0855.

TAPES,CARTS & REELS

Want to Sell

Mono country cart library, excel audio quality, good tape & pads, Fid's 300's, one or all, $2.50 ea. B Taylor, KWSS, Box 292, Miami AZ 85539. 602-425-4378.

Ampex 671, three groups to choose from: 7" x 2400' hand picked bulk taped down ends, 70 per ctn 60¢ ea or $42 per ctn plus UPS; or hand picked taped down ends in printed box, 50 per ctn, 80¢ ea, $40 per ctn plus UPS; or as is bulk, 60 per ctn, 35¢ ea, $21 per ctn plus UPS. Call Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572. 1-800-331-3191 or in NYS 516-678-4414.

Fidelipac 300 gray carts, used, loaded, 75¢ ea, unloaded 50¢ ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Fidelipac 300, (85) various lengths, $1 ea. C Shelonberger, WFTW, POB 10, Ft Walton Bch FL 32549. 904-243-7676.

Sesac 16" transcription library, like new cond, collectors items, BO; RCA transcription player, 16", works, fair cond, BO. R Bellavia, WSBC, 4949 W Belmont, Chicago IL 60641. 312-777-1700.

Metal reels, 8-10" of 1/2" Ampex tape, BO. C Larko, Audio Prods, 230 Gaskins Bldg, 124 W Washington Blvd, Ft Wayne IN 46802. 219-424-2405.

Metal reels, 10-1/2", all for 1/4" tape, all NAB hub, large stock, guar in excel cond, 1 to 10, $1.50, 10 to 100, $1.25, 100 plus, $1 ea, COD, shipped UPS, approp charges added to total invoice & KY sales tax added as applicable. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Fidelipac carts (300), mostly 20 & 40 sec, $100. D Markegard, KTCA, 1640 Como, St Paul MN 55108. 812-646-4611.

Mastercart II's (100) 70 sec, (70) 40's, $3.75 ea/BO; also several hundred Fidelipac 300's. D McGroom, WNDH, 419-592-8060.

Capital A2's, approx 200 various lengths, $400 takes all. K Hunter, KLKT, 774 Mayes Blvd, Incline Village NV 89450.702-832-1000.

Want to Buy

Dr. Dimento shows wanted for non bdct use in any format. S Fink, Clackboard Prod, 2289 S Green Rd, Beachwood OH 44122. 216-382-4886.

Scotch 1/2 mil tape in bulk. H Simons, WAEB, POB 2727, Lehigh Valley PA 18001. 215-434-4424.

Good used 1" video tape in quantity. H Casteel, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

TAX DEDUCTION EQUIPMENT

Permittee of chan 35 soliciting tax deduct donations of video equip, esp 3/4" recorders, editors, & tapes. K Sleeman, Ind Public Media of Phila, 2714 Quarry Rd NW, Wash DC 20009. 202-332-6130.

MW school needs prod gear to support news & prod program: R-R, carts & cass machines, entire studio, tax deductable. D Silcott, Creighton Univ, 25 & Calif Sts, Omaha NE 68178. 402-280-3014.

Mic mixer, 6-8 chan & other PA equip for church. P Johnson, Pilgrim Baptist Church, Hebron Ave, Glastonbury CT 06044. 203-633-7190.

Need mod monitors, Orban 8000A, 10 W exciter, xmtr 300-1000 W, 3 bay CP antenna, etc. J Carlson, Redwood Comm Radio, POB 135, Redway CA 95560. 707-923-2911.

Bdct equip needed by small college building new department. R Toomey, McCook Comm College, McCook NE 69001. 308-345-6303.

Radio & RF bdct equip wanted as donation, receive full market value. SFC, POB 3382, LaVale MD 21502. 301-729-8876 (5-10PM).

Non-profit college station needs: stereo or mono cart machines w/manuals. F Thomas, Muskegon Comm College, 221 S Quarterline Rd, Muskegon MI 49442. 616-777-0330.

El Salvador Christian station needs remote RF link, 8921R tubes & submergible water pump. J Counter, YSLE, 5484 San Patricio Dr, Santa Barbara CA 93111. 805-967-6410.

FM xmtr, 10 kW, need for public radio in Pittsburgh. P Rosenfeld, WYEP, 580 E End Ave, Pittsburgh PA 15221. 412-765-1170.

