

Massachusetts Rules on RFR

by Edward Wytkind

West Newton MA ... Massachusetts state officials have adopted new radio frequency radiation (RFR) standards equal to the FCC mandated exposure limit, but with highly stringent compliance requirements for workers.

These new rules, which were scheduled to become effective 23 December 1985, apply to all new and pending broadcast facility applications in Massachusetts.

Facilities in operation prior to 23 December will be grandfathered for one year, according to Massachusetts Department of Labor and Industries Radiation Control Supervisor Frank

Archibald.

The FCC standard, effective 1 January 1986 for new applications and those awaiting CPs, requires only that broadcasters certify to the Commission that they comply with the American National Standards Institute (ANSI) exposure limit at the time of new applications, modifications and renewals.

On numerous occasions, FCC officials have said that a station's RFR levels will be only one factor when ruling on an application.

Overexposure illegal

Unlike the FCC's regulations, Massachusetts' new rules essentially make it illegal for technicians to be exposed to

RFR exceeding the federally recognized ANSI standard, unless the incident of overexposure falls under stated "provisions for variance," Archibald explained.

To be granted a variance, employers must determine that an exposure violation is due to an unavoidable operational emergency.

Employees must also ensure that adequate shielding devices and RFR measuring gear is provided, and that a trained RF safety officer is on site during all cases of overexposure.

In addition, an employer cannot require that an employee enter an area with RFR levels exceeding the ANSI standard unless the employee volunteers and signs a statement of consent.

Moreover, any area with RFR levels exceeding 10 times the ANSI standard will be off limits to employees, with no exceptions.

Following each exposure violation, an employer must send a report to the state that includes a justification for the variance.

NAB opposes standard

NAB Engineer Ralph Justus said the regulation poses "severe problems" for the state's broadcasters because it imposes "unnecessary and duplicative" administrative duties.

Justus added that the FCC's new rules already impose the ANSI standard on broadcasters without mandating burdensome paperwork.

Referring to the state's public exposure standard—which has RFR limits 1/5 those of the ANSI standard—Barry Umansky, NAB counsel and Electromagnetic Energy Policy Alliance (EEPA) president, said Massachusetts has a "track record for implementing overly stringent nonionizing radiation standards."

Umansky added that this standard imposes "real costs that are not necessary," especially since the FCC has already adopted RFR regulations.

Moreover, this case exemplifies how important it is for the Commission to preempt the implementation of state and local RFR standards, Umansky said. "The NAB has been searching for a case to base its preemption argument on, and Massachusetts may be perfect."

For more information, call the Massachusetts Department of Labor and Industries at 617-398-2727.

Cuban Interference Increasing

by David Hughes

Miami FL ... South Florida broadcasters report increased Cuban interference on the AM band, including some instances of jamming, since a 50 kW Spanish-language station signed on in Miami in late October.

Though the interference is also affecting some stations across the continent at night, there appears to be little chance of talks with Cuban authorities to reduce the problem.

The latest round of interference coincided, broadcasters said, with the arrival of WAQI, a 50 kW Spanish-language station on 710 kHz. On 23 October, WAQI replaced Miami's WGBS, an English-language news/talk station, which merged operations with another Miami station, WNWS, on 790 kHz.

Jefferson-Pilot Broadcasting Company sold WGBS to the Mambisa Broadcasting Corporation and, in turn, purchased WNWS. Jefferson-Pilot merged its WGBS staff with the existing WNWS staff to continue the English news/talk format there.

"Radio Mambi"

WAQI, which calls itself "Radio Mambi," is apparently drawing electromagnetic scorn from Cuban authorities because it not only has the strongest signal in the state, but also reports on news events in Cuba, said WAQI VP Charles Fernandez.

In the first few days after its launch, before jamming began, WAQI's 710 kHz signal could reach well into Cuba, Fernandez said, even better than the Voice of America's (VOA) Radio Marti service.

WAQI programs a mix of news, talk and entertainment. While it is not "anti-Castro" per se, Fernandez said that the

Castro regime would not be too pleased with the content of some of the programming.

According to former WGBS CE John Morris (now with WNWS), WGBS' English-language programming had not been subject to Cuban interference.

"Most Cuban people don't speak English, so Cuba wasn't worried about WGBS," Fernandez added.

By 27 October, however, Cuba began a powerful broadcast of its Radio Re-

belde program—which is found elsewhere on the AM band—on WAQI's 710 kHz frequency. According to several broadcast engineers in South Florida, the island nation has also been broadcasting a noisy jamming signal at times on the frequency.

An area broadcaster who did not want to be identified said the FCC told him that it speculates that two transmitters in Cuba are pumping about 100 kW on 710
(continued on page 4)

Fidelipac sounds bright to Malrite.

Malrite Communications Group chose Dynamax® CTR100 Series cartridge machines for their hometown station WMMS, #1 in Cleveland.
Find out why. Call 800-HOT-TAPE.



DYNAMAX
BROADCAST PRODUCTS BY FIDELIPAC*

Fidelipac Corporation □ P.O. Box 808 □ Moorestown, NJ 08057 □ U.S.A.
609-235-3900 □ TELEX 710-897-0254 □ Toll Free 800-HOT TAPE
Dynamax is a trademark of Fidelipac Corporation.



Radio World Newspaper
PO Box 1814
Folk Church VA 22041
USA
ADDRESS CORRECTION REQUESTED



Regulatory News

FCC Clips

Equipment seizure

With assistance from the US Marshall's Service, the FCC seized about \$40,000 worth of electronic equipment, including illegal radio frequency amplifiers and modified CB transceivers, from two Northern California CB outlets in October.

The action, according to the Commission, was taken "as a result of a lengthy investigation by the San Francisco office as part of a continuing enforcement program to ensure that the FCC ban on manufacturing and selling CB linear amplifiers and other non-type-accepted transmitters is observed."

Federal law prohibits the marketing and manufacture of non-compliant electronic equipment, the FCC added.

For more information contact Sue Earlewine at 202-634-1940 or Rick Engelman at 202-632-6345.

Unified agenda

The FCC has published its unified agenda, listing all significant proceedings that are under development and review.

The current listing contains 103 items, each bearing a title, rulemaking or docket number, a description, timetable and contact person, according to the Commission.

Copies can be obtained from the Superintendent of Documents, Government Printing Office, at 202-783-8320 or from International Transcription Services, 2100 M St., NW, Suite 140, Washington DC 20036, 202-857-3800.

For more information on the agenda, contact Claudette Pride at 202-632-3906.

Mass media forms

The Commission has issued a revised listing of acceptable editions of a wide variety of forms.

In many cases, the revision of a form makes the previous edition obsolete. The FCC said that the use of obsolete forms can result in "unnecessary delays" in processing applications, requests for more information or the preparation and submission of data no longer required.

The listing contains information on 40 forms.

For more information or a copy of the listing, contact the FCC at 202-632-0002.

Station totals

The Commission has announced its updated station totals as of 31 October 1985.

According to the count, there are 9871 licensed radio stations in the US. That includes the 4805 AM radio stations on the air. On the FM side, there are 3846 commercial stations and 1220 noncommercial operations.

New FM Translator Rule Sought

by David Hughes

Washington DC ... The Moody Bible Institute (MBI) has again asked the FCC to allow it to feed its noncommercial FM translators via satellite or terrestrial microwave instead of using the traditional directly broadcast over-the-air signal.

In 1984, the FCC turned down a similar request from the Chicago-based MBI, which owns seven FM and four AM stations.

MBI said its new petition for rulemaking is a "modest proposal for the amendment of the FM translator rules." The satellite and microwave feeds would "re-broadcast" Moody's "owned and operated stations."

"Time is right"

In the request, submitted in late October 1985, MBI claimed that the FCC in April 1984 believed it was not the proper time "to undertake the significant expansion of the FM service" which would likely have resulted from the proposal.

MBI said the Commission then invited it to resubmit its proposal at a later date.

The FCC reaffirmed its decision in November 1984 when it denied MBI's request for a partial reconsideration of its April decision.

MBI maintains that the time is right to resubmit its proposal, since the FCC has concluded the FM/TV 6 interference ruling, and Docket 80-90 proceedings to create almost 700 commercial FM stations are well underway.

According to MBI's new petition, the FCC's FM translator rules were formed to help FM serve areas cut off by distance

and signal obstructions.

However, MBI noted that FCC rules do not treat commercial and noncommercial translators in the same way. MBI pointed out that the FCC placed site restrictions on commercial translators to allow the development of new commer-

“ MBI noted that FCC rules do not treat commercial and noncommercial translators in the same way. ”

cial full-service stations. MBI indicated that the restrictions did not apply to non-commercial FMs.

Over-the-air reception

MBI added that FCC regulations require that the FM translators must be able to receive their input signal over the air from the primary station or another translator. MBI said the requirement "limit(s) translators to the retransmission of a broadcast quality signal received off the air from the primary station or an intervening translator."

MBI argued that FCC TV translator regulations allow a "a variety of input sources, including FM microwave and satellite or terrestrial common carrier microwave feeds." The sister FM translator service was not included, MBI said.

"There is no reason to limit arbitrar-

ly the potential service areas of noncommercial FM translators to locations where the primary station or another translator can be received over the air," MBI said.

MBI said its FM station in Chattanooga, Tenn., WMBW, encounters a "hostile winter environment," making it difficult for a translator station on a mountaintop to receive the primary station's signal.

Instead of being forced to install a "large, cumbersome antenna," MBI said it could have relied on a less expensive, more dependable satellite feed.

Satellite feeds would also allow translator service in more rural, remote areas, MBI concluded.

Docket number of the request is RM-5219. For more information contact John Reiser at the FCC: 202-632-9660.

Featured this issue

New Pioneer Car Radio	
by Mark Persons	10
AM Fundamentals: AM Stereo	
by Ed Montgomery	12
AM Stereo Antenna Conversion	
by Tom Wright	13
Carrier Current Basics	
by Thomas Vernon	14
Alternatives to Telco: TRLs	
by Peter Burk	15
Line AC Hum	
by John Shepler	17
New Products	19
Broadcast Computing	21

Vanguard Series™

Broadcast Audio Consoles

Performance, Value and Reliability through Innovative Technology



- Raised, tactile feel, lighted membrane switch panel-digitally scanned
- 12 stereo inputs plus optional expander
- VCA controls, rotary and linear
- Analog and fluorescent meters
- Modular, plug in electronics
- Easy punch block installation
- Effective RF protection

**BC8DS
8 Mixer
Dual Stereo**

only **\$2,995**

AUDIO
TECHNOLOGIES
INCORPORATED



328 Maple Avenue, Horsham, PA 19044 • (215) 443-0330

Regulatory News

FCC: AM Improvement On Track

by David Hughes

Washington DC . . . FCC Mass Media Bureau Chief James McKinney has assured broadcasters that AM improvement is on track at the Commission, with proposed rule changes "on target" for spring 1986.

In a speech to the NAB's Regulatory Review Committee on 5 December, McKinney said that the FCC's report on overall AM improvement should be released by January, with specific rulemaking proposals to be started in the spring.

McKinney originally unveiled the FCC's AM improvement drive in a speech at the IEEE Fall Symposium in late September. He called for revamping the nation's clear channel service, instituting bandwidth reductions to reduce interference, allowing synchronous transmitters and relaxing the AM duopoly rules.

In his NAB talk, McKinney said that the first rule change in the AM improvement campaign will involve synchronous transmitters. The plan would allow an AM broadcaster to extend coverage by using a second transmission on the same frequency.

“The first rule change in the AM improvement campaign will involve synchronous transmitters.”

McKinney also indicated that potential changes may occur in the AM duopoly rules. For example, he cited a 50 kW station in central Nebraska that was prohibited from owning a station hundreds of miles away in the eastern portion of the state because the 50 kW station's groundwave reached into the eastern region.

He pointed out the wide array of technical rules that the FCC has purged in order to reduce the "burden" to AM broadcasters. Now, he said, broadcasters must take it upon themselves to upgrade their equipment, and particularly to replace antiquated antenna systems. He also urged AM broadcasters to go stereo.

McKinney added that receiver manufacturers must develop higher quality AM receivers, particularly those in cars.

Stereo confession

McKinney revealed that he thought that AM had been hurt in general by what he termed the "industry's" failure to set a standard.

But he admitted that the blame also fell on the FCC. He said the Commission should have decided on an AM stereo system, "even if it was the worst system."

The lack of an AM stereo standard, he said, has hurt broadcasters much more than would have even a misguided FCC

decision to select a standard.

McKinney also jested that the "only other mistake" the FCC made, in recent memory, was its failure to crack down harder on RF lighting devices, which can cause AM band interference.

He said the FCC's decision had been based on a "let the buyer beware" philosophy. If a homeowner wanted to install RF bulbs, which reportedly last longer than standard bulbs, and forget about listening to AM radio, there would be es-

entially no problem. However, with the proliferation of densely packed apartments and condominiums, an RF bulb's interference could easily spread to AM receivers in other dwellings.

(continued on page 8)



OPTIMOD-FM: BECAUSE MUSIC MATTERS.

Even though loudness was considered of vital importance in the design of OPTIMOD-FM Model 8100A/1, something else had even higher priority.

Music. Because music is what your listeners care about passionately.

OPTIMOD-FM was designed and built by people who have worked professionally in the recording industry. People with educated ears who *know* natural, musical sound—and who aren't satisfied with anything less. And people who are also skilled in the art of sophisticated, mathematical design techniques.

In OPTIMOD-FM, the math and the music come together in perfect harmony.

There are no bells and whistles. The few flashing lights are functional, not cosmetic. The sophistication is on the inside, where it belongs—assuring *listener satisfaction* by never mangling the music.

That's why OPTIMOD-FM is the best-selling FM processor ever. Use it alone, or adapt it to special needs with its optional Six-Band Limiter (for the more aggressive sound demanded by certain formats) and/or Studio Accessory Chassis (for dual STLs). OPTIMOD's versatility makes it the right choice for *your* station, regardless of format.

If you believe that music matters to your listeners, why wait any longer to bring them the best? Call your favorite Orban Broadcast Dealer, or contact us direct.

Orban Associates Inc.

645 Bryant Street, San Francisco, CA 94107
(800) 227-4498 or (415) 957-1067 Telex: 17-1480

orban

Circle Reader Service 36 on Page 24

World Radio History

Cuban Interference Increases

(continued from page 1)

kHz toward the US to jam WAQI.

Both Fernandez and Morris complained that the Cuban station has been using WAQI's calls to further confuse the situation. "They are trying to get us in trouble with the FCC," Fernandez added.

Fernandez said that, during the day, WAQI can be heard in the Miami area, but listeners in the Florida Keys can only hear Cuba's Rebelde. At night the problem is more severe, compounded by the fact that WAQI has been operating at only 18 kW while it makes equipment repairs, he added.

The Cuban interference on 710 kHz has even affected New York City's 50 kW WOR, which operates on the same frequency. Listeners in the mid-Atlantic states who previously received WOR at night with no problem report a rather strong Spanish-language signal underneath it.

FCC Field Operations Bureau Deputy Chief Arlan Van Doorn said the Commission will investigate an interference complaint it received in early December from WOR.

Not Radio Marti backlash

The issue of Cuban interference is nothing new to South Florida broadcasters. Many feared they would be subject to massive interference after the VOA started its "Radio Marti" service on 20 May 1985.

Aimed directly at the Cuban population, Radio Marti broadcasts with at least 50 kW on 1180 kHz from a transmitter in the Florida Keys. Previously the VOA used the frequency to relay its general Spanish programming to Central America and the Caribbean.

Radio Marti's programming apparently did not bother the Cuban authorities, and most South Florida broadcasters did

not report any major increase in interference after Marti signed on, even though Havana has experimented with high-powered AM band interference on occasion.

Other frequencies affected

Besides increased interference on 710 kHz, stations on other frequencies are reporting higher levels of Cuban interference. Fernandez said it appears that Cuba is striking hardest at Spanish-language stations in South Florida.

Ralph Chambers, CE at WCMQ, a Spanish-language station on 1210 kHz, said he had noticed a significant increase in interference on 1210 kHz within one week after WAQI signed on. He said Cuba has been running Radio Rebelde on other frequencies besides 710 and 1210 kHz.

Chambers confirmed that Cuba had been broadcasting noise jamming, in addition to Radio Rebelde, on 710 kHz.

While he has always noted a Cuban station on WCMQ's frequency before WAQI signed on, he said the level of interference on 1210 kHz has doubled since last year. "We have listeners in the fringe area of CMQ that can't get us anymore," Chambers said.

WCMQ operates at night with 2850 W under special temporary authority, instead of its normal 2500 W. But the night power is no longer enough to counteract the Cuban interference, Chambers said.

CE John Morris said the level of Cuban interference to English-language WNWS on 790 kHz also seems to be getting stronger. "We are getting more complaints," he said.

Other stations are reporting interference. NAB Engineer Mike Rau said his organization received a recent Cuban interference complaint from KSL, Salt Lake City, Utah, a 50 kW station operating on

1160 kHz.

KSL Assistant CE Randy Finch confirmed that the station has received complaints, particularly from listeners in Southern Utah who hear Spanish language programming underneath KSL's Brigham Young University sports events. Finch said he even got a complaint from a listener in Hawaii who said a Cuban station was interfering with reception of KSL.

Finch said that two years ago Cuba violated an agreement it had to respect KSL's clear channel status, and many complaints were received.

He added that there would be a greater number of recent complaints if there were not a period of such low sunspot activity now, which tends to reduce the ionospheric skywave "skip" of distant stations.

Cuba has reportedly been operating a station for tourists on 1160 kHz that has been broadcasting, at times, in English. Though the station normally signs off at local sunset, it has occasionally been monitored operating at night, when it then interferes with KSL's signal.