TEST EQUIPMENT

Want to Sell

Nems Clark 120 AM field strength meter, $600. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Audio/Video test equip, jigs, fixtures, Sound Tech 1000A FM gen; Tek NTSC waveform mon & vectorscope, JVC color camera, etc; library of A/V manuals w/file cabinets; spare parts of Sony, Hitachi, JVC, Panasonic, Pioneer, etc, A/V srvs dept close out, call for more info, sell by price or BO for all. Karl, 603-352-8400.

Tek up/down counter, $40 ; Lear Siegler 7650 digital multimeter, 19" rack mount w/3 printer connectors, $125; Tek 547 scope, $85; Matec 1204 master sync & exponential gen, $150; Tapaz 250 GW static inverter, $125; Weston Roter 840 RMS/DC converter, $150; HP 3420B DC diff voltmeter rationmeter, $150; Macrodyne Erdac 1100A transient recorder, $175; Tek RM 564 scope, $85, plus UPS charges. J Baltar, Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Sencore Cricket transistor checker, vgc, $60. A Ross, 8022 27th NE, Seattle WA 98115. 296-525-4624.

McMartin BFM 1521R audio gen, gd cond, w/manual, $75. R Eaton, WFHC, 158 E Main, Henderson TN 38340. 901-989-6000.

Sound Tech 1710A w/ind, dist analyzer, excel cond, $3000. D Denton, Denton Engr, 18142 Via Harriet, San Lorenzo CA 94580. 415-278-6463.

B&K 1403, $125; Telequipment D61A dual trace, $325; LSI ADM-3 CRT terminal, $100. B Urz, NCS, 2620 S 36th, Omaha NE 68105. 402-553-4591.

Jasoni Elec audio tape analyzer prototype, $260. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Loftech TS1 trade for Orban 245 stereo synthesizer. E O'Brien, Outhouse Recdgs, 3041 Crainford St, Terre Haute IN 47803. 812-238-9312.

IVIE 30 spectrum analyzer w/IVIE 17A analyzer & 20B noise source. M Brenner, Cal State Univ, 213-496-4796.

Nems Clark 120 AM field strength meter, recently calibrated, $600. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Sound Technology 1500A tape recorder test system, $5500. B Mishkind, KFXX, 3222 S Richey, Tucson AZ 85713. 602-748-1450.

Potomac FIM21 field intensity meter, 7 yrs old, excel cond. B Securo, WCHL, 1721 E Franklin, Chapel Hill NC 27514. 919-942-8765 X102.

Tek 527 waveform monitor, one in gd working order, one for parts, $500/BO for both. S Kafka, K61CU-TV, 902-941 O St, Lincoln NE 68508. 402-476-6115.

Fluke 9050A digital multimeter w/dB measurement, excel, $275. R McMillen, 13515 SW 72nd, Tigard OR 97223. 503-684-1973.

HP 606B signal gen, 50 kHz to 65 MHz, excel cond, $250 w/manual. M Mattews, Rockwell Collins, 3316 Shield Ln, Galand TX 75042. 214-996-6844.

Tek 564 storage scope, $500; Tek 502 scope dualbeam, $100. J Gagliardi, Harvard Univ, 69 Fruit, Norlork MA 02056. 617-732-1752.

Want to Buy

Quadraphonic scope, 4 chan & quad R-R music. R Longseth, Sound Effects Plus, Box 349, Sioux Falls SD 57101. 605-339-1632.

Potomac AT51 test system. J Meeker, Family Radio, 4609 78th Pl SW, Mukilteo WA 98275. 206-348-3322.

ACTION-GRAM

EQUIPMENT LISTINGS:

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply call 1-800-426-8434 to place your listings courtesy of Broadcast Supply West.

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an $18/25 word basis. Call 800-336-3045 for details and complete display rates.

EMPLOYMENT SECTION:

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

RW Broadcast Equipment Exchange

TRANSMITTERS

Want to Sell

RCA BTA10F, all or any parts, plenty of gd parts avail. B Emanuel, KASH, 1300 E 68th Ave #208, Anchorage AK 99518. 807-522-1515.