Severity questioned

Despite complaints from some broadcasters, the FCC said it is not convinced that the level of Cuban interference is significantly higher than in the past.

While he said he was familiar with the WAQI situation, the FCC's Van Doorn said he had not received many complaints from broadcasters. In fact, the only recent Cuban interference complaint he has received was from WOR.

"We normally get calls, but it has been quiet," he added.

However, WAQI's Fernandez said he has already filed an interference complaint with the FCC and plans to file another.

The FCC, Van Doorn said, regularly monitors Cuban medium wave activity and releases reports. The last Cuban broadcast list was made available in mid-October, before WAQI signed on.

Talks stalemated

State Department and FCC officials said they have tried to resolve the ongoing problem of Cuban interference. Both organizations blame Cuba for unwillingness to negotiate.

At a fall meeting of the Radio Advisory Committee (RAC), which was attended by broadcasting representatives and officials from the NAB and FCC, there was talk that the US and Cuba might meet to discuss more critical communications involving aircraft, weather and telephone links.

However, US State Department International Radio Communications Office Deputy Director Bill Jahn doubted that the talks would take place in the near future.

A matter of primary importance, he added, was the replacement of an aging telephone cable between Miami and Havana. Therefore, he said, negotiations may emphasize common carriers as opposed to broadcasters.

"We met with Cuba in August 1983, in San Jose, Costa Rica, and again in October 1983 in Mexico City. But Cuba walked out of the talks at the last minute," Jahn said. "The US has a standing offer to (reopen) the talks."

FCC Attorney Louis Stephens, who also serves as chairman of the RAC, said "We are seeking opportunities to develop understandings with Cuba. However, previous efforts have failed," because Cuba has sought "trade-offs" in non-broadcasting areas.

Officials at the Cuban Interest Section office at the Czech Embassy in Washington, DC could not be reached for comment on the matter.

Financial compensation

The FCC is continuing to administer its program to provide monetary compensation to stations that have made costly improvements in their transmission systems to battle increased Cuban interference, according to FCC Audio Services Division Assistant Chief Dennis Williams.

However, he reported that financial compensation has not yet been sent to broadcasters.

Williams said the FCC previously approved \$12,265 in compensation to WSUN, St. Petersburg. Under the plan, the FCC's recommendation was sent to the US Information Agency (USIA), which is to distribute the money. However, Williams said that Congress has not yet appropriated the money to USIA.

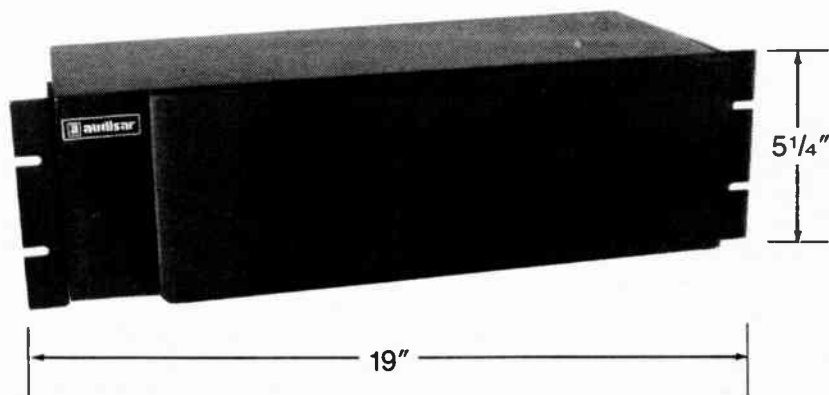
However, some stations are not as interested in financial compensation.

"We are not angry at the FCC," said Ralph Chambers of WCMQ, which did not file for compensation.

"We just want a power level to overcome the interference," he added.

For more information about Cuban interference, contact Louis Stephens at the FCC: 202-632-7792. To obtain the latest list of Cuban AM broadcasts, contact Wilbur Thomas at International Transcription Services, Washington DC: 202-857-3800.

AUDISAR 14K100 Rack Mount Monitor Loudspeaker



Finally a small two-way rack-mounted monitor loudspeaker a broadcaster can use for a reasonable price.

ONLY \$165.00

FOR MORE INFORMATION CONTACT

RAM BROADCAST SYSTEMS

Specialists in Broadcast Systems Design and Engineering, Prewired Systems and Equipment Sales

CHICAGO: 346 WEST COLFAX STREET, PALATINE, IL 60067 312/358-3330
WASHINGTON, DC: 2274 COCQUINA DRIVE, RESTON, VA 22091 703/860-5823

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).

Shoddy reporting?

Dear RW:

I just finished scanning the 1 November issue of RW. I was, to say the least, surprised when I read your page 1 article on the upcoming SBE national convention.

You have either been a victim of shoddy reporting or biased journalism by your obvious oversight in not mentioning *Broadcast Engineering's* participation in this show.

In point of fact, the engineering sessions which John Battison will be putting together will be done as a contracted employee of *Broadcasting Engineering*. These engineering sessions will be *Broadcast Engineering's* sessions. It would also seem to be newsworthy that *Broadcast Engineering* is the mutual and joint co-sponsor of this event.

All in all, a rather ironic oversight or error, wouldn't you say?

Cameron Bishop
Broadcast Engineering Magazine

RW replies: *Neither an oversight nor an error. We're simply not in the business of giving PR to our competitors. See you in St. Louis.*

Studioline postscript

Dear RW:

I would like to correct the misconception promulgated in the otherwise excellent article by Warren Vandever (RW, 15 October) of NBC concerning the Studioline system produced by *Leaming Industries*.

The article failed to point out that I designed the compander system for our good friends at Studioline. That compander is based on the High Com technology from AEG Telefunken, for which we purchased an exclusive patent license (for professional use in the United States).

Studioline is having the equipment manufactured by Leaming, and the system looks like a winner. I hope the Studioline system becomes the world standard for high quality audio transmission via cable.

Bill Sacks, Pres.
Straight Wire Audio

Watts?

Dear RW:

Re: "Daytimers Face Low Power" (RW, 15 November), I refuse to discuss signal levels and powers with anyone who cannot think of power in "comparative decibels."

If they quote *watts* to me, I ask them, "How much is that in dB?"

If they do not have an answer, I break off right there.

George Bonadio
Watertown, NY

RW replies: *Good point.*

Key differences

Dear RW:

In answer to Bob Mayben's letter in the 15 October RW, all technical aspects aside, I have listened to four systems: Kahn's, off the air from XETRA in Tijuana, Mexico; Harris off the air from CKLW in Windsor, Ontario, Canada; Motorola's off our local KXKW; and the Magnavox system at a broadcast convention in Reno.

Of all the systems, Kahn's was the best sounding by far.

Mr. Mayben is missing a point when he mentions SSB in amateur radio. The point is, what is used in amateur radio is *single side band, suppressed carrier*, the key being the suppressed carrier. Kahn's is more of an independent sideband system, *with carrier*.

Ham radio sounds like it does for several reasons unrelated to Kahn's system,

Before Radio Marti went on the air, broadcasters, trade associations and federal agencies were concerned about threats of possible Cuban interference. Nothing significant materialized, apparently because of the nature of Radio Marti's programming.

The issue has reappeared, this time not in the form of threats. Real, audible interference is affecting not only reception in south Florida, but also along the East Coast and as far west as Utah and Hawaii.

This interference was not in response to Radio Marti. WAQI, a 50 kW commercial Florida station, apparently has brought on the reaction because of its Spanish-language programming.

So profound is the effect on skywave propagation characteristics from Cuban jamming and interference that not only can no one in Cuba hear WAQI, but many US citizens can no longer receive local and clear channel stations without also hearing Cuba's Radio Rebelde.

Stopgap measures written into federal law in preparation for Radio Marti include the FCC's program to provide affected stations with economic compensation

for transmission system upgrades. But Congress has yet to appropriate funds to the US Information Agency for distribution to those stations.

Over 19 months after Radio Marti began transmission, the federal government still does not have its act together. There is no reason why the FCC, the USIA and Congress should not have methods of quickly identifying critical frequencies or stations. Streamlining STA approval and funding for stations needing to adapt their equipment is also necessary.

Because the interference issue is by nature international, the federal government cannot play ostrich. The FCC, Congress, the USIA, the State Department and other federal agencies should protect US broadcasters from interference storms caused by foreign countries.

Finally, Florida broadcasters should enlist all available aid in ensuring that the federal government doesn't continue to hide behind overly discreet diplomacy or pretend that the problem will disappear if the US feigns nonchalance.

—RW

not the least of which are the lack of carrier (and the fairly critical tuning on the receiving end to regain the proper regenerated carrier/sideband relationships), and the fairly narrow band transmission standards most hams use (Kahn's system isn't restricted by a typical 2.8 kHz, or less, bandwidth).

Pat Shirley, CE
KPEL, Lafayette LA

Sharks vs. Jets

Dear RW:

I would like to respond to some points made by Bob Mayben in the 15 October issue regarding platform motion, switching to mono, and amateur radio single-sideband.

First, by now it should be evident that platform motion exists; there is no need to debate the point.

Further, it is not necessary for the receiver to be "some distance from the transmitter." Under the right skywave conditions, platform motion can be heard within the primary coverage area. Whether this is a problem is subject to much controversy. Some feel that it will make you sick, others feel that it is practically imperceptible.

If platform motion is seen to be a problem, go with the system that will not be bothered with it. If you don't see it as a problem, then go with the other system. Make your choice, and spend your

money.

Second, do not consider a stereo-to-mono switch too quickly. For over a dozen years I have had cars with stereo radios. None of these radios had stereo/mono switches, though I wish they did. Radios with stereo/mono switches are sold, but typically in the aftermarket. All my cars have had factory installed radios. I must conclude that switching to mono may not be an option for many. Also, many "non-radio" people don't always put interference and mono/stereo switches together.

Third, do not compare independent sideband modulation with amateur single-sideband suppressed carrier. It would make as much sense to compare amateur radio 2-meter FM with FM broadcast, or to Motorola AM stereo. The name of the game in amateur radio is to maximize intelligibility and minimize bandwidth. Ham radio SSB is not intended to "sound good." You cannot compare the two services.

All the AM stereo infighting is starting to make me sick. I am CE of a Kahn station, and I think we sound great. Across town is a Motorola station, and they sound great, too. I refuse to be parochial about systems. I think any system can be made to sound great or lousy, AM stereo or FM stereo. Have you listened to an FM market locked in a loudness battle? Sounds pretty sick, doesn't it?

(continued on page 6)

Radio World

Vol 10

January 1, 1986

No 1



Radio World is published twice a month by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone (703) 998-7600. Copyright 1986 by Industrial Marketing Advisory Services, Inc. All rights reserved.

Free subscriptions are available to professional broadcasting and audiovisual equipment users. For address changes, send current and new address to RW a month in advance at the above address. Unsolicited manuscripts are welcomed for review; send to the attention of the appropriate editor.

Publisher, Ad Sales Mgr: Stevan B. Dana; East Coast, Ernie Robitel (516-759-1092) Editor: Pamela A. White; News Dept: David Hughes/Manager, Edward Wytkind; Broadcast Computing: Roger Skolnik/Editor;

Columnists: Grant Bingeman, John M. Cummuta, Mark Durenberger, Floyd Hall, John Q. Shepler, Thomas Vernon; Production Dept: Jean Choi/Manager; Nancy E. Olson/Graphic Artist, Typesetter.

NAB Considers Radio-Only Areas

by Edward Wytkind

St. Louis MO . . . Following a meeting with its Exhibitors Advisory Committee on 6 November, the NAB said it may offer both radio-only and integrated radio-TV exhibit areas at future conventions if demand is apparent among manufacturers.

The meeting was the latest in a series held to address problems experienced at the 1985 convention in Las Vegas, where several exhibitors in an auxiliary exhibit hall in the Las Vegas Hilton complained of poor booth traffic.

Though the exhibit floor in Dallas for both 1986 and 1987 will probably be integrated, future conventions may feature both integrated and radio-only areas, committee chairman Al Fisher and NAB Exhibitor Director Edward Gayou said.

Fisher said there were "no major breakthroughs" at this latest meeting, but added that Gayou was "receptive" to many of the committee's suggestions.

Booth assignments

The committee and NAB discussed booth and space assignment procedures for future shows, along with floor layout for the upcoming convention in Dallas.

Gayou revealed that last year's 11,000 square foot RCA booth space was split between two manufacturers who "de-

serve the space." He would not divulge which companies were granted this desirable booth space.

Despite RCA's booth space having been freed up, Fisher said that, for 1986, larger exhibitors have accepted 10% space reductions, while smaller 10' by 10' booth allotments are not affected.

Some broadcasters expressed concern that RCA's space would be given to one or two major exhibitors instead of relieving companies having to accept booth reductions.

Exhibitors asked

In a show of hands among 120 exhibitors at the committee meeting held at the October SMPTE show, there was overwhelming support for mixing radio and TV exhibits.

However, a poll conducted last September by Arrakis Systems President Mike Palmer revealed little exhibitor support for the committee's proposal last year to abolish distinctions between radio and TV booth layout at future NAB conventions.

Palmer reported that 34% opposed the plan and another 34% supported it. But even those companies supporting an integration acknowledged the danger a mixed hall could have on radio manufacturers.

Fisher maintained that with so many radio-only manufacturers supporting an

exhibit zone reserved solely for radio products, the committee has recommended that radio manufacturers be given a choice of whether to exhibit in an integrated or radio-only zone.

Fisher said NAB would probably "be able to accommodate" those radio manufacturers preferring to display their wares in a segregated zone.

Referring to past conventions, Gayou said many manufacturers have voiced their preference to display in a segregated zone, and then have changed their minds at the "last minute."

"My previous experience has shown that manufacturers are not supportive of this," he added.

The committee also recommended that zone and booth number identification procedures be improved. The group also proposed that pocket-sized maps be distributed to Dallas attendees.

At an earlier meeting the committee had supported eliminating indoor truck and van displays, but changed its mind and agreed with Gayou to allow each exhibitor one unit, not to exceed 25', per inside booth, while all other trucks will have to be shown at a prescribed area outside.

Fisher said the committee also discussed holding exhibitor meetings at the close of this year's convention to give manufacturers the opportunity to request space for the 1987 show, again slated in Dallas.

For further information, call Edward Gayou at 314-721-7717.

More Readers' Forum

(continued from page 5)

Instead of constantly harping on each other's faults, why not admit we have a multisystem marketplace and proceed from there.

If we can convince receiver manufacturers to market multimode receivers (and we can), we can go on about the business of selling AM stereo to the public, and everyone will profit.

Or we can go on with more of the same: I have more stations; I have more big stations; I have more radios; I have better radios; I have better separation; I

have better single channel modulation; I have a headache!

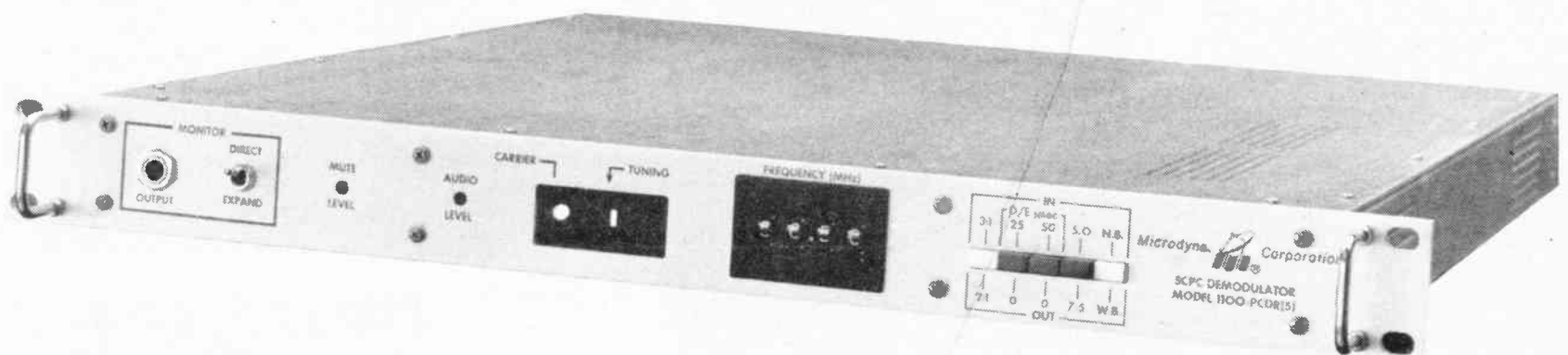
This reminds me of West Side Story. We are going to keep on fighting like the Sharks and the Jets until we all stand around with our knives at our sides, looking over the dead body of AM radio. Robert A. Shotwell, CE WMAS Radio, WA1-KUZ, Springfield, MA

RW replies: Good comments, but the key question in your scenario is whether the receiver companies will try to sell more multi-mode radios. We've yet to see this.

THE BENCHMARK OF BROADCAST SCPC RECEPTION



The Microdyne PCDR-5



Isn't it about time you cashed in on all the great programming available to you via satellite?

Lease plans available for less than the cost of a typical phone loop.

CALL JEFF or JAY (317) 962-8596

ALLIED
Satellite Equipment

GO WITH THE WINNERS.

DYNAMAX CTR100 SERIES

"We chose Dynamax CTR100 Series cartridge machines for our hometown station WMMS, #1 in Cleveland. Dynamax helps give WMMS the best sound in town."

Gil Rosenwald
*Executive Vice President
President-Radio Division
Malrite Communications Group*



DYNAMAX[®]
BROADCAST PRODUCTS BY FIDELIPAC[®]

Fidelipac Corporation P.O. Box 808
 Moorestown, NJ 08057 U.S.A.
609-235-3900 TELEX: 710-897-0254
 Toll Free 800-HOT TAPE

FCC Schedules AM Improvement

(continued from page 3)

"AM is the backbone of the EBS (Emergency Broadcast System)," McKinney said. "The spectrum cannot be used for anything but broadcasting. It is a valuable natural resource."