Continental 317-B 50 kW AM, 710 kHz. R Benson, KEEL, POB 20007, Shreveport LA 71120. 318-425-8692.

Gates Vanguard 1 1 kW, as is, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

Weston 2031 power meter for Continental Power Rock & FM xmtrs, $45. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Plate xfmr, 25 kW for Continental/Collins FM xmt, we crate, you ship, $1300. J Banks, WLTT, 5912 Hubbard Dr, Rockville MD 20852. 301-984-8000.

RCA BTA250M 1340 kHz solid state supply, clean w/manual, $1500 FOB Phila. B Hoy, WHAT, 3930 Conshohocken Ave, Phila PA 19131. 215-878-1500 X31.

RCA BTF10D w/exciter & spare parts & remote control panel, $8000. K O'Malley, WLRW, POB 3369, Champaign IL 61821. 217-352-4141.

Tepco 10 W FM translators (3), BO. K Brown, KWOR, 1340 Radio Dr, Worland WY 82401. 307-347-3232.

Collins 21E 5 kW AM, w/some spare parts & tube, avail around 12/15/86, $8000 plus pkg & ship. D Aydelotte, WCBC, POB 1290, Cumberland MD 21502. 301-724-5000.

Gates TE-3 working when removed, $900. B Greenough, WNTE, Box 84, Mansfield PA 16933. 717-662-4600.

Collins 21E 5 kW AM xmtr, call for details. J Meeker, Family Radio, 4609 78th Pl SW, Mukilteo WA 98275. 206-348-3322.

RCA BTA-5T, 5 kW AM, excel cond, manuals & spare tubes, 550 kHz. H Leupp, KFYR, Box 1738, Bismarck ND 58502. 701-223-0900.

Harris BC1H1 1 kW AM, excel cond, present main 1240 kHz, some spares, $7000. L Robinson, WPAX, Box 129, Thomasville GA 31799. 912-226-1240.

RCA TTU1B TV xmtr, UHF 1 kW, gd cond, spare cavities, diplexer, comp set of tubes. L Nixon, WTKV, 601 N Lee St, Valdosta GA 31601. 912-247-3333.

QEI FM xmtr meter bridge, reads SWR/voltage/current, Vp to 150 W, $250. Stan, KAK-FM91, Box 91, Villa Grande CA 95486. 707-528-4055.

FM plate for Collins 831D, 200-250 V primary nominal 5160 V sec at 1 A w/taps 3600 & 4400 V, $500. J David, KMPL, POB 907, Sikeston MO 63801. 314-471-1520.

Continental 2 yrs old, 1 kW, mint cond, all current updates, $12000 terms, $10000 cash. D Jack, KNTA, Box 6528, San Jose CA 95150. 503-234-8448.

Collins 1 kW xmtr, in service, 1978 model, station now 5 kW. V Arnold, WJEM, POB 368, Valdosta GA 31603. 912-242-1565.

RCA BTF-5D 5 kW FM xmtr, 94.7 MHz, $8000. M Raby, WFBQ, 6161 Fall Creek Rd, Indianapolis IN 46220. 317-257-7565.

Gates FM-1 xmtr, $6500. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

AEL 10KB 10 kW xmtr, $5000. E Fears, KHBN, POB 31235, Jackson MS 39206. 601-981-4245.

AM xmtrs crystals, one 1320 kHz & one 1390 kHz, BO. D Workman, KPPL, RR 1 Box 203, Stockton IA 52769. 319-785-6069.

Wilkinson exciter, excel cond, up to 15 W, tuned to your freq, has AFC metering & full sys metering, avail immed. L James, WROC, 975 S Florida Ave, Tarpin Springs FL. 813-937-3429.

Collins FM 5B, 5 kW FM, gd cond, BO. D Workman, KPPL, RR 1 Box 203, Stockton IA 52769. 319-785-6069.

Want to Buy

Non-commercial station needs your xmtrs, 1-10 kW, need in any cond, will pay cash & pick-up. R Van Zandt, WGNV, POB 500, Petersburg IL 62675. 217-632-3115.

FM 1 kW xmtr needed, near $4000. Doug Booth, WLTS, 504-943-9019.

FM 1-3.5 kW, non-profit station. B Shiver, KBJS, Box 193, Jacksonville TX 75766. 214-586-8724.