In other news, the FCC announced that McKinney will head the US delegation to the Regional Administrative Radio Advisory Conference (RARAC), to be held in April 1986 in Geneva, Switzerland. The conference will ex-

amine plans to extend the AM broadcast band in the Western Hemisphere to 1705 kHz.

NRSC meets

In a related development in the AM improvement arena, the National Radio Systems Committee (NRSC) met on 4 December in Kansas City to further explore issues between broadcasters and receiver manufacturers.

The NRSC, a joint committee of NAB

and the Electronic Industries Association (EIA), is comprised of receiver manufacturers and broadcasters.

General Motors, which manufactures Delco car receivers, presented a "receiver tutorial" on the basics of receiver design and testing. Other receiver manufacturers attended the NRSC meeting, including Panasonic and Sony, according to Katz Broadcasting VP/Engineering John Marino.

"The meeting showed that broadcast-

ers and receiver manufacturers need to work on compromises," said Marino, particularly on questions involving signal quality in rural versus urban areas, which have greater AM band congestion.

Marino, who chairs the NRSC subcommittee that is looking at a possible AM preemphasis/deemphasis standard, said the group examined a proposal but did not look at it in detail.

Marino said he will deliver a report on a preemphasis standard when the full NRSC meets on 10 January.

For more information on the NRSC, contact NAB Engineer Mike Rau at 202-429-5346.



Circuit Research Labs, Inc.

PRESENTS OUR TOP TEN DEALERS FOR 1985

1. ALLIED BROADCASTING
Indiana 317-962-8596
2. BROADCAST SUPPLY WEST
Washington 800-426-8434
3. CROUSE-KIMSEY
Texas 817-737-9911
4. RADIO RESOURCES
Maryland 301-796-1500
5. R.F. SPECIALTIES
Washington 206-363-7730
6. CLEMENTS COMPANY
California 805-684-1423
7. AUDIOMEDIA
Louisiana 504-242-8014
8. PRO AUDIO GENERAL STORE
Florida 904-622-9058
9. NORTHEAST BROADCAST LABS
New York 518-793-2181
10. RADCOM
Arkansas 501-253-8702

Our number one international dealer:
COMAD COMMUNICATIONS OF CANADA

Thanks to ALL of the broadcasters who purchased CRL processing, making 1985 the best year yet! If your station has not yet tried CRL processing call us at 800-535-7648 for complete information. ASK ABOUT OUR FREE TRIAL PLAN.

Mutual Deal Finalized

by Edward Wytkind

Los Angeles CA . . . Westwood One has purchased Mutual Broadcasting System from Amway Corporation for \$30 million in cash and notes and 210,000 shares of Westwood One common stock valued at about \$9.2 million, officials formally announced in December.

Officials from both companies said Amway will also purchase \$5 million of advertising on the Mutual network.

Amway also agreed to distribute Mutual programming via its satellite distribution system for three years at no charge. Distribution costs were valued at \$12 million.

Amway retained its still-to-be-named

satellite distribution division, formerly called Mutual Satellite Services, which will operate the MultiComm data transmission service.

According to MultiComm spokesperson Jim Weinrebe, MultiComm has been launched, and is currently reaching over 60 markets in the US.

Services currently transmitted via MultiComm include the Dow Jones radio financial information service, and TeleSport, a United Press International/American Sports Advisors joint venture offering nationwide sports information.

For more information, call James Brown at Westwood One, 213-204-5000, or Jim Weinrebe of MultiComm at 703-685-2500.

NOW THE U.S.A. MAKES A BETTER DIRECT-DRIVE TURNTABLE!



After years of extensive research and testing, RUSSCO finally brings you a Direct-Drive Turntable that beats the imports . . . the STELLAR Professional RT700. Made of heavy aluminum, not plastic chassis materials. Speeds are locked by crystal reference exactly at 33.3 and 45RPM and performance is spectacular! Get Fast Starts (2" back cue at 33), Rumble less than -50 dB unweighted DIN A, -70 dB DIN B, Wow & Flutter .035% or less, a removable tone arm mounting plate and built-in 45 adapter! Best of all, a single, easily replaceable, circuit board gets it back in operation quickly, if you should ever need repairs. RUSSCO is sending the Japanese back to the drawing boards while you move ahead with the STELLAR RT700!

Call or write today for the low introductory price.



5690 East Shields Avenue / Fresno, CA 93727 / Phone (209) 291-5591

Circle Reader Service 11 on Page 24

NAB Plans New Antenna Project

by David Hughes

Washington DC ... As part of the overall movement to improve the technical quality of AM radio, NAB has announced that it will spearhead an antenna testing program.

The program, which NAB President Eddie Fritts announced on 5 December at a luncheon of NAB's Regulatory Review Committee, will involve constructing prototypes of newly designed AM antennas that should bolster the AM service by "increasing signal strength."

"The program will significantly enhance AM radio's future," said Fritts.

Plans call for NAB to field test two proposed antenna designs, one by Richard Biby, with Communications Engineering Services, and the other by Ogden Prestholdt of A. D. Ring and Associates.

New designs

The "basic concept" for the antenna improvement, according to NAB, involves the antenna's signal strength versus the angle of departure.

A typical antenna radiates a relatively strong signal, in addition to the important ground wave signal, at 45° above the horizon, which ultimately becomes the skywave signal.

However, the new antenna designs restrict the skywave signal level at 45°, thereby increasing the ground wave signal by making it more closely adhere to a 0° angle.

"These antenna designs offer separate control over skywave signals and ground wave signals, in effect by combining two or more antennas at a single location," NAB said.

"Generally speaking, the new designs

accentuate the ground wave," Biby said. "We just want to try them and see how they work."

"They exist on paper and appear to

perform as desired," the NAB said, adding that it could not guarantee success of the antenna designs because they have never been built and tested.

"The designs are promising enough to justify NAB technical development," the association added.

(continued on page 10)

A QEI NEWS RELEASE

"We're setting new records with our 675 FM Exciter."

There are now over one thousand 675 Exciters out in the field. They go virtually unnoticed, day after day providing the listening public with news, music, and talk shows ... They are sometimes neglected, abused, and even mishandled, but they go on providing top-quality sound with almost no care or upkeep costs. No wonder we reached our thousandth unit this year.



NAB NOTE

All owners of QEI-manufactured* 675 Exciters will be eligible for a drawing that will be held in Dallas on the first day of the NAB at our booth number 3336. The winner will receive our new 695 FM Exciter. Just return the following information to us before April 1, 1986.

COMPANY _____

ADDRESS _____

STATION _____

675 EXCITER SERIAL NUMBER _____

PRESENT TRANSMITTER _____

*Includes exciters manufactured for AEL and CSI by QEI Corp. Rules and regulations available from QEI Corp. Void where prohibited, limited, licensed or regulated by law.

OUR NEW 695 MODEL

The 675 is a hard act to follow, but we've done it! The 695 will do everything that the 675 will do, but more and better ... super-low distortion and noise, automatic modulation control, etc. Yes, the 695 has it all — the best sound, and minimal upkeep. Why, it even measures its own modulation percentage! For more information contact John Tiedeck.

QEI Corporation

One Airport Drive
P.O. Box D
Williamstown, NJ 08094
Phone: 609-728-2020
Telex: 510-686-9402

QEI Corporation

RADCOM DOES IT BETTER!

Complete Automation Packages	Complete FM Packages
Complete Studio Packages	Complete STL, RPU & TSL Packages

Radcom sells QEI, SMC, BE, OTARI, ORBAN, AUTOGRAM, AUDICORD, MARTI, TFT, HOWE, CRL, LPB, MCI, TECHNICS, RAMKO and other quality product lines!



P.O. Box 191
Eureka Springs, AR 72632
(501) 253-8556

We're Broadcasters and Ham's too!
KTCN-FM, W5OWB and W45NGX

Pioneer's Car Radio a Winner

by Mark Persons

Brainerd MN . . . Pioneer has been making good aftermarket car radios for quite a while. The Pioneer KE-A433AM car radio is, in my opinion, one of the best car radios built. It is a microprocessor

Mark Persons is an engineering consultant and president of M. W. Persons and Associates of Brainerd, Minn. He can be reached at 218-829-1326.

controlled, digitally tuned C-QUAM AM stereo, FM stereo, and stereo cassette unit.

I ordered one to try out. Before installing it in my car, I took a peek inside. The radio is well-built and repairable.

A service manual, ordered separately for about \$8.00, provided more than enough information. Large three-and-four-color cutaway views of the circuit cards made component locating easy.

Pioneer has even gone to the trouble

of explaining how each section of the radio works, and how, for instance, AM stereo is broadcast and decoded.

Complete alignment procedures are spelled out as well. Wiring terminates on plugs and jacks. Every wire is shown in the documentation.

To top it off, the service manual has a questionnaire, because Pioneer wants to find out your ideas on how to make their product better. They want to ensure a good reputation in the field.

The radio comes with a great deal of mounting hardware and instruction on how to install it in a car. Virtually any mounting situation is possible, especially with adapter plates, purchased separately, for mounting the radio in cars of a particular manufacturer like GM, Chrysler and Ford.

However, a friend told me the radio would not fit in his car, which has a radio area just a little too small to accommodate the rig.

Three inline fuses cover main power, lights and digital memory keep-alive. There is an inline power choke to reduce engine and other interface noise. A lighted front panel almost invisibly connects electrically to the rest of the radio via two spring wires.

Field Service +

A backlit LCD display, which can be clearly seen both day and night, indicates which of the 6 AM or 12 FM preset frequencies the radio is tuned to. It also indicates the frequency, whether the transmission is in stereo, if the radio is in seek/scan mode and if it is set to seek local or weak signals.

The audio output amplifiers are only 2.9 W each, which is plenty of power and volume for me. However, I understand some people are adding power amp/equalizers to their radios to get truly spectacular sound.

FM performance features

The FM section of this radio is from the Pioneer Supertuner III series. Electronic tuning of the front end, *before the* (continued on next page)

Antennas

(continued from page 9)

NAB Engineer Mike Rau said the tests would take place at a "farmland" location about 40 miles west of Washington DC.

Biby said he has been looking for some land "within a reasonable drive of Washington DC," but had not located a choice piece of property as of mid-December.

Costs

The tests would probably cost in the \$50,000 range, Rau said. He added that NAB's executive committee was scheduled to meet in December to nail down the project's budget.

He also said NAB would welcome requests for equipment firms to donate equipment, such as a tower, to be used in the tests.

Rau said he hoped that groundbreaking could take place by March 1986, with the first year devoted to building and the second year to testing.

Biby, who agreed that the spring of 1986 would be a good "target date" for the testing program to start, said he hopes formal plans for the tests could be formed by the end of 1985.

"A significant increase in AM service would result if these antennas are successful," NAB said.

For more information about the antenna testing program, contact Tom Keller or Michael Rau at NAB: 202-429-5346.



PRO AUDIO GENERAL STORE

REGIONAL OFFICE:
746 Cypress Lane • Carol Stream, IL 60188
(312) 231-7120

REGIONAL OFFICE:
1805 Kimberly Drive • Marietta, GA 30060
(404) 425-0630

HOME OFFICE
2480 S.E. 52nd Street • Ocala, FL 32671
(904) 622-9058

IN FLORIDA CALL - (800) 342-0186

named by
Inc. Magazine
as one of the
1985 Inc. 500.

The updated PR99 MKII, now offering a microprocessor controlled real time counter, address locate, zero locate, auto repeat, and variable speed control, can improve your audio production efficiency. And, as before, it's built to meet strict Studer standards for long-term reliability.

Welcome to real time. The PR99 MKII's real time counter gives a plus or minus readout in hours, minutes and seconds from -9.59.59 to +29.59.59. Counter error is less than 0.5%, and the microprocessor automatically recomputes the time displayed on the LED counter when you change tape speeds.

Fast find modes. Press the address locate button and the PR99 MKII fast winds to your pre-selected address, which may be entered from the keyboard or transferred from the counter reading. Press zero locate and it fast winds to the zero counter reading. In the repeat mode, the PR99 plays from the lower memory point (zero or negative address) to the higher point, rewinds to lower point, and re-activates play mode for a continuously repeating cycle.

Pick up the tempo? When activated by a latching pushbutton, the front-panel vari-speed control adjusts the nominal tape speed across a -33% to +50% range. The adjustment potentiometer is spread in the center range for fine tuning of pitch.

Future perfect. The PR99 MKII also offers a serial data port for direct access to all microprocessor controlled functions.

Much gained, nothing lost. The new MKII version retains all features of its highly regarded predecessor, including a die-cast aluminum chassis and headblock, balanced and floating "+4" inputs and outputs, self-sync, input mode switching, and front panel microphone inputs.

European endurance. Designed and built in Switzerland and West Germany, the PR99 MKII is a product of precision manufacturing and meticulous assembly. Every part inside is made to last.

To discover more about the world's most versatile and dependable budget-priced recorder, please contact:

PRO AUDIO GENERAL STORE

Call For A
FREE
Demo
Appointment



STUDER REVOX

Pioneer's Car Radio a Winner

(continued from previous page) first amplifier stage, gives excellent sensitivity with good overload protection.

On weak stations, the Supertuner automatically and gradually reduces stereo separation to keep noise down. The listener doesn't usually know it is happening. What he does know is that the radio is able to receive FM stations from a long way away.

AM performance features

The AM section of the Pioneer KE-A433AM car radio has some interesting features as well. First, full electronic tuning eliminates the need for an antenna trimmer capacitor. The AM front end is tuned to the specific frequency of interest.

A dual-bandwidth IF section gives a user the ability to hear high frequencies on AM like he has never heard before. The specifications say frequency response is 3 dB down at 6 kHz. This isn't bad considering the kind of bandwidth AM radios have traditionally had. The bandwidth must be wide enough, because Pioneer has included a pair of 10

kHz adjacent channel whistle filters at the output of the stereo decoder IC. There is a front panel pushbutton to switch back to a more traditional narrow bandwidth when adjacent channel interference is high.

AM stereo separation is rated at 30 dB. It may not be the 40 dB or more separation available on some FM tuners, but it sounds great.

I have really enjoyed listening to "The Grand Old Opry" on WSM, Nashville, in stereo at night in Minnesota. WJR, Detroit, sounds great, as well as KCLD, St. Cloud, MN, both day and night. The AM band is really lighting up with stereo pilots—I counted 20 AM stereo stations on the dial one night.

When interference gets too great for good stereo decoding, the Motorola decoder IC switches back to mono. There is also a forced mono pushbutton on the front panel.

What a thrill it is to switch back and forth between mono and stereo, listening to a station come alive in stereo.

The Pioneer KE-A433AM has a lot packed into a small case. Consequently,

the front panel pushbuttons must be small to make it all happen. On occasion, one of my large-ish fingers will hit two buttons at a time accidentally. It's the small price I pay for getting a radio with a lot of capabilities.

The one thing I don't like about the radio is that the tuning knob is actually a three-position rocker switch with a spring return to center. To tune up in frequency, one has to twist the tuning knob

a few degrees clockwise and watch the digital display as the electronic tuning moves slowly at first, then quickly up the band. The same is true for tuning down.

I'm a fan of a real tuning knob that goes around and around. However, I am learning the new tuning method.

The Pioneer KE-A433AM car radio lists at \$360. You can probably do much better than that by shopping around. The warranty is a full year.

Switch off your black & white radio

Install Microdyne's 1100 PCDR(5) tunable demodulator and put "color" in your radio broadcasting picture.

We'll show you how to reduce your operating costs and how to access nearly every SCPC satellite channel in use.

For more information and a competitive price quote, call the telecommunications pros with 40 years experience.



TELE-WIRE
BROADCAST DIVISION

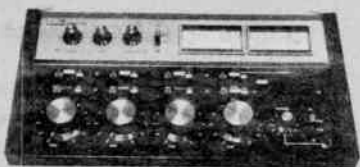
CALL TOLL-FREE
800-645-9510

IN NEW YORK
516-293-7788

Special 10% Discount Sale On All Consoles

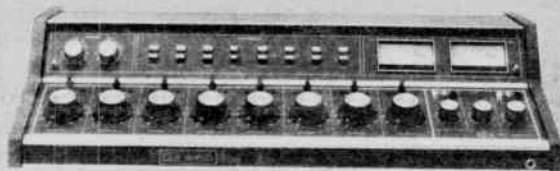
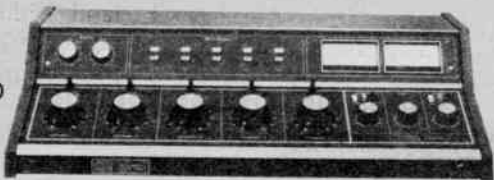
Until January 15, 1986

Exceptional audio performance! Each mixer in every series 150, 250 and 350 console has a selectable preamp for either microphone or high level input PLUS a full complement of line, monitor, cue and headphone amplifiers - all on plug-in boards. Series 150 mixing controls utilize sealed potentiometers with cue bus switching. Push buttons select two inputs for each mixer.