AM xmtr, 5 or 10 kW. B Sadler, WFSI, 918 Chesapeake Ave, Annapolis MD. 301-269-6500.

Gate BC500GY or 250, working or not. K Kimsey, KSLQ, 102 Elm St Ste 203, Washington MO 63090. 314-239-6800.

Continental 1970's 315 or Collins 820E AM xmtr, 5000 W w/solid state drivers. J Meeker, Family Radio, 4609 78th Pl SW, Mukilteo WA 98275. 206-348-3322.

FM xmtr, 1 to 3 kW. J Bruce, Thoen Comm, 407 N Swenson, Stamford TX 79553. 714-761-4377.

Solid state FM exciter in working order. Stan, KAK-FM91, Box 91, Villa Grande CA 95486. 707-528-4055.

TUBES

Want to Sell

IO 3" #5820A early TV pick-up tube, collectors item, $300; Vidicon 8480-4810 for RCA TK-27 film chain, gd cond, $90; many receiving tubes, WE & industrial numbered tubes, gd selection, single or lot. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

EIMAC 4CX1000A, used, $125. C Shelonberger, WFTW, POB 10, Ft Walton Bch FL 32549. 904-243-7676.

Small audio & RF tubes, from $1-5, write for list. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

EIMAC 4CX1000D, never used. R Benson, KEEL, Box 20007, Shreveport LA 71120. 318-425-8692.

EIMAC 4CX5000A, factory sealed box, late date code, $1025. A Emerald, Emerald Entrp, 8956 Swallow, Fountain Valley CA 92708. 714-962-5940.

Eimac 4CX1000 tube & SK-890B socket, fits Collins 830 1 kW xmt, both new & in box, BO. K Buckley, WCLD, POB 780, Cleveland MS 38732. 601-843-4091.

Misc audio & small RF tubes, from $1 to $5, write for list. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

EIMAC 833A modulator final tubes, new, $100 ea. J Bruce, Thoen Comm, 407 N Swenson, Stamford TX 79553. 714-761-4377.

4CX250FG, 23 avail, call for info, $40 ea or less if you buy more or BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Want to Buy

Tube socket for 6076 tube, needed immed. L Smith, Foster Comm's, 115 W 1st, San Angelo TX 76903. 915-653-3387.

TURNTABLES

Want to Sell

Gray 108B viscous damped tone arm, 16", new cond, extra slides, silicone fluid, $100; phono preamp, PS audio, stereo, like new cond, $60. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Russco Studio Pro, vgc, $275/BO; Russco Studio Pro (2) fair, $85/BO ea; RCA 16" in RCA cabinet antique, $150/BO. W Brassell, Brazro Rec, 1215 N Concord, Chattanooga TN 37421. 615-892-5995.

QRK 12-8, no tonearm, BO. M Saady, First City Recdg, 141-60 84th Rd #3E, Brairwood NY 11435. 718-846-2062.

Gates CB1200 w/Grey 303 tonearm, BO. M Saady, First City Recdg, 141-60 84th Rd #3E, Brairwood NY 11435. 718-846-2062.

BE QRK 3 spd, Micro-Trak tonearms & Stanton cartridges, fair to gd cond, $500/pr. M Elkins, WBQM, 1312 Riverview Ave SE, Decatur AL 35601. 205-353-7951.

Disc cutting head stack, 1/2" for Studer A80. M Brenner, Cal State Univ, 213-498-4796.

Sansui P-L50 linear programmable table, $95. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

RCA 70D w/arm, etc, gd cond, $75. D Olson, POB 479, Island Heights NJ 08732. 201-929-0694.

Grampian cutter heads type 1D feedback (2), one $300 & other $275. L Oliver, Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 1PM.

Gates CD77 as is, BO. B Greenough, WNTE, Box 84, Mansfield PA 16933. 717-662-4600.

Rek-O-Kut B-12H w/120 arm & Empire 980 arm, also B-12H usable or for parts, $125 for all. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

QRK w/base & Russco, $50/both. M Matthews, Rockwell Collins, 3318 Shield Ln, Galand TX 75042. 214-996-6844.

Technics SL10 MKII TTs (2), $350 ea. C Hampton, WXBM, 1687 Quintet Rd, Milton FL 32470. 904-994-5357.

QRK 12-C excel cond w/tonearms, $95 ea, call after 6PM CDT. R Moen, Radio Srvs, 402-334-8767.

Rek-O-Kut 12" Rondine deluxe 3 speed TT, w/non-descript viscous dampened tone arm & GE cartridge, $35 plus ship. C Brennan, 661 Horseshoe Curve, Pike Road AL 36064. 205-277-0139.

Want to Buy

RCA 16" in RCA floor cabinets, also parts for 70D & BQ2 TTs. L Scott Jr, POD 1729, Bartow FL 33830. 813-533-4654 eves.

Transcription TT, 16", motor & arm, cartridge & base for use with 78 rpm/33 rpm records. F Luppino Jr, Marketing Insights, 1445 Sunset Ridge, Glenview IL 60025. 312-729-2047.

VIDEO PRODUCTION EQUIP.

Want to Sell

Shintron 336 video dist amp, 1 input, 6 outputs w/manual, $100. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Rack of video prod equip, desk-style rack, Shintron 370 switcher, sync gen, Panasonic triple B&W monitors, Microtime T-120 & Edutron TBC's, Shure M267 audio mixer, all wired, operating order, $5000. M Taylor, AliMar Prod, 274 County Rd, Tenafly NJ 07670. 201-569-1717.

Panasonic CT1010M, $295; Panasonic WV 5203, $400. L Sharp, KZOK, 200 W Mercer #304, Seattle WA 98109. 206-281-5600.

For-A 4200 color corrector, $2500; Panasonic 8500 VHS editing deck, $1850; Hitachi FP10UD video camera, $1500. S Dubin, 30-15 Seven Dr, Fair Lawn NJ 07410. 201-797-4019.

JVC 3/4" CR-6650U, $2995; Bogen 3040 (2), $100 ea; Panasonic WV3806B (2), $300 ea; 150' of 19 pin camera cable, $150 per 50'; Sony DR10A (3) camera to switcher headsets, $50 ea. L Sharp, KZOK, 200 W Mercer #304, Seattle WA 98109. 206-281-5600.

Chyron VP1 character gen w/software & gen lock upgrades, $2100. L Froom, SPS Video Prod, 1901 Chapel Hill Rd, Silver Spring MD 20906. 301-598-5392.

Want to Buy

Panasonic TN-63 video monitor. F Vobbe, WLIO, POB 1689, Lima OH 45802. 419-228-8835.

Shintron 383 color bar/black/bkgd signal gen, any cond. G Odell, The Film Group, Box 9, Wethersfield CT 06109. 203-527-2972.

Unimedia SMT-12 video monitor schematic. J Balter, Maine Reel Prod, 67 Green St, Augusta ME 04330. 207-623-1941.

VIDEO TAPE RECORDERS

Want to Sell

RCA TR800 spare parts & assemblies. T Smith, 192 Lancaster, Frazier PA 19355. 215-269-1725.

RCA TR600 spare parts & assemblies; Sony BVH spare heads & scanners; Sony, NTSC, & PAL align tape, new stock BR5-2. T Smith, CCI Comm, 192 Lancaster Ave, Frazier PA 19355. 215-269-1725.

Sony VP2000 3/4" U-matic videocassette player, vgc, $200. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

JVC 5000 3/4" U-matic player, recently overhauled, $300. M Taylor, AliMar Prod, 274 County Rd, Tenafly NJ 07670. 201-569-1717.

Panasonic NV9400 3/4" portable VCR w/charger & 3 batteries, great shape, $650 plus ship. J Owens, Ashbury College, Wilmore KY 40390. 606-858-3511 x757.

JVC 6060U 3/4" VCR, $800. R Robinson, TNA, 10 George, Wallingford CT 06492. 203-269-4465.

Want to Buy

Sony BVU-110 or 150 3/4" portable VCR or equiv. M Glaser, MRG Assoc, 2 Floyd Ln, Massapequa NY 11762. 516-489-1071.

RCA TR800 & access, need not be working. H Henson, Henson Prod, 4569 Haven Crest Rd, Winston Salem NC 27106. 919-924-8717.