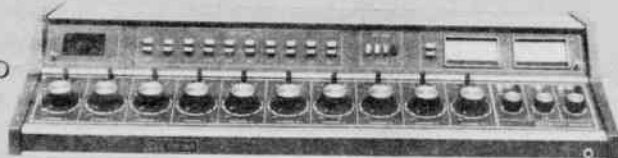
Model 4S50 STEREO
Now \$1795

Model 5S150,
5-MIXER STEREO
Now \$2565



Model 8S150,
8-MIXER STEREO
Now \$3195

Model 10S150,
10-MIXER STEREO
Now \$4635

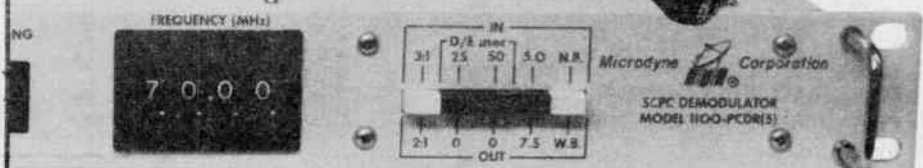


With telephone-type key switches for channel selection.

For more information, contact your local Broadcast Electronics distributor, or write for our new four color brochure.

BE BROADCAST ELECTRONICS INC.

4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305-3606, (217) 224-9600, TELEX: 250142



Corporate Headquarters: 7 Michael Avenue • E. Farmingdale, NY 11735

AM Stereo Systems Explained

by Ed Montgomery
Lesson 5

Annandale VA . . . AM stereo transmission was first proposed decades ago, but was not finally authorized by the FCC until 1982.

Ed Montgomery is Professor of Broadcast Engineering Technology at Northern Virginia Community College. He is available at 703-323-3248.

The first AM stereo proposal reached the FCC in the 1950s. At that time the Commission denied the request. Instead, it approved FM stereo transmission because FM broadcasting was failing and stereo transmission was seen as a way to promote FM and offer it a competitive edge. FM stereo broadcasting began in 1961.

In the 1970s, broadcasters took another look at the possibilities of AM stereo transmission, while the FCC set some

preliminary standards for manufacturers:

- Stereo transmission had to be compatible with existing receivers. Simply stated, the existing monophonic receiver would have to receive the AM stereo transmission and respond to it as though it were a monophonic transmission, receiving equal amounts of left and right signals in its single speaker;

- The AM stereo signal had to fit within the existing AM bandwidths to avoid additional interference in the AM

broadcast band;

- AM stereo encoding systems had to be compatible with existing AM transmitters and antennas;

- The AM stereo transmission system should not result in any loss of loudness of the received signals;

- Finally, AM stereo receiver design should be cost effective, and function equally well with ground wave or night-time skywave signals.

In 1978, five different systems were submitted to the FCC for consideration. Ultimately the FCC opted to let the marketplace decide what system it wanted. Many consider this decision to be the main reason why AM stereo has not become the rule rather than the exception for AM broadcasters. Broadcasters initially opted for a system that most receiver manufacturers did not like.

Over the years, the competition between the five systems has been reduced to two. In that time, receiver manufacturers developed a "smart" radio that could detect the different stereo transmissions and automatically decode them for the listener. But the AM stereo receiver has yet to make a large impact on the consumer. Automobile manufacturers have been marketing AM stereo re-

“

The differences between ISB and C-QUAM are in how the stereo signal is encoded.

”

ceivers, but little effort has gone into promoting AM stereo in stereo systems for the home.

ISB and C-QUAM

The two stereo systems presently operating in the United States are Independent Sidebands (ISB) and Compatible Quadrature Amplitude Modulation (C-QUAM). Both systems use a sum and difference method of encoding their signals. The left and right channels are combined in a circuit known as a matrix. The output of the matrix produces a sum channel (L+R) for the monophonic receiver and a difference channel (L-R) providing stereo information for the stereo receiver.

Both ISB and C-QUAM have benefited from the technological advancement in electronics over the decades. Both signals offer maximum power transmission of both left and right channels over the entire signal coverage area, an improvement over the system presently used to transmit FM stereo. Both AM stereo systems transmit a pilot or control signal. This signal activates stereo decoding circuitry within the receiver.

Signal encoding

The differences between ISB and C-QUAM are in how the stereo signal is encoded in the transmitter. ISB employs an amplitude modulated L+R signal and a phase modulated L-R signal. The two signals are transmitted in a manner in which most of the left stereo information is transmitted in the lower sideband and most of the right stereo information is

(continued on page 14)



"As anyone who's been in this business a long time knows—if you don't move ahead, you're left behind.

"We've just upgraded WANN to a 50,000 watt, four-tower directional array. We now reach a potential market of six million people.

"That—along with a new urban contemporary sound—means that WANN is moving ahead, planning for the future . . . and sounding better than ever.

"And Of Course, We're In Stereo"

"AM Stereo is the most phenomenal sound I've heard in 40 years of owning this station.

"We sound absolutely great in stereo—a purer, cleaner high-quality signal. We even sound better in Mono.

"And you can be sure AM stereo receivers are coming. By next year, over 30% of all new cars will have AM Stereo. And we're ready to capture those listeners right now.

"Naturally, I Chose Delta Electronics"

"When I decided to upgrade to AM Stereo, I chose Delta Electronics. Why? Because Delta's been around a long time, providing precision equipment to the broadcast industry long before they came into AM Stereo. They know my business and they know what they're doing. They installed my C-QUAM® stereo system without a hitch.

"And Delta's C-QUAM system is rugged and reliable, built to

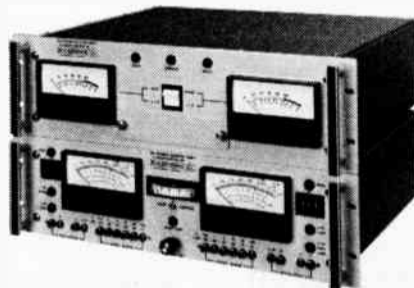
work the way it should. Literally trouble-free. Plus, it's got the numbers to back it up: over 65 systems operating in the U.S. and worldwide.

"Even better, Delta stands behind it with full technical and service support. Any problems or questions—I just pick up the phone. They're always ready to help.

"Next Time You're In Annapolis . . ."

"Stop by and I'll personally give you the deluxe station tour.

"Better yet, turn your dial to 1190 and hear for yourself the new sound of AM Stereo—and hear where your listeners are going to be."



Delta's C-QUAM Stereo System: ASE-1 Exciter (top) and ASM-1 Modulation Monitor. FCC laboratory tested and type-accepted.

Delta Electronics, Inc.
5730 General Washington Drive
P.O. Box 11268
Alexandria, Virginia 22312
(703) 354-3350
Telex: 90-1963

C-QUAM is a registered trademark of Motorola, Inc. Manufactured under license from Motorola, Inc.

DELTA ELECTRONICS



C-QUAM Outlined Graphically

Editor's note: The following article is the first in a series by Delta Electronics on transmitter conversion for AM stereo using C-QUAM.

by Tom Wright
Part 1

Alexandria VA ... In order for C-QUAM® (compatible quadrature amplitude modulation) to be successful, members of the broadcast community need a clear, intuitive understanding of C-QUAM fundamentals. To this end, I have presented a graphical approach to C-QUAM with the hope of clearing up any uncertainty, confusion or mystery about it. This graphical approach is also useful in understanding some of the factors that limit C-QUAM stereo performance in the real world and the steps necessary to reduce these factors.

Following is a brief description of the vector model of modulation for readers who are unfamiliar with the concept.

It can be shown mathematically that an RF carrier may be plotted on the complex plane as a vector rotating counterclockwise at the carrier frequency, W_c radians per second, as shown in Figure 1.

The magnitude of the carrier has been normalized. That is, the magnitude of all vectors in the remainder of this article are divided by the magnitude of the carrier vector. The angle that the vector makes with the real axis, P , is $W_c t$ radians, assuming that the carrier vector passed the real axis at $t=0$.

If the complex plane is rotated counterclockwise about the origin (0), the real axis is now vertical. As the vector rotates and aligns with the real axis, the vector is locked onto by rotating the complex plane counterclockwise at the carrier frequency rate. Thus, if we could climb aboard the complex plane, we would see that the carrier vector is both stationary and aligned with the real axis, as shown in Figure 2.

The carrier vector now has an angle of 0° with the real axis, establishing a phase reference. Vectors that lie along the real axis are in phase with the carrier and thus are sometimes called "I" vectors. The real axis may therefore be relabeled the I axis, as shown in Figure 2.

A vector pointing to the right along the imaginary axis (not shown) would lag behind the carrier vector by 90° , while a vector pointing to the left along the imaginary axis would lead the carrier by 90° . Vectors along this axis are said to be "in quadrature" with the carrier, and thus are sometimes called "Q" vectors. The imaginary axis is relabeled the Q axis, as shown in Figure 2.

Amplitude modulation

Now add two vectors U and V of equal magnitude at frequencies $W_c + W_m$ and $W_c - W_m$ respectively, as shown in Figure 3a. Since our reference axis is al-

ready rotating at W_c , the U vector will rotate counterclockwise at a frequency $W_c + W_m - W_c = W_m$. Similarly, vector V will rotate at a frequency of $W_c - W_m - W_c = -W_m$, or clockwise at W_m . Notice that vectors U and V are arranged so that as they rotate the angle of U to the reference is equal and opposite to the angle of V.

The quadrature components of vectors U and V, U_Q and V_Q respectively in Figure 3a, are equal in magnitude and in opposite directions. If vectors U and V are added to the carrier vector, as shown in Figure 3b, U_Q will always cancel V_Q . The resultant will be a stretched or compressed version of the carrier vector. This is called amplitude modulation (AM), and U and V are called upper and lower sidebands, respectively.

Incidental phase modulation

When broadcasting stereo source material in monophonic AM, the left and right audio channels are summed (L+R) and fed to the transmitter modulator so that the resultant vector of Figure 3b has a magnitude equal to $1 + L + R$. Figure 3b shows the ideal case for single tone amplitude modulation.

If, however, U_Q does not exactly cancel V_Q , the resultant vector of Figure 3b will be slightly tilted away from the in-phase axis. This effect is called incidental phase modulation (IPM).

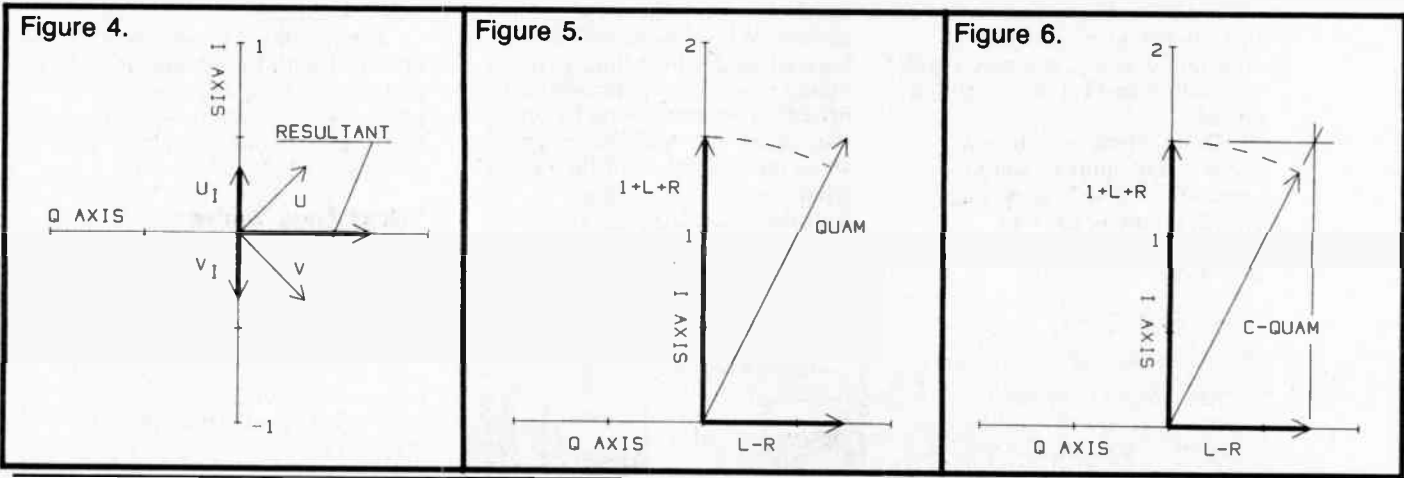
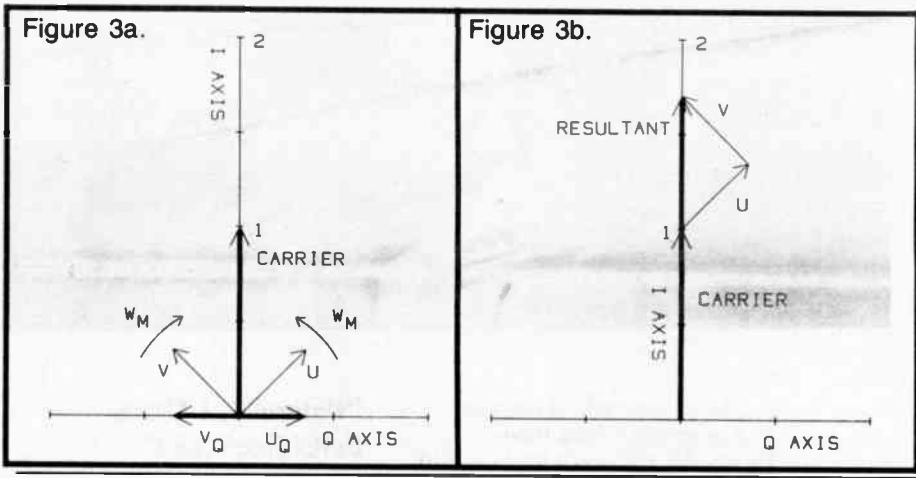
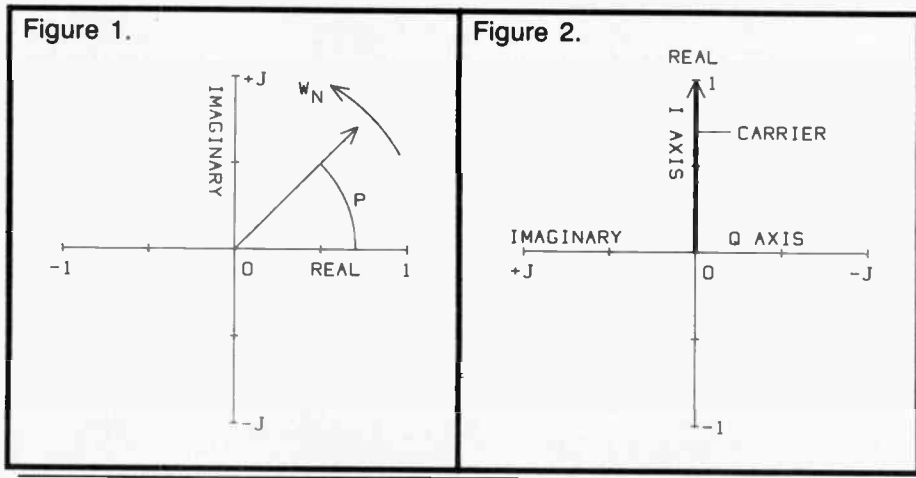
Now re-orient the U and V vectors so that they maintain equal and opposite angles with the quadrature axis, as shown in Figure 4 (for clarity, the carrier vector has been omitted). The components of U and V along the in-phase axis, labeled U_I and V_I , are equal in magnitude and in opposite directions.

If vectors U and V are added, U_I will exactly cancel V so that the magnitude of the carrier vector (not shown) is unaffected. The resultant of U and V extends only along the quadrature axis, always maintaining a $\pm 90^\circ$ phase angle with the carrier vector.

The vector in Figure 4 can be gener-

ated by a balanced modulator driven by a carrier frequency signal at -90° phase angle to the carrier signal, and by an audio signal at frequency W_m . The modulator output is a double sideband suppressed carrier signal in which U is the upper sideband and V is the lower

(continued on page 14)



Micro Amp Series
by
ATI

AUDIO TECHNOLOGIES INCORPORATED
328 Maple Avenue
Horsham, PA. 19044
(215) 443-0330
Free Detailed Brochures

**Audio Processors
Modular Distribution
Amplifiers**

Distribution Amplifiers

Phono Preamplifiers

**Dual Mike,
Line, & Power
Amplifiers
Rack Mounting**

Tom Wright has been a staff engineer with Delta Electronics for 10 years. He can be reached at 703-354-3350.

Carrier Current Use Increasing

by Thomas L. Vernon

Harrisburg PA . . . At a time when contract engineering is becoming more popular, some of you may be doing work for college stations which broadcast by

Thomas Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. His number is 717-249-1230.

means of carrier current. For the average broadcast engineer, the idea of feeding RF into the power lines to distribute an AM broadcast signal may be a bit novel. Herewith is a brief overview of carrier current radio.

Historically, carrier current has been around since the 1930s, when power companies used it to communicate between substations. In the 1960s, broadcasting into power lines became popular with many colleges. Several improve-

ments were made in the ferrite materials used in couplers, as well as overall coupling technology. Many carrier current stations converted to Class D 10 W FMs in the 70s, and let their AM operations fall into disuse.

Now, with 10 W FMs a thing of the past, carrier current has seen a resurgence on campus because it is the most economical way to get on the air. In some urban areas, it is the only way to get on the air when all available channels are

taken.

Other applications have evolved for carrier current over the years, many involving limited free radiation via a distribution wire or special coaxial cable.

Station Sketches

Drive-in theaters have been using it in place of speakers on car windows.

Traffic information stations for airport parking lots broadcast via slotted coax buried alongside the road.

(continued on page 16)

Your next remote control
is only a day away
from Northeast!



Moseley MRC-1600

Call Northeast at
1-800-227-1093
TODAY
for your
remote control system
TOMORROW.