Panasonic NV9600/NV9240XD, working 3/4" edit decks & other assoc edit equip, could also use NU8500 VHS decks. B Chapman, Video Effects, POB 6316, Napa CA 94581. 707-257-7669.

Category of the Month

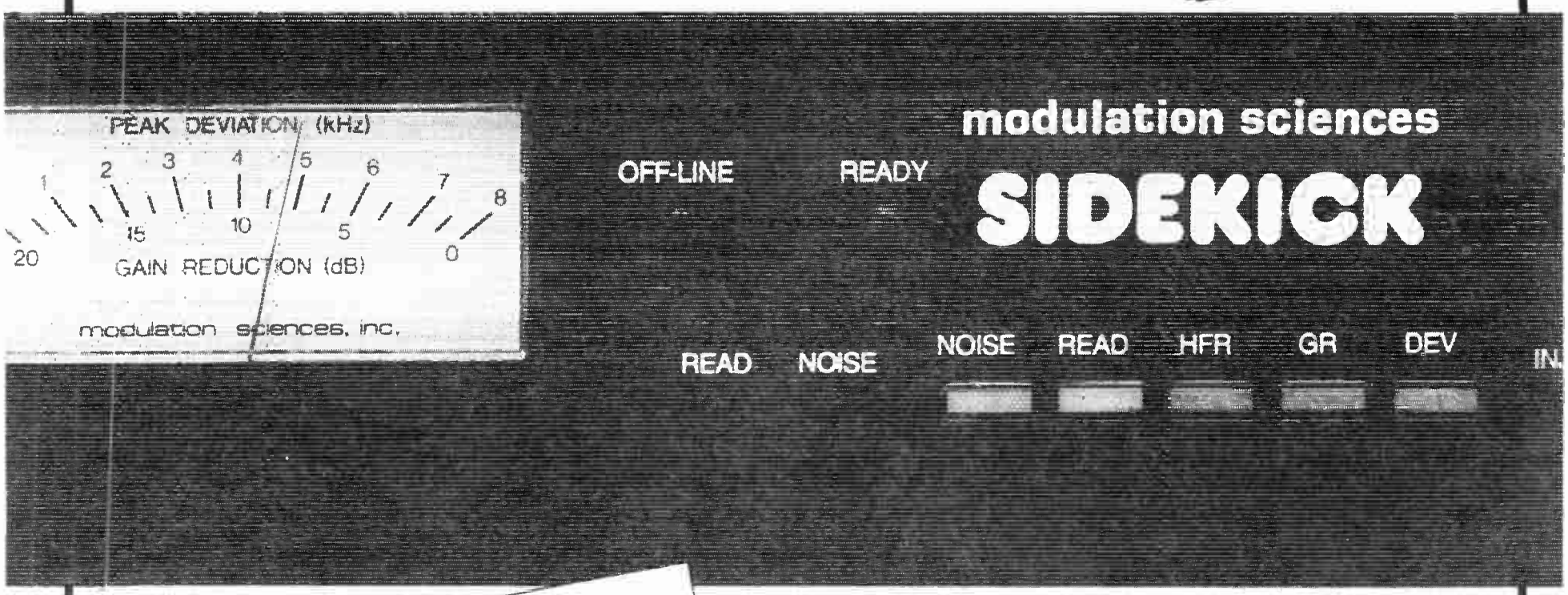
Each month the Buyers Guide highlights one area of broadcast equipment.

JAN	FEB	MARCH	APRIL
Test & Monitoring Equipment	Satellite & Automation Equipment	Microphones, Turntables & CD Players	AM Transmitters & Exciters
MAY	**JUNE**	**JULY**	**AUG**
Antennas, Towers & Cables	Program Audio Processing	Studio Audio Equipment	Consoles
SEPT	**OCT**	**NOV**	**DEC**
Reel-to-Reel & Pro Tape Recorders	STL, Remote, & Telco Equipment	FM Transmitters, Exciters & SCAs	Cart Machines

For more information, or to participate in the Buyers Guide, write: Radio World Buyers Guide, PO Box 1214, Falls Church VA 22041. 703-998-7600.