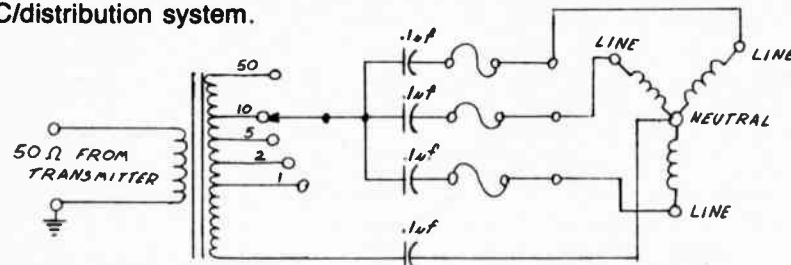
For LOW prices on ALL your broadcast needs call:

NORTHEAST BROADCAST LAB, INC.



15 Charles Street, PO Box 1176
South Glens Falls, NY 12801
800-227-1093 (NY call 518-793-2181)

Figure 1. Typical coupler for connecting carrier current transmitter to 3 phase power system. Note that the size of the coupling capacitors can be varied to control the amount of signal that is fed to each phase of the AC/distribution system.



AM Stereo Explained

(continued from page 12)

transmitted in the upper sideband. This type of transmission allows a listener to receive stereo with two monophonic receivers tuned slightly above and below the station's carrier.

C-QUAM employs two AM carriers transmitted out of phase. One carrier contains the sum information (L+R) and the other carrier contains the difference (L-R). Listeners must have a special stereo receiver to decode the signal.

ISB and C-QUAM offer compatible groundwave coverage, with C-Quam having an advantage in stereo separation. ISB transmission has an advantage in many receivers with skywave reception, while C-QUAM has suffered from "platforming," a condition that results from the receiver losing control of the

signal, resulting in the sensation that the received signal is drifting from one channel to the other and back.

On the other hand, it has been my experience to have C-QUAM be a much quieter signal when compared to ISB.

Each broadcaster must decide which stereo system is most applicable to their needs. One should consider if it is important for the nighttime listener several hundred miles from their facility to receive a quality stereo signal. Another consideration is local service: What results can be expected in the secondary service areas of a broadcasting station when power is reduced at night or when the antenna pattern changes in the evening? The result could be some undesirable effects for stereo receivers in the broadcaster's own backyard.

C-QUAM System Outlined

(continued from page 13)

sideband. In generating C-QUAM, the audio signal to the balanced modulator is left channel minus right channel audio (L-R). During monophonic modulation, L-R=0, and the resultant vector of Figure 4 disappears.

For the remainder of this two-part introduction, the contra-rotating vectors U and V will not be shown. Only the resultant vectors of Figure 3b and Figure 4 along the in-phase and quadrature axes will be shown.

Quadrature AM

If the resultant vectors of Figures 3b and 4 are combined, as shown in Figure 5, the in-phase vector, which is 1+L+R long, adds with the quadrature vector, which is L-R long, to form quadrature amplitude modulation, or QUAM. This is stereo modulation, since it contains both L+R and L-R information.

Unfortunately, QUAM has one draw-

back for stereo transmission; it is not compatible with the envelope detectors in existing monophonic receivers. The QUAM vector is longer than the I vector (1+L+R), so an envelope detector will have too large an output. The solution to the compatibility problem is to shorten the QUAM vector until it is the same length as the I vector, as shown in Figure 6. This shorter vector is called compatible quadrature amplitude modulation, or C-QUAM.

Figure 6 reveals that the C-QUAM vector is simply a phase modulated I vector. C-QUAM is generated by feeding a QUAM signal to an RF limiter to produce a phase modulated carrier. This carrier replaces the crystal oscillator in the broadcast transmitter. An L+R audio signal is fed (input) to the transmitter modulator exactly as in monophonic transmission. The transmitter output is C-QUAM.

Part 2 of this series will address the process of decoding the C-QUAM signal.

Telemetry Offers Many Options

Editor's note: The following article is the fourth in a continuing series on alternatives to telco.

by Peter Burk

Harvard, MA ... Getting telemetry from the transmitter to the studio used to be simple: all you had to do was order up a pair from the phone company, connect both ends, and listen to those step-pers click! If you needed more reliability, that was easy, too—just order another pair.

It's different now. Though we can be thankful that remote controls with stepper relays are on the endangered species list, lamentably, so is the convenient, economical telco loop. For many stations, a TRL (telemetry return link) is a real alternative.

Peter Burk, with Advanced Micro-dynamics, is a regular RW contributor. Call him at 617-456-3570.

Eight channels in the 450 MHz band are provided for telemetry use, each 10 kHz wide (see Table 1). Several manufacturers provide transmitters and receivers specifically for this use.

Frequency coordination

The only real problem is that frequently there are more than eight stations in a market wishing to use TRLs.

If you're contemplating a TRL, contact your local frequency coordinator first. The FCC requires prior coordination on all applications for this service. You might be lucky enough to be in a market where a channel is vacant or where directional antennas will permit you to share a channel with another station. (The FCC will license co-channel operation in one market if the stations coordinate with each other.)

In larger markets, a newcomer is likely to find that there are no available channels. This calls for a creative solution.

One approach is to pick a frequency other than the ones offered and apply for

Table 1. 10 kHz channels available for TRL.

450.01	450.02
450.98	450.99
455.01	455.02
455.98	455.99

a waiver. The FCC doesn't want to open Pandora's box on this one and is probably going to ask you to seek a more spectrum-efficient solution.

Unused spectrum

Remote control telemetry is inherently slowly changing data. We don't need a full 10 kHz channel all day long to adequately monitor the transmitter plant. We're wasting precious spectrum using AFSK tones on a fat FM carrier.

About the only thing that can be said in favor of the current approach is that most remote controls can be put on a TRL with no modification.

One obvious solution is to reduce the baud rate and squeeze more carriers in the same band. That's okay with the FCC if you want to do it. Two stations can apply for the same channel and operate offset from the center frequency as long as they stay within the boundaries of the channel.

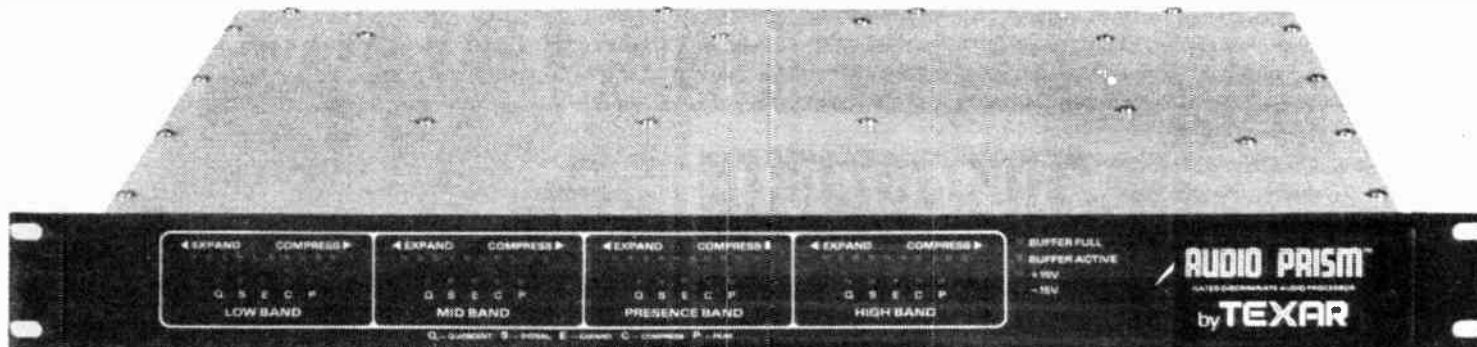
But there are some problems with this approach. Present UHF FM technology would be pushed pretty hard to keep receivers locked on at 5 kHz spacing. AM or SSB is a possible solution, although there is no equipment presently being marketed for this use.

Time division multiplexing

Time division multiplexing would seem to be a superior approach. The interesting thing about the data we're shipping back is that we don't have much use for it most of the time, but, when something happens, we want it fast. Bursts of data could be sent quickly when needed, leaving the channel available for other users when the data is not

(continued on page 16)

STEP UP TO DIGITAL CONTROL.



Staying ahead of the guy next door gets harder and harder. With modulation levels approaching their theoretical limits, the line between competitive audio processing and fatiguing overprocessing becomes finer every day. What's a chief engineer to do?

Many engineers are finding that the TEXAR AUDIO PRISM™ delivers unbelievably potent audio punch without producing listener-fatiguing grunge. The secret is DIGITAL CONTROL. Digital control doesn't feed a ragged sawtooth wave into the control port of your VCA to create annoying sum and difference products.

Digital control does deliver on-air clarity simply not possible with analog-based processors. The TEXAR AUDIO PRISM™ is now on the air on six major FM's in New York, three major FM's in Los Angeles, and over two-hundred other stations across the U.S. and Canada.

Station after station is discovering that digital control delivers the same or greater signal penetration as the most expensive analog-based processors, but without the grunge and processing artifacts. Fewer processing artifacts mean less listener fatigue and better quarter-hour maintenance.

On AM, the AUDIO PRISM™ with EAGLE™ clipper is a complete processing system, from console output to transmitter input. On FM, the AUDIO PRISM serves as a supercharger for your Optimod™ or other high-quality FM limiter/stereo generator combination.

For immediate service, call Barry Honel or Glen Clark at (412) 85-MICRO.

Try the digitally-controlled TEXAR AUDIO PRISM in your station for 10 days with no obligation. See if you don't agree that digital control isn't just the latest high-tech buzzword. It really does make a difference.

TEXAR

616 Beatty Road, Monroeville, PA 15146-1502

(412) 856-4276

(412) 85-MICRO

* Optimod 8000 and Optimod 8100 are registered trademarks of ORBAN ASSOCIATES INC., San Francisco, California.

Carrier Current Use Increasing

(continued from page 14)

Finally, 'tunnel broadcasting' has been used both by broadcasters and advertisers to take advantage of the captive audience available in long tunnels where no outside RF can penetrate.

CKLW in Windsor, Ontario rebroadcasts its signal in the tunnel under the Detroit River. In Boston, a major outdoor advertiser is planning to broadcast commercials to helpless commuters in the tunnel to Logan Airport.

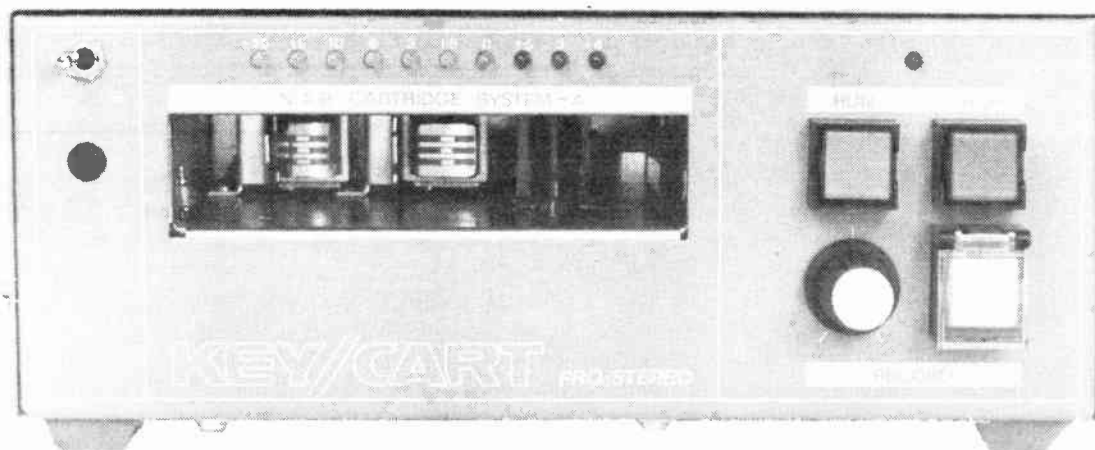
Legally, carrier current systems fall under Part 15 of the FCC Rules and Regulations. In a nutshell, the requirements are twofold: no interference to licensed broadcasters, and conformity to specified field strength limitations.

Field strength for carrier current operations is restricted to $15 \mu\text{V}$ at a distance of λ (wavelength in meters) divided by 2π . The reason for this is that $\lambda/2\pi$ defines the point where the induction field and the radiation field from a

transmitting source are of the same magnitude.

From the above formula, you can see that it is advantageous to operate a carrier current system at the lower end of the broadcast band. On the East Coast, most stations are on 640 kHz. Since 640 is a clear channel on the West Coast (KFI, Los Angeles), many carrier current operations are on 550, 560 and 570 kHz. For 640, the $15 \mu\text{V}$ point is about 230' from the transmitter.

HUNDREDS\$ LESS!



KEY-CART...THE NEW LOW COST PERFORMERS.

- Low profile—front loading
- Full remote control
- Toroidal power transformer
- Modular, plug-in electronics
- Play and record LED metering
- Excellent audio specifications

Model KC1000-MP mono play	\$595.00
Model KC1000-MRP mono record/play	\$795.00
Model KC1000-SP stereo play	\$795.00
Model KC1000-SRP stereo record/play	\$1,095.00

Contact Your Favorite Distributor or Call:

RADIO SYSTEMS INC.

5113 West Chester Pike • Edgemont, PA 19028 • 215/356-4700

Call 800/523-2133 or (in PA call 800/423-2133)

As you can see, unlike commercial AM operations, carrier current depends on the induction field to reach its listeners.

The biggest challenge facing one who is setting up carrier current transmitters is efficiently coupling RF into the AC power distribution system. We have to make a good antenna out of a system of wiring that was designed for a completely different purpose.

Figure 1 shows a typical coupling unit, with a broadband ferrite transformer and multiple taps to match different building impedances. In the early days (pre 1960s), coupling units used resonant circuits. This had the shortcoming of not always being in resonance as the impedance of the power line changed.

One of the keys to good coupling is knowing the impedance of the power line at the broadcast frequency. Typically, impedances are quite low and largely resistive. Four to ten ohms seems to be about average, remembering that the impedance drops in the evening hours as more lights are switched on.

To sum up, carrier current is a form of limited area broadcasting that is unique in that it employs the power line as an antenna and relies on the induction field to reach its listeners. Such operations are regulated by Part 15 of the FCC rules and regulations.

Next time we'll look at power splitters, carrier current transmitters, utility tunnels, and things that go hum in the night.

Telemetry Versatile

(continued from page 15)

needed. This approach is familiar to anyone who has connected their computer to a packet network such as Telenet or communicated via packet radio on the ham bands.

Packets are chunks of data preceded by an address and containing error detection and correction words. The packets are sent asynchronously so that no common clock is required among users. Two packets sent at the same time "collide," but the collision is detected and each packet is sent again after a short delay.

An entire update of all channels and status information can be sent in less than 2 seconds for a reasonably sized system. During actual adjustment periods, the bursts could be more frequent. In most cases, the user would not notice any deterioration in the response time of his system.

The RF equipment to implement such a scheme would remain the same. All that is needed is some smarts in the remote control to operate in the burst mode. The Advanced Micro-Dynamics TC-8 and other microprocessor-based remote control systems can be made to operate this way with nothing more than a PROM change.

If it's so easy, what's the hold-up? Cooperation. If a station has been using a fulltime TRL for years, would they be willing to throw out their existing system to accommodate a newcomer? As spectrum grows more valuable, cooperation will become even more vital. Let us know what you think about "packet" TRL.

How to Prevent, Search Out AC Hum

by John "Q" Shepler

Rockford II . . . The idea behind DC power supplies is that they take AC power from the line and turn it into sparkling clear DC, just like you get from a battery. It seldom works quite that nicely, but a good power supply will look very much like a battery to the opamps and transistors in your equipment.

Q-Tips

Sometimes a tightly regulated supply will behave even better than a battery. Batteries droop with increasing loads and tend to poop out at the most inconvenient times. Regulated supplies don't have those problems as long as the power lines are up. However, there is one problem you never have to worry about with batteries . . . that's hum.

Power supply hum is most often a smidgen of line AC that sneaks through the filtering and regulation. All power supplies let a little hum through; it's just a question of whether you can detect it or not. The output from a well-filtered supply may contain more white noise from the semiconductors or high frequency hash than hum. When you hear hum in your signal where there was none before, a good place to start looking is in the power supplies.

Figure 1 shows a typical low voltage

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

power supply. It has a stepdown transformer, rectifier bridge, large filter capacitor, regulator chip and noise filter capacitor. This is typical of the supplies that you find in solid state equipment. You can often find several versions of this circuit delivering different voltage levels in one piece of equipment.

The transformer sets the upper limit of the voltage output. The rectifier diodes change the alternating current to pulsating direct current, and change 60 Hz ripple to 120 Hz ripple. Though pulsating DC in power supplies is called "ripple" rather than "hum," when you hear it, it's hum. If you hear hum and your scope shows a 120 Hz waveform, the related power supply is almost always the culprit. After all, if the hum was coupled from the power line it would be 60 Hz, right?

What if the ripple is 60 Hz? It could be that you have a half wave rectifier circuit, which is less common these days. It could also mean that one of your rectifier diodes is open. If so, the ripple not only changes to 60 Hz, it most likely increases in amplitude. That's because the power supply filter is really a very low pass filter. A higher frequency like 120 Hz is much easier to filter than 60 Hz—twice as easy to be exact.

Filter capacitors

If the ripple is 120 Hz, suspect C1 first. Filter capacitors are rather large brutes and normally filter out the major portion of the AC. However, the only cheap filter is an electrolytic filter, and electrolytics have a nasty habit of drying out. This happens much faster when you stick

(continued on page 18)

Figure 1. Low Voltage Power Supply.

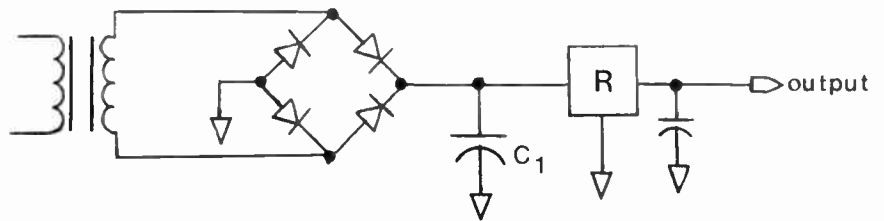


Figure 2. Simple 3-Terminal Regulator

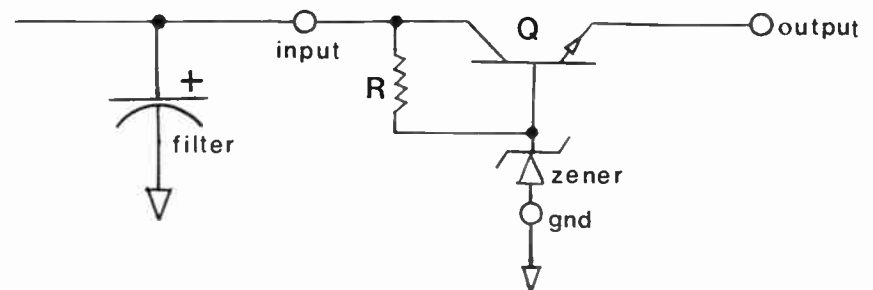
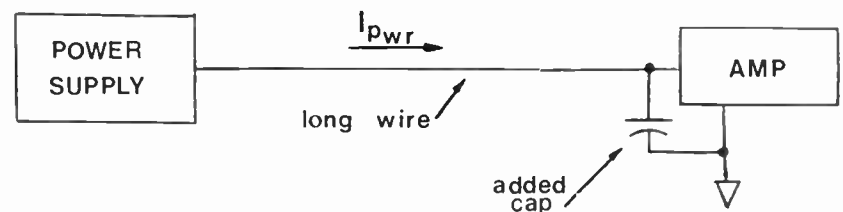
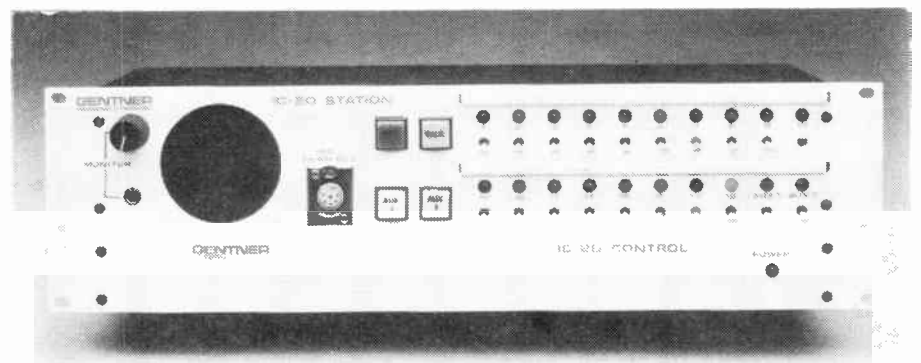


Figure 3. Long Supply Leads



IC-20 Intercom System



The Intercom designed for the Radio Broadcaster.

- Multiple, independent talk paths
- Conference or 'party line' communication
- 2-way and telephone interface capability
- Easily expandable (up to maximum of 20 stations)
- Simple installation
- Push-to-talk or hands-free operation

The Clear Choice

GENTNER
ENGINEERING COMPANY, INC.

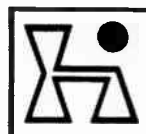
540 West 3560 South
Salt Lake City, Utah 84115
(801) 268-1117

RF RADIATION MEASUREMENT
made easy

MEET THE NEW FCC REQUIREMENT with
ISOTROPIC BROADBAND FIELD STRENGTH METERS from **HOLADAY INDUSTRIES**

These meters feature automatic *self-zeroing* and are designed to measure both electric and magnetic fields in accordance with the *ANSI RF Exposure Standard*.

CALL OR WRITE FOR SPECIFICATIONS AND PRICES



HOLADAY INDUSTRIES, INC.
14825 Martin Drive
Eden Prairie, MN 55344
Telephone: (612) 934-4920
Telex: 29-0922

Find, Prevent Line AC Hum

(continued from page 17)

the power supply in a confined location with no air circulation. Heat kills capacitors.

Unfortunately, old capacitors seldom die... they slowly fade away. This means that hum problems will often sneak up on you very gradually.

As the electrolytic filter dries out, its capacitance decreases and the ripple increases. Regulator R tries to compensate by holding the supply output constant in

spite of the increased AC component.

Regulators are actually miniature servo systems and will fight like mad to hold the output at a steady level regardless of load or ripple input. In fact, some of the better IC regulator chips will hang on for dear life until the ripple is so large that the minimum amplitude isn't enough to overcome the forward drop in the regulator semiconductors. At that point, you not only have hum, you also have a low bus voltage which can cause clip-

ping distortion in the audio amps.

Many of the regulators you see today are in the form of integrated circuits that look like transistors. These are called three-terminal regulators because they have only three connections—an input from the filter capacitor, an output to your circuits and a common ground. You can add a pot in the ground lead of some chips to adjust the regulated output voltage. If only three terminals are used, the voltage is pre-set in the chip.

Three-terminal regulators are popular because they are cheap compared to other solutions. They also offer short circuit protection. An IC regulator will generally shut itself down rather than drive too heavy a load.

When the short is removed, the regulator automatically goes back into action. I mention this because many power supplies designed in the last 10 to 15 years have regulators without this protection.

Series pass regulators

Figure 2 shows a do-it-yourself three-terminal regulator. The resistor and zener diode set the DC voltage level, while transistor Q provides the "oomph" to drive the circuits hooked to the output. This configuration is called a series pass regulator because all the current passes from the filter through transistor Q.

I've built a lot of these circuits, and they work great. But—and this is a very big BUT—look out; if you short the output, the transistor will most likely also short and then you have major trouble.

For a series pass regulator to work properly, the input voltage is generally 1.5 to 2 times the output voltage. This takes care of brownouts and other AC supply side problems. The pass transistor absorbs the ups and downs. When it

shorts, you get the 1.5 to 2 times normal voltage on your supply bus. Amplifiers start to sizzle and pilot lamps go black inside.

I had this happen on a control board that was hit by a lightning induced line surge. It cooked for a couple of hours before I got to the scene—bad news.

What's this got to do with hum? Transistor Q not only regulates the voltage, it also suppresses hum. The zener diode is a regulator itself and greatly attenuates what ripple is left from the filter capacitor. The zener provides base current for Q and basically determines how much ripple gets through.

You can filter the hum by adding a capacitor across the zener. The capacitor's filtering action will be multiplied by the β of Q which, in effect, amplifies

“Unfortunately, old capacitors seldom die... they slowly fade away.”

the capacitance of the second filter.

However, when Q shorts, all ripple suppression is gone. Whatever hum gets past the filter cap is now on the power supply output bus. This can easily be several volts in a 24 V supply.

Though this may seem like a rather long trip into regulators to make a fairly simple statement, remember, when you hear hum in an amplifier or board or tape deck, get a meter on those power supplies as quickly as you can. If humming is the result of a failed regulator, it may be getting ready to send \$100 worth of semiconductors to their eternal reward.

Filter supply line

Figure 3 shows the fairly long path that often exists between the power supply and the circuit needing the power. In this case it is an audio amplifier. The supply line is generally unshielded and can pick up hum or RF like any other wire.

You can suppress this with an additional filter capacitor at the far end of the supply. A value of 100 to 1000 μF will probably do the trick nicely.

Some amplifiers handle this problem by having the regulator chip located on the amp card. In this case, a 0.1 to 1.0 μF cap is needed to suppress noise, but is not needed for hum filtering.

There are other sources of power supply hum, like tubes. However, these are pretty much limited to transmitters and will be discussed in a column about transmitter hum problems.

If your other equipment has tubes at this late date, that's okay. You are just being thrifty. The biggest problem with tube circuits isn't hum. It's finding a drug store that still has a tube tester. Happy hunting!

All over the world, you can count on CSI transmitters.

- ✓ Dependable
- ✓ Efficient
- ✓ Cost-effective

More than 1,000 CSI AM and FM transmitters are spread throughout the world, featuring innovative design features for today's broadcaster.

CSI transmitter design is straightforward, using time-proven stable circuits and mechanical design features, assuring many years of superb performance.

CSI transmitters are designed for the broadcaster, with standardization of parts so that all are interchangeable for ease of operation; simplicity of design to control maintenance cost; and proven reliability.

You can count on CSI transmitters for many exceptional features, such as front panel circuit breakers, lighted pushbutton switches, high-low switch and local-remote switch that enables the operator to disable the remote control for safety purposes.

CSI is celebrating its 10th anniversary this year and now is part of the Cutler-Federal family of companies, headquartered in Lakeland, Florida.



ELECTRONICS, INC.
P.O. Box 965
Highland City, Florida 33846
(813) 647-1904



INOVONICS

Replacement Tape Electronics for:

- Ampex and Scully Magnetic Recorders
- High Speed Tape Duplicating
- Playback Only
- Mag Film



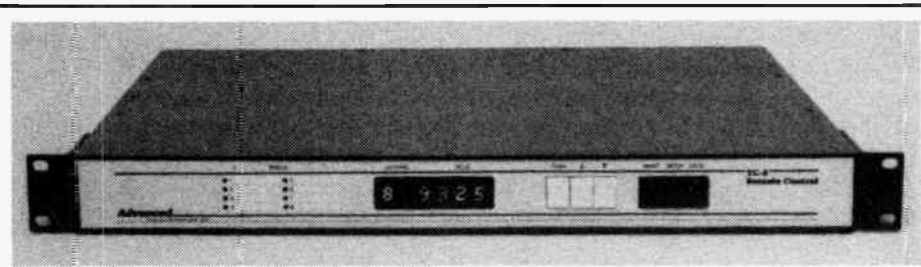
EXCLUSIVE DISTRIBUTION BY

MARCOM

P.O. BOX 66507

SCOTT'S VALLEY, CA 95066 (408) 438-4273

New Products



TC-8 Remote Control

Advanced Micro-Dynamics has introduced the TC-8, a full-featured remote control system.

Status inputs accept 5 to 28 V signals and metering channels accept inputs of either polarity from 0.25 to 4 V, ensuring easy interface with all broadcast equipment. Status LEDs and the large dot-matrix metering display can be read from across the room.

Operation is simple, facilitating use by unskilled operators. Calibration is accomplished by one person using front panel pushbuttons. Nonvolatile memory assures orderly recovery from

power failures

The TC-8 requires only 1 3/4" of rack space and provides 8 metering channels, 8 status inputs and 8 pair of control outputs. Studio and transmitter units communicate via telco loops or STL/SCA subcarriers.

CRT display, logging, and fully automatic operation is possible using the optional RS-232 interface.

The TC-8 is priced at \$2195 and is available direct or through leading distributors. For more information, contact Peter Burk at Advanced Micro-Dynamics: 617-456-3570.

M-20, M21 Audio Tape Recorders

AEG Corp. has announced the availability of their M-20 and M-21 professional audio tape recorders.

The M-20 Series recorders are available in standard two-track or center-track SMPTE Time Code configurations. Standard features include complete microprocessor control of all functions, a six-position locator, programmable and stored level, equalization, bias alignments for four tape speeds (including NAB or proposed AES/CCIR equalization and optimization for three tape formulations at each speed), and external synchronization capability.

The design incorporates a cast steel deck, easily accessible and modular circuitry and superb ergonomic layout of

tape path and controls for ease of operation and editing.

The M-21 Series recorders have been developed for less sophisticated applications requiring only two-speed operation, manual audio alignment and no synchronization possibilities.

Both series are available with a variety of options and mounting configurations.

Both the M-20 and M-21 Series utilize AEG's exclusive Amorphous Head design. A manufacturing process gives the heads a previously unattainable hardness. The butterfly core construction reduces interchannel crosstalk.

The head's wide profile yields marked low frequency response at higher speeds.

For more information on the M-20 and M-21 Series, contact Larry Lamoray, sales manager/Audio Systems, AEG Corporation, P. O. Box 3800, Somerville NJ 08876-1269 or call 201-722-9800.

American Music Formats

American Music Formats is featuring two format products. The "Roots of Rock N' Roll" targets men 40+ and women 36+. The format offers a 1,000-title "Blues/Soul" addendum and an 800-title "Country/Rockabilly" addendum. A 200-title Christmas library is also available. The base library has 2,000 titles.

"Pure Country" targets men 40+ and women 36+. A 600-title addendum is available, along with a 150-title Christmas library. The base library has 1,400 titles.

Reel-to-reel and cart versions are available for both formats.

For information, contact: American Music Formats, 15205 W. Lynwood Court, New Berlin WI 53151.

QEI tube warranty

QEI Corporation now warrants tube life in their 3.5 and 5 kW FM transmitters for 15,000 hours or two years of operating time, whichever comes first.

This warranty applies to the 3CX3000A7 tube originally supplied and

(continued on page 20)



Ellason Weather Radar

Ellason Weather Radar has added the E300 model to their line of ground-based Color Weather Radars.

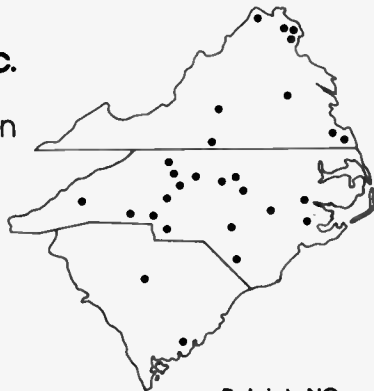
The E300 is a 360° scan radar utilizing the same model receiver/transmitter used in the E200 sector scan radar system. The E300 has five ranges: 10, 25, 50, 100, and 200 nautical miles.

Precipitation is displayed in three levels: green for light, yellow for moderate, and red for heavy. Future plans are to offer a fourth level to show intense precipitation (over 2" per hour).

For more information, contact Arnold Lane at Ellason Weather Radar: 314-532-3031.

The numbers tell the story.

Auditronics, inc. has delivered more consoles to this region than all others in its class combined.



- Arlington, VA
Gerald Lewis Recording
- Asheville, NC
WLOS-TV
- Chapel Hill, NC
WCHL
- Charleston, SC
WCSC-TV
- Charlotte, NC
WLVA
WSOC (3)
WTVI-TV
Capitol Broadcasting (4)
- Columbia, SC
WDPN (2)
- Danville, VA
WDVA (2)

- Durham, NC
WDCG (2)
WDNC
WDXU (2)
- Falls Church, VA
WFAX
- Fayetteville, NC
WFSS
- Gastonia, NC
WZXI
- Goldsboro, NC
WGBR (2)
- Greensboro, NC
WCOG (4)
- High Point, NC
WMAG (2)

- Lynchburg, VA
Old Time Gospel Hour
- Monroe, NC
WDEX
- New Bern, NC
WCTI-TV
WSFL
WTEB (2)
- Norfolk, VA
WLTY (2)
WTAR (2)

- Raleigh, NC
WKIX (2)
WYYD
WPTF-TV
WPTF
WQDR (2)
WRAL-TV (3)
WRAL (6)
WRDU (2)
Capitol Broadcasting (10)
(Group locations not shown)

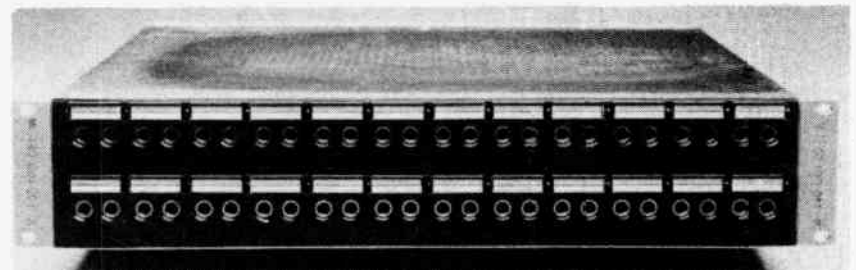
- Richmond, VA
WRNL (3)
WRVA (2)
WRXL (3)
- Salisbury, NC
WSTP
WRDX (2)
- Tobaccoville, NC
MKB Recording
- Virginia Beach, VA
WCMS (3)
CBN
- Washington, DC
USIA (3)
WETA
Westinghouse
- Washington, NC
WDLX
- Whiteville, NC
WENC
- Winchester, VA
WINC
- Winston-Salem, NC
WSJS (2)
WTQR (3)
WFDD (2)

Seven out of ten were sold by:

BROADCAST SERVICES CO.

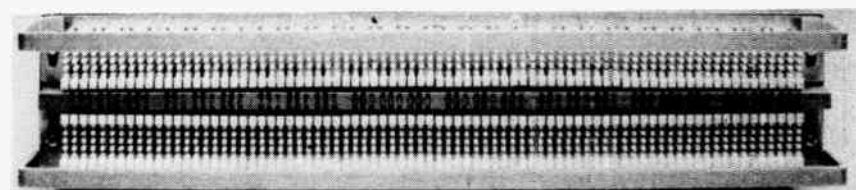
Neal Davis, Four Oaks, NC, 919 934-6869. Keith Arnett, Front Royal, VA, 703-635-1413.

Versatility. Flexibility.



Versapatch.

Gentner Engineering's Versapatch is the only chassis-enclosed patch panel with the unique Flexiblock Termination. With Versapatch, you get the ease of punch-down connections combined with high density (up to 8 connections per circuit) and the flex strength of stranded wire.