Can't Find It? **Call 1-800-426-8434 For Immediate Action!** **Want To Sell It?**

THE ONE BOX SOLUTION THAT MADE SCA WORK

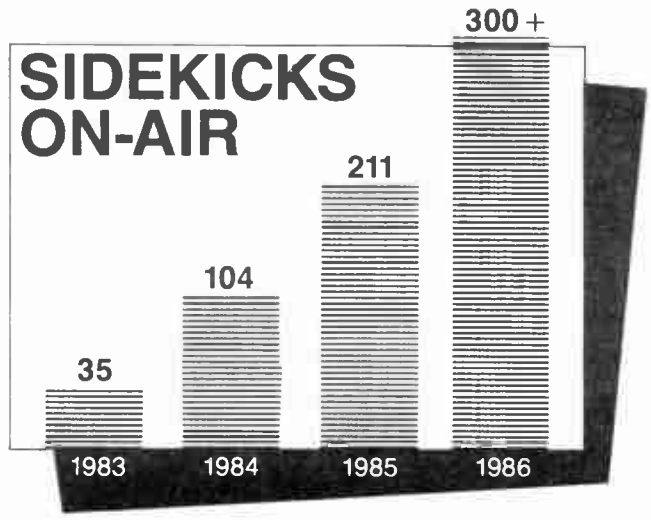


RF IDEAS

E.J. PRYOR, JR. *Broadcast Technologies, Inc.*

"I have been operating one SCA on 67khz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

Reprinted by permission from Broadcasters ID. Aug/Sept 1985



Here's how Sidekick® makes SCA work:

Sidekick installation is quick, easy, and problem-free:

- Install at studio or transmitter.
- Insert anywhere in chain via Sidekick's loop-through composite input/output (SCA input NOT required).
- Remote control provisions standard.

Sidekick's elegant circuit design takes the hassles out of SCA:

- Sidekick is tweak-free and drift-free.
- Crystal-locked synthesizer is stable over time/temperature.
- Excellent RF and EMI shielding.
- Performance certified by an independent P.E. (to receive a copy, just call).

Sidekick's "One Box Solution" builds in everything you need:

- Integrated audio processor for superb SCA performance.
- Noise generator and synchronous AM meter lets you tune transmitter for minimum crosstalk.
- Super-accurate peak & hold SCA deviation monitor.

30-Market Survey Results:

SIDEKICK IS THE #1 CHOICE OF MUSIC SCA OPERATORS.

From SCA: Radio Subcarrier Report 9/85

© Waters Information Services, Inc.

Call **Toll-Free (800) 826-2603**
And Get Sidekick Working For You.

modulation sciences, inc.

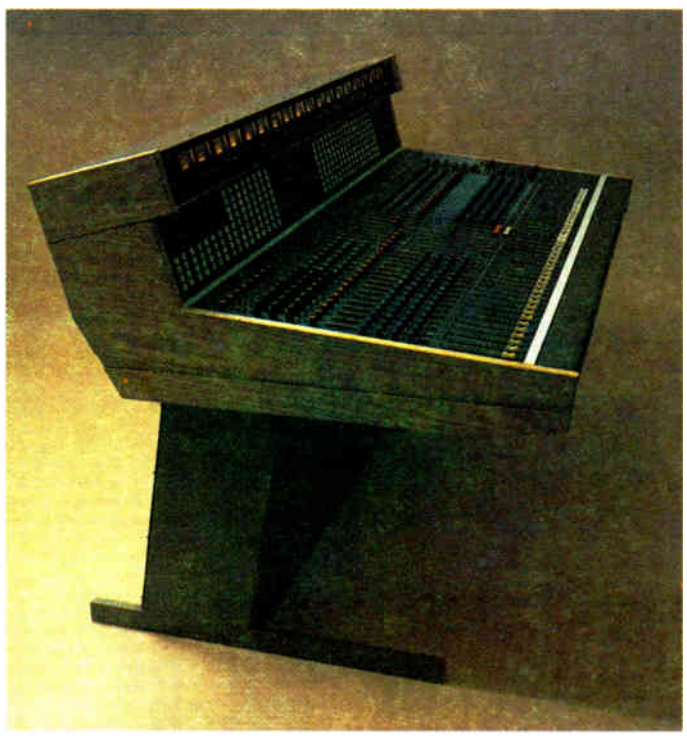
115 Myrtle Ave. Brooklyn, NY 11201 In N.Y.S. (718) 625-7333

Circle Reader Service 50 on Page 20

Multiple Choice:

What do you need in an audio console?
Every application is different; what are *your* requirements? Should the input section be stereo or mono, mic or line? What kind of outputs and subgrouping do you need? Is a matrix mix important? Do you require mix-minus capabilities? What about metering, timers, tape remotes, mainframes, future expansion?