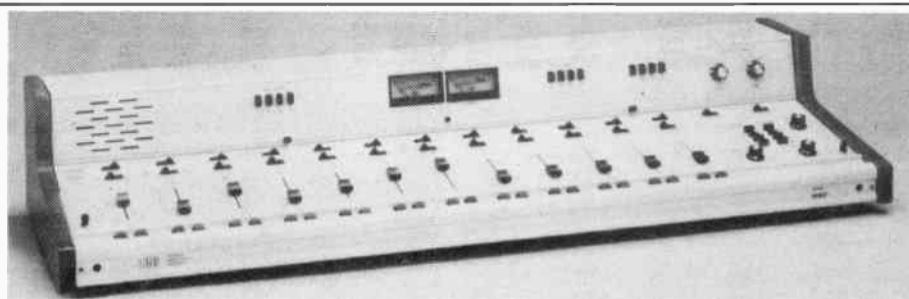
Whether you're rewiring your facility or upgrading a room, Versapatch will make your job easier.

The Clear Choice.

GENTNER
ENGINEERING COMPANY, INC.

540 West 3560 South
Salt Lake City, Utah 84115
(801) 268-1117

New Products



UREI 1690 Consoles
Hz.

The UREI 1690 Broadcast Console Series from JBL Professional allows radio stations to handle up to 12 program sources simultaneously. The UREI 1690 series includes three models, each offering a choice of mixer controls.

The SNR of the microphone channel, from input to console output, is more than 74 dB with -50 dBm input and +4 dBm output, or more than 90 dB referenced to maximum output. At the full output level of +24 dBm into 600 ohms, the THD of both Program and Audition channels is less than 0.25% over the range of 30 Hz to 15

Each mixer position has two inputs selectable with a rocker switch. In addition, three banks of four pushbutton switches may be connected to any mixer input for use with additional sources, such as remote or network feeds. An overload indicator LED is located between the VU meters. Its threshold can be internally adjusted to alert the operator that a downstream device, such as an STL, may be clipping.

For more information, contact Mark Gander, VP/Marketing, JBL Professional: 818-893-8411.

(continued from page 19)

to those factory installed in all future transmitter shipments. The tube is covered by a full replacement warranty for the first 10,000 hours with a pro-rated extension to 15,000 hours.

For more information on the warranty, contact John Tiedeck at QEI: 609-728-2020.

Air Sentry

DE Winget & Co. has begun production of the Air Sentry, designed to constantly monitor the presence of an audio signal and to energize a relay when the audio is absent. Activation of the relay is front-panel adjustable from 4-20

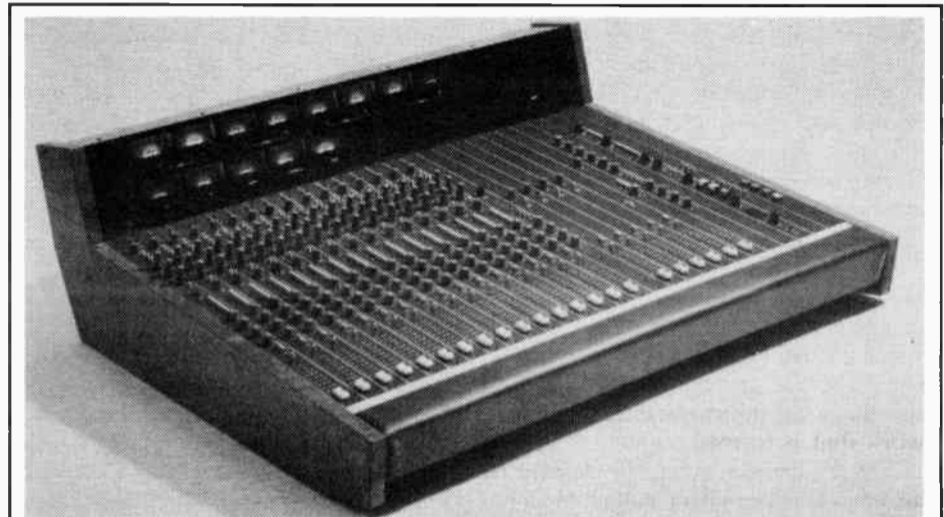
seconds.

The relay may in turn be used to activate an external audible or visible alarm to notify station personnel of the absence of the broadcast signal, or as a secondary remote control failsafe.

Air Sentry may be used to monitor any stereo or mono audio source, such as audio from an AM/FM tuner, television receiver or modulation monitor.

Air Sentry is built to broadcast standards of reliability. Cost is \$295. Distribution is through major broadcast equipment distributors.

For more information on the Air Sentry, contact Donald Winget, sales manager: 206-641-0297.



SP-5 Console

Wheatstone Corporation's newest production console, the SP-5, can be custom configured to the client's specific system requirements.

Both mono and stereo inputs are offered, as well as stereo subgroups, multitrack routing and matrix submixing.

Composite stereo and mono mixes, in addition to four aux send buses, are provided. They will also provide tape machine controls, clocks, timers and user-specified frame widths.

For more information, contact Ray Esparolini at Wheatstone Corporation: 203-393-0887.

From the publisher of Radio World newspaper, the nation's leading radio engineering publication.



NOW . . . TV Technology

a FREE monthly tabloid magazine covering TV engineering/operations exclusively!

TV Technology invites you to become a FREE subscriber. Complementing Radio World by offering you the other side of broadcasting, TV Technology will focus on television engineering... FCC developments, equipment maintenance-operation-repair, test reports, classified, and more. Sign up now to receive TV Technology. Fill in the coupon below and mail it today!

..... Clip & Mail.....

I would like to receive TV Technology free each month. YES NO

Signature _____ Date _____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ ZIP _____

Function (check one):

- Corporate management
- Eng/technical management
- Eng/technical staff
- Production/operations mgmt or staff
- News mgmt or staff
- Other (specify) _____

Type of Organization (check one):

- VHF-TV
- CATV
- Network/Group Owner
- Teleprod facility
- UHF-TV
- CCTV
- Other (specify) _____

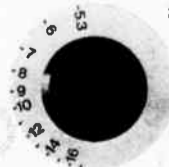
TV Technology • PO Box 1214 • Falls Church VA 22041

AM BROADCASTING - HIGH FIDELITY Are these terms mutually exclusive?

YES NO DON'T KNOW

Suprisingly, many broadcasters may not know that the correct answer to this question is no. Large sums of money are spent each year to purchase new transmitters, new studio equipment, new audio processing equipment and to modify antenna systems for improved AM sound. Unfortunately, until now, there has been no such thing as a professional quality AM monitor receiver. As a result, the perceived fidelity of an AM signal has been severely restricted by receiver performance.

Potomac has developed the SMR-11 Synthesized Monitor Receiver which will let you hear and measure the quality of your transmitted AM signal ... perhaps for the first time. Features include: Crystal Stability; 60 dB Signal to Noise Ratio; Audio Frequency Response ± 0.5 dB, 20 Hz to 8 kHz; Total Harmonic Distortion less than 0.2% (95% Modulation) at audio frequencies above 40 Hz ... please write for complete descriptive brochure.



THIS DIAL WILL TUNE YOU IN TO THE
NEW SOUND OF AM BROADCASTING

POTOMAC INSTRUMENTS

932 PHILADELPHIA AVE.
SILVER SPRING, MD. 20910
(301) 585-2662

Broadcast Computing

Find RF Networks via Trial, Error

by Ronald F. Balonis

Wilkes-Barre PA ... There are programs to calculate just about every engineering need. This one, called TRYNET, calculates RF networks, but with a unique difference: it uses simple trial and error as its method. Thus, an inefficient method becomes efficient when combined with a computer's dumb speed and your own practical experience.

TRYNET won't do away with Smith charts, or the need for complex mathematical methods to compute RF networks, or even let you give up on theory—nothing can replace them. But it will help you understand them better. When you need to, it will help you design, adjust or modify a network, just like an expert.

This network program is for broadcast engineers who are long on experience and practice, but short on time and parts.

How does it work?

TRYNET's algorithm starts with a load's statistics, adds the elements selected by trial and error to it, and then computes the input statistics of the network that is formed.

The program converts the element reactances to component values, which it then uses in network calculations. The calculations algebraically add the elements into the network. The network's phase shift is the sum of the phase shifts between current nodes.

To make a network with this trial-and-error program, you keep looping on the element trials and the input statistic screens until you get the desired results. A complete listing of the Radio Shack Model 100 version of the program is included as Figure 1.

How to use it

All computer programs say they are simple and easy to use. TRYNET really is, especially when you consider the complexity of the other ways to compute the values for a network.

With TRYNET, all you do is enter the load points (up to three) and then, by

Ron Balonis is CE of WILK, Wilkes-Barre and a frequent contributor. You can reach him at 717-824-4666.

trial and error, add elements (up to five) in series and/or parallel to make the network.

TRYNET.BA consists of five display screens: initial sign-on, load statistics, element trial, input statistics and a list of network values (see the sample screens

in Figure 2).

The initial sign-on screen prompts for the transmission line impedance used for the VSWR calculation: enter a 0 to quit or a value between 1 and 9,999 ohms.

It next prompts for the network's load points. Enter up to three, separated by

commas, in the form of: frequency (0.5 MHz to 2.0 MHz), resistance (1 to 9,999 ohms) and reactance (± 0 to 9,999 ohms). For less than three load-points, just enter at the prompt.

The program next displays the load
(continued on page 23)



All Under One Roof

For Efficiency and Economy

Million Dollar Inventory
In-House for fast delivery.

200 Product lines
for your shopping pleasure.

Open 12 hours daily
in your time zone.

Now open Saturday
for your convenience

One toll free number
10 lines to serve you.
1-800-426-8434



A GREAT PLACE TO BUY

BROADCAST SUPPLY WEST • 7012 - 27th ST. W. • TACOMA, WA 98466

SOFTPRO SYSTEMS

and micro engineers

CUSTOM BUSINESS SYSTEMS
PROGRAMMING - TRAINING
- SUPPORT -

- DBASE II/III
- FRAMEWORK
- LOTUS 1-2-3
- UNIX
- DOS
- NOVELL

MEDICAL, LEGAL, INSURANCE,
SALES, ASSOCIATIONS,
PUBLISHING & MANY OTHERS

FREE CONSULTATION
(301) 942-1132

Broadcast Computing

Find RF Networks via Trial, Error

(continued from page 21)
 statistics screen with the load points, their VSWR and phase shift. Press Q to quit or press the enter key to move to the element trial screen.

The element trial screen prompts for a series or parallel element, backup or quit. Backup lets you re-do previous elements. Quit returns you to the initial sign-on screen.

Specify a series or parallel element and the program prompts for the frequency in megahertz and then the element's reactance. Enter a reactance as (+) for inductive or (-) for capacitive. Then the element is added to the network and the screen displays the network's new input statistics.

The statistics input screen displays the element number and its type (SC/SL/PC/PL), the resistance, reactance, VSWR and phase shift for each load-point frequency. It then prompts

for: Re-do the element, Do another element, Backup to previous element, List the network or Quit.

The 10 screens shown in Figure 2 illustrate the final sequence of a three-element network to match an antenna to a 50 ohm transmission line. After the initial load-point screen, there were several iterations between the element trial and network statistics input screens before the network gave the desired input statistics of a nearly symmetrical load matched 0.98 MHz.

Hints on using TRYNET:

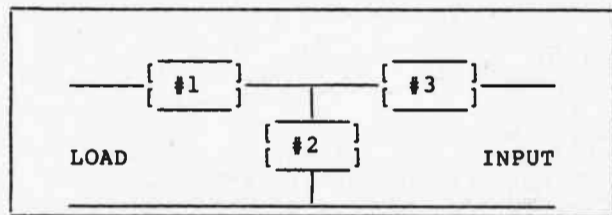
This computer program lets you combine both theory and experience to take the drudgery out of network calculations. It can be used for the conventional method of designing networks by computing values first and then getting the parts. Or it can be used in its more powerful mode, to compute the network

using the parts you already have on hand.

Since TRYNET displays theory in continuous action, it can help you make more sense out of the tons of articles about networks that fill the broadcast trade magazines and textbooks. TRYNET doesn't replace theory; in fact, it's quite useless without a working knowledge of network theory. It just does away with the need to use complex and radical math in all of those formulas.

TRYNET is designed for simple series/parallel networks, the most common network configurations frequently found in broadcasting. Its results coincide with those calculated by the complex mathematical methods. Use the example as a reference to verify that you've keyed the program in without error. Step through it screen-by-screen and see how easy trial-and-error network design can be.

Figure 2. TRYNET Network Example and Screens



Network Example

```

++ TRIAL & ERROR NETWORK ++ ELEM. 2
<S>ERIES <P>ARALLEL <B>ACKUP <Q>UIT P
FREQ. (MHZ) (0 TO BACK UP) ? .98
REACT. (OHMS) (+XL OR -XC) ? -52.8
    
```

Element #2 Trial

```

++ TRIAL & ERROR NETWORK ++ ©1984 RFB
VSWR IMPEDANCE ZO (0 TO EXIT)? 50
+++ ENTER LOAD POINTS (MAX OF 3) +++
ENTER F( 1 ), R, X ? .97,49,51
ENTER F( 2 ), R, X ? .98,52,58
ENTER F( 3 ), R, X ? .99,55,63
    
```

Initial Sign-on

```

++ TRIAL & ERROR NETWORK ++ ELEM. 2 PC
FRQ      R      X      VSWR  PHASE SHFT
0.970   48.7   -31.9  1.89  -66.3
0.980   50.1   -39.5  2.16  -75.1
0.990   48.6   -45.1  2.43  -81.6
+ <R>E <D>O ELEMENT <L>IST <Q>UIT < > +
    
```

Element #2 Input Statistics

```

++ TRIAL & ERROR NETWORK ++ + Load +
FRQ      R      X      VSWR  PHASE SHFT
0.970   49.0   51.0   2.69   0.0
0.980   52.0   58.0   2.96   0.0
0.990   55.0   63.0   3.13   0.0
+++ PRESS ANYTHING OR <Q>UIT +++
    
```

Input Load

```

++ TRIAL & ERROR NETWORK ++ ELEM. 3
<S>ERIES <P>ARALLEL <B>ACKUP <Q>UIT S
FREQ. (MHZ) (0 TO BACK UP) ? .98
REACT. (OHMS) (+XL OR -XC) ? 39.5
    
```

Element #3 Trial

```

++ TRIAL & ERROR NETWORK ++ ELEM. 1
<S>ERIES <P>ARALLEL <B>ACKUP <Q>UIT S
FREQ. (MHZ) (0 TO BACK UP) ? .98
REACT. (OHMS) (+XL OR -XC) ? -19
    
```

Element #1 Trial

```

++ TRIAL & ERROR NETWORK ++ ELEM. 3 SL
FRQ      R      X      VSWR  PHASE SHFT
0.970   48.7    7.1   1.16  -74.6
0.980   50.1   -0.0   1.00  -75.1
0.990   48.6   -5.2   1.12  -75.5
+ <R>E <D>O ELEMENT <L>IST <Q>UIT < > +
    
```

Element #3 Input Statistics

```

++ TRIAL & ERROR NETWORK ++ ELEM. 1 SC
FRQ      R      X      VSWR  PHASE SHFT
0.970   49.0   31.8   1.88  -33.0
0.980   52.0   39.0   2.11  -36.9
0.990   55.0   44.2   2.28  -38.8
+ <R>E <D>O ELEMENT <L>IST <Q>UIT < > +
    
```

Element #1 Input Statistics

```

++ TRIAL & ERROR NETWORK ++
EL SP/LC VAL X/F0= 0.970 0.980 0.990
1 SC 8547.5 UUFD 19.2 19.0 18.8
2 PC 3075.8 UUFD 53.3 52.8 52.3
3 SL 6.4 UH 39.1 39.5 39.9
+++ PRESS ANYTHING OR <Q>UIT +++
    
```

List Network Elements

BROADCAST SUPPLY IS THE PLACE TO BUY !

MOSELEY

STL & REMOTE CONTROL

FOR BEST SERVICE & PRICE

CALL TOLL FREE 1-800-426-8434 BROADCAST SUPPLY WEST



Broadcast Computing

Program Translated

by Ron Balonis

Wilkes Barre PA . . . Nearly all micro-computers have BASIC as their "communicate-with-human language." But, dialectical differences between BASIC limit their programs' compatibility with each other. Sometimes you've got to translate programs to get them to work on another computer. TRYNET was originally written for a Radio Shack Model 100, which uses one version of Microsoft BASIC.

The listing in Figure 3 shows the modifications to TRYNET to make it work on a Commodore 64 computer and others lacking Microsoft-like commands and functions.

Basically, the changes are: Translate CLS, MENU, INKEY\$, and ' (apostrophe) to C64 BASIC. Rewrite the IF-THEN-

ELSE statements, lines 120 and 740, to IF-THEN only—new lines 120 to 125 and 740 to 745. Construct routines to make the INSTR function—new lines 350 to 358, 720 to 728 and 740 to 750. Construct a PRINTUSING function—new lines 10000 to 10240. And replace the display routines—lines 820 to 880 and 5100 to 5110.

This version of TRYNET works the same, except for an occasional minor error in the lowest displayed digit. The routine that emulates the PRINTUSING function truncates the displayed digits, thereby giving a nonrounding error to the calculations.

Use the example in the TRYNET article to debug and verify that you've got it keyed in right. When it's right, it will give the same screens and same results.

Figure 3.
Commodore 64
Modification Listing
to TRYNET

DELETE:	LINES 10, 70, 120, 350, 710, 720, 740, 750, 820, 835, 845, 855, 865, 870, 880, 5100, and 5110
CHANGE:	CLS in lines 100, 200, 330, 500, and 800 TO: PRINT CHR\$(147)
CHANGE:	AS=INKEY\$ in line 1020 TO: GET AS
CHANGE:	Apostrophes (') before REMARKS TO: REM
CHANGE:	RUN in lines 360 and 730 TO: 750

LET US REPAIR YOUR BROADCAST EQUIPMENT

- complete test facilities
- cart machine specialists
- experienced technicians
- turntables
- authorized repair center and direct factory distributor for over 120 major manufacturers
- reel to reel equipment
- all parts guaranteed for 90 days and all labor for 30 days
- cassette decks
- mixing consoles
- amplification equipment
- estimates available

SPECIAL OFFER: if you would rather retire your old cart machines instead of repairing them, we will buy them, subject to their condition, and give you \$125 in merchandise at professional list price.