A-500 Radio On-Air

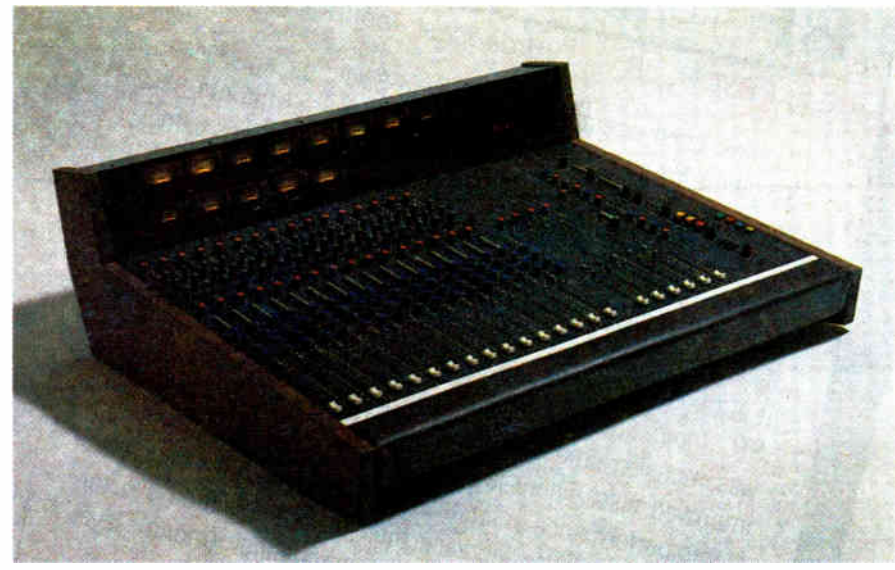


TV-80 Television Master

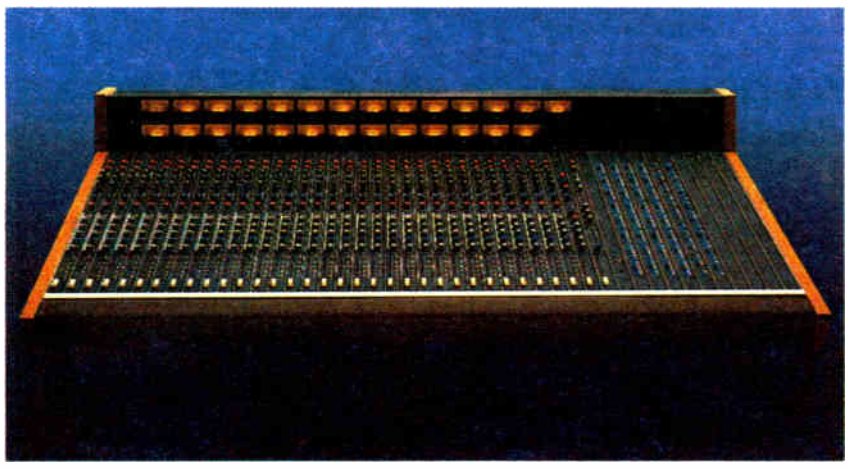
WHEATSTONE consoles give you all the choices. Our sales engineers listen to your requirements, then work with you and plan your console from the first module to the last VU meter. The result is custom-configured equipment built specifically to your needs.

The truth is, there's only one choice when specifying broadcast equipment: QUALITY. There's simply no room in broadcast for cutting corners; when you're on-the-air the phrase "Time is Money" takes on real meaning.

SP-5 Stereo Production



So whatever your application, stereo or multitrack production, television master control, on-air, video edit, or mobile installation, consult WHEATSTONE.



3224 Multi-Track

QUALITY

There's No Better Choice.

Wheatstone Corporation

Circle Reader Service 17 on Page 20