BECAUSE YOUR ENGINEER'S TIME IS TOO VALUABLE TO WASTE.

RADIO SYSTEMS INC.
5113 WEST CHESTER PIKE • EDGEMONT, PA 19028
800/523-2133 or (in PA call 800/423-2133)



Figure 3 Continued.

```

INSERT: The following NEW program lines
120 IF ZO=0 THEN STOP
125 IF ZO>9999 THEN RUN

350 GET EL$(K):IF EL$(K)=" " THEN 350
352 IK=1
354 FOR II=1 TO 4
356 IF MID$("SPBQ",II,1)=EL$(K) THEN IK=IK+II
358 NEXT II

720 GET A$:IF A$="" THEN 720
722 IK=1
724 FOR II=1 TO 4
726 IF MID$("RDLQ",II,1)=A$ THEN IK=IK+II
728 NEXT II

740 IF K<5 THEN K=K+1:GOTO 320
745 GOTO 710
750 RUN 0

820 U$=" #.###":N=FRQ(I0):GOSUB 10000
835 PRINT I;EL$(I);" ";
845 U$=" ####.#":N=EL(I)*1E12:GOSUB 10000:PRINT" UUPD";
855 U$=" ####.#":N=1/(K0*FRQ(I0)*EL(I)):GOSUB 10000
870 U$=" ####.#":N=EL(I)*1E6:GOSUB 10000:PRINT" UH ";
880 U$=" ####.#":N=K0*FRQ(I0)*EL(I):GOSUB 10000

5100 U$=" #.###":N=FRQ(I):GOSUB 10000
5102 U$=" ####.#":N=R(I,J):GOSUB 10000
5104 U$=" ####.#":N=X(I,J):GOSUB 10000
5106 U$=" ###.###":N=S(I,J):GOSUB 10000
5110 U$=" ####.#":N=-DLY(I,J):GOSUB 10000:PRINT
    
```

And ADD the following program lines

```

10000 REM-EMULATION OF PRINTUSING FOR C64
10010 REM-FORMAT IN U$ "####.###" NUMBER IN N
10100 L=LEN(U$):UDP=0:REM--FIND DEC PT IN U$
10105 FOR II=1 TO L
10110 IF MID$(U$,II,1)="." THEN UDP=II:II=L
10115 NEXT II
10120 IF UDP>0 THEN LP=UDP-1:RP=L-UDP
10125 IF UDP=0 THEN LP=L:RP=0
10130 IF ABS(N)<.01 THEN N=0
10150 N$=STR$(N):L=LEN(N$)
10155 IF LEFT$(N$,1)="-" THEN N$=RIGHT$(N$,L-1)
10160 L=LEN(N$):DP=0:REM--FIND DEC PT IN N
10165 FOR II=1 TO L
10170 IF MID$(N$,II,1)="." THEN DP=II:II=L
10175 NEXT II
10185 IF LP=0 THEN 10215:REM--SKIP LEFT
10190 IF DP=0 THEN L$=N$:GOTO 10200
10195 L$="":IF DP>1 THEN L$=MID$(N$,1,DP-1)
10200 IF LEN(L$)>LP THEN L$="."+RIGHT$(L$,LP)
10205 IF LEN(L$)<LP THEN L$=" "+L$:GOTO 10205
10210 PRINT L$;
10215 IF UDP=0 THEN RETURN:REM--SKIP RIGHT
10220 PRINT ". ";
10225 IF DP=0 THEN R$="0":GOTO 10240
10230 R$=MID$(N$,DP+1,RP)
10235 IF LEN(R$)<RP THEN R$=R$+"0":GOTO 10235
10240 PRINT R$;:RETURN:REM--END OF MOD
    
```

Subscription/Reader Service Forms

Radio World
January 1, 1986 Issue Use until April 1, 1986

FREE Subscription/Renewal Form

I would like to receive or continue receiving **Radio World** FREE each month. YES NO

Signature _____ Date _____

Please print and include all information:

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ ZIP _____

Business Telephone () _____

Please circle only one entry for each category

I. Type of Firm

- | | |
|------------------------------|------------------------------------|
| 1. Commercial AM station | 6. Recording studio |
| 2. Commercial FM station | 7. TV station or teleprod facility |
| 3. Educational FM station | 8. Consultant/ind engineer |
| 4. Combination AM/FM station | 9. Mfg. distributor or dealer |
| 5. Network/group owner | 10. Other _____ |

II. Job Function

- | | |
|-----------------------|---------------------------|
| A. Ownership | D. Programming/production |
| B. General management | E. News operations |
| C. Engineering | F. Other (specify) _____ |

III. Purchasing Authority

1. Recommend 2. Specify 3. Approve

Reader Service

Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below. NOTE: Circle no more than 10 numbers. otherwise card will not be processed.

001	021	041	061	081
002	022	042	062	082
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

Sales Call Service

Please have a salesperson contact me about these items (list numbers)

Clip & Mail to: Radio World, PO Box 1214, Falls Church VA 22041

Broadcast Equipment Exchange

"Broadcast Equipment Exchange" accepts no responsibility for the condition of the equipment listed or for the specifics of transactions made between buyers and sellers.

AMPLIFIERS

Want to Sell

Acoustat TNT 2000 amp. \$1000. R Robinson, TNA Records, 10 George St. Wallingford CT 06492. 203-269-4465.

Duke amp mdl 1 U460 A 150 W, 3 mic inputs, 70 V bal, 8-4 ohms, 2 aux, 25 V, \$125. R Hillsman, HiHo Prod, 7855 S Halsted, Chicago IL 60620. 312-224-5612.

University 20-T mixer, \$75 plus P/F. M Tait, Tait Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

Crown MT-1000 amp in 3-SP road case, nearly new, \$750. D Wade, Collegium Snd, 35-41 72nd St, Jackson Heights NY 11372. 718-426-8555.

Bogart-35W PA amp, excel cond, \$125. R Wiles, Comm Svcs, 9421 Ballentine, Overland Pk KS 66214. 913-541-9674.

Dynaco PAT-5 preamp & stereo 410 pwr amp, excel cond, \$400; Ampex AA-620 amp speaker (2), vgc, \$125 ea. T O'Laughlin, WERN, 821 University Ave, Madison WI 53704. 608-264-6667.

Micro-Trak 6411 (2) stereo phono preamps, gd cond, \$150/both; Shure M54 (3) stereo phono preamps, gd cond, \$85/all; Hnat stereo phono preamps (2) prof bcdt series, gd cond, \$125/both. M Gollub, WMJS, POB 547, Prince Frederick MD 20673. 301-535-2201.

Russco Fidelity Master bal stereo TT preamp, \$195. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Dynaco 400 stereo, \$300; Univ 100 W basic, \$100; 60 W mixer/amp, \$100; Sony 4650, \$125. B Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-866-8670.

Hitachi HA1100, integrated stereo amp, 430 W, like new, \$325. B Davidson, Davidson Comm, 2712 Eastlake Ave E, Seattle WA 98102. 206-325-5550.

SAE 2:00 amp, SAE MK 30 preamp, \$325. T Hill, WSKG, Box 3000, Binghamton NY 13902. 607-775-0100.

Want to Buy

ESS 500-M amp, must be in mint cond. D Sura, Eastman Kodak Co, 3099 Science Pk Rd, San Diego CA 91212. 619-455-9910 X301.

Marantz, McIntosh, WE, amps, preamps, tubes, etc. C Dripps, Kurluff Ent, 4331 Maxson, El Monte CA 91732. 818-444-7079.

McIntosh MC275, C22 Marantz 7, 88, 9, 10B, 16, 19, M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

ANTENNAS & TOWERS

Want to Sell

Andrew 47R-3, 1-5/8" EIA FL connector for use w/Heliac, new w/coupl/kit, \$95. G Churpek, N6FL, 839 Cambon Circle, Ojai CA 93023. 805-646-5296.

Harris/ERI FML-3E antenna on 89.5, vgc, 5 yrs old, \$2500. L Marchese, KNPR, 5151 Boulder Hwy, Las Vegas NV 89126. 702-456-6695.

Lapp base insulator for 210' tower, \$500. L Bradick, WIYN, POB 5226, Rome GA 301601. 404-291-6161.

PiRad 320' tower, almost new, bargain. C Phillips, WOLA, POB 1530 Woodson Mall, LaFollette TN 37766. 615-566-1000.

Tower sections: 40' face, 20' lengths, single leg and dbl leg, \$100 & \$150 respectively. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63114. 314-427-7584.

Waveguide, ice shield, pipes, 4" dia, 10' length, \$30; 3" x 10' waveguide ice shield, \$200. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63112. 314-427-7584.

RCA 4 bay FM antenna on ground w/deicers, BO. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46124. 317-266-9700.

Anixter Mark STL mini-grids, like new, \$240 ea. G Arroyo, WONQ, POB 150207, Orlando FL 32808. 305-297-1140.

Crouse-Hinds FCB-12 tower beacons for 2-620 W lamps (4); Crouse-Hinds 46996 Motor Flasher Unit, brand new. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 91213. 619-565-6006.

RCA FM isocoupler tuned to 94.1 (ancient); Auto-Dryaire 102-507 dehydrator for transmission line; Harris (ERI) FMS-5, 5 bay CP FM antenna at 106.5 MHz. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 91213. 619-565-6006.

FM Antenna, 3 bay, famous brand, tuned to 104.9, will re-tune, almost new, bargain. C Phillips, WOLA, POB 1530 Woodson Mall, LaFollette TN 37766. 615-566-1000.

Phelps Dodge 4-bay CP antenna, tuned to 88.1 MHz, \$600. D Strecker, WLTL, 100 S Brainard, LaGrange IL 60525. 312-482-9585.

RCA BCF-7 just removed from service, feed with 20 kW, freq 98.1. \$3500. D Gibson, WRQQ, POB 100, Lexington KY 40590. 606-252-6694.

Andrew 47R-3 connector for heliac, new, \$95 plus ship. G Churpek, Kilo-Tec, POB 7001, Oak View CA 93022. 805-646-9645.

Ground screens, (4), new, 54' x 75', \$1 sq ft. L Tighe, WRNJ, Box 1000, Hackensack NJ 07840. 201-850-1000.

Windcharger, 400', 18" face, on ground, you pick up, \$5000; 130', 16" face Utility tower, on ground, some guys, \$1500. J Robillard, KLVU, 1803 N First East St, Haynesville LA 71038. 318-624-0105.

Gates lighting choke for tower lighting systems, 110 V, 1 phase, \$200. G Fuller, KPRB, POB 1240, Redmond OR 97756. 503-548-5101.

Towers, 325' & 450' avail immed, suitable for AM-FM-CATV-cellular. P Starke, Stainless, 3rd & Montgomery, N Wales PA 19454. 215-698-4871.

Rohn 25G 110' tower complete w/guys, on ground, avail immed. BO. M Dickey, Midwest Translator, Rt 6 No 103, St Robert MO 65583. 314-336-3133.

FM antenna 8 bay, 95.3 MHz, J Parker, KKAN, Cottonmill Rd, Kearney NE 68847. 308-234-1367.

FMC-1 Kimtronics iso-coupler 7/8" transmission cable & fittings. J Parker, KKAN, Cottonmill Rd, Kearney NE 68847. 308-234-1367.

Phelps-Dodge 2-3 bay on 100.9 MHz, HP version, \$750. L Berg, WZNE, 8320 Starkey, Seminole FL 33543. 813-391-9988.

HJB-508 approx 250' w/conc on reel, gd cond, BO plus shipping. R Turner, WCLR, 8833 Gross Pt Rd, Chicago IL 60077. 312-677-5900.

Want to Buy

Chan 12 TV antenna, any power level or type, will consider ch 8-13 batwing antennas. S Smedley, KJKL, POB 64, Seward NE 68434. 402-534-2071.

TV antenna on chan 12 & one on chan 16 capable of 5-10 kW input or greater. A Peabody, KOLN, POB 30350, Lincoln NE 68503. 402-534-2071.

AUDIO PRODUCTION (OTHER)

Want to Sell

Eventide BD955 delay unit, mono, new, \$2800; Comrex TLX freq extender, transmit end, new, \$850. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Eventide BD955 stereo digital delays, 15 kHz, 3.2 sec, never used, \$5500. L Henry, KIQQ, 6430 Sunset #1102, Hollywood CA 90028. 213-469-1631.

EXR Mark II aural exciter, \$1200/BO or trade for new Technics 1500US, V Taft, RHG, 1326 Midland, Syracuse NY 13205. 315-475-2936.

Shure 50AC telephone acoustic couplers, new (4), \$20/ea. M Gollub, WMJS, POB 547, Prince Frederick MD 20678. 301-535-2201.

Opamp Labs mdl 700 plug-in opamp modules, adjustable audio oscillator, mdl 350P microphone preamp, (2) mdl 425 DC line amps & mdl 526 15 V bipolar pwr supply, \$125/BO. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Fone box telco interface, \$300. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

UREI 970 Vidigraf bar graph gen, new, w/inst, \$500. I Kaufman, Natl Recd, 460 W 42nd, NY NY 10036. 212-279-2000.

dbx 155 4 chan tape NR system; Otari MX7800 8 trk, send for list, BO. S Delahoyde, ITT Tech Inst, 4837 E McDowell, Phoenix AZ 85008. 602-231-0871 X174.

Completat studio includes (2) Howe boards & Otari playback units & turntables. Equip 3 yrs old & has not been used. Too much to itemize. 421 Fidelipacs like new cartridges, best bid wins. Call Fritz at 303-482-4873.

Want to Buy

Various studio equip for station in Caribbean, including T-T's, R-R's, cart machines, limiters, etc. RM Joseph, Island Comm, 88 Theford Ave, Boston MA 02124. 617-288-1754.

AUTOMATION EQUIP.

Want to Sell

IGM-PAL logging system incl Xtel printer, Vistar CRT, logger & decoder, \$500. T Wojciechowski, Garden City Bcdt, 400 Ryman St, Missoula MT 59802. 406-728-9300.

Carousel, 250 RS, R Baker, Bcdt Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Harris 9A01 program automation system, brain, pwr supply, source rack, cards & spares, extra memory, spare CPU, Tec 70 console, sell or trade for DP1 & cash, avail now. R Buxter, WMAV, POB 450, Springfield IL 62705. 217-629-7077.

ITC 750 R-R PB decks w/25 Hz tone sensors, new stereo Nortronics heads, perfect, \$1000. B Fornoff, KKEI, 402-534-2071.

IGM 48-S stereo Instacarts (3), mint cond, at \$6500 ea. T McGinley, First Media Corp, POB 10239, Wash DC 2A018. 301-441-3500.

Carousel RS252 stereo, \$795. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Harris System 9000 time announcers, (2) Insta-carts (3) reels, like new, \$45,000. J Quesenberry, WCIR, 305 Reservoir Rd, Beckley WV 25801. 304-252-6452.

Automated Bcdt Controls 2800APM automation system, factory re-cond, avail w/factory warranty, gd system for sat programming. S Cichorsky, KPRL, POB 7, Paso Robles CA 93447. 805-238-1230.

IGM 770 plus 750 (2), extra boards & disks, \$3000 plus ship. E Miller, KXLE, 1311 Vantage Hwy, Ellensburg WA 98926. 509-925-1488.

IGM Basic A automation system, complete, call for details, M Hieb, KUTR, POB 1229, Salt Lake City UT 84111. 801-533-9305.

Sequencer system, 4-deck, live assist, ITC R-R compatible, \$300. R Rocks, KZLS, Box 23569, Billings MT 59104. 406-248-2681.

Cassette-based automation: brain, terminal, printing logger, country-music library & 12 decks; stand-alone prod system w/2 decks; custom liners avail, all together or separate. BO. R Forrester, WKAE, POB 1646, High Springs FL 32643. 904-454-3666.

Gates automation equip incl: KSP-10, TS4 time selector, RA-10 sub programmer & more, call for details. D Jackson, WPRN, POB 566, Butler AL 36904. 205-459-3222.

Harris 9003 automation; IGM mdl II Go-Cart Carousel, 42 tray; IGM Instacart, 48 tray, excel cond, great price. S Portier, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Systemation cassette based automation system, incl: mach controller, Commodore keyboard, monitor, cassette deck, pwr supply & more, call for details, \$10,000. J Hardee, WMZQ, 5513 Conn Ave NW, Washington DC 20015. 202-362-8330.

SMC stereo 24 tray Carostat w/SMC interface, \$1500. M Persons, 218-829-1326.

Automated Bcdt Control 2504 tone sensor demos, \$200. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

Schafer 800T automation system w/(4) Ampex 440's, (4) SMC random select Carousels, one SMC 512 cart machine, one time announcer w/(2) SMC 510 cart machines & (2) Teletype mdl 3320-SJE, one SMC 592 R/P cart machine & (5) equip racks. D Jackson, WPRN, POB 566, Butler AL 36904. 205-459-3222.

Automated Bcdt Controls live assist programmer, remote control console, 25 Hz sensors, \$1200. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

Sono-Mag MSP-1 sat auto system, MSP-1 brain & controller, 3 SMC mod 452 stereo Carousels, 2 SMC mdl 722 stereo PBs, installed in roller racks, completely wired, 6 mos old, still under warranty, \$18,500. B Holbrook, KFMV, 103 Wilson, Franklin LA 70538. 318-828-5372.

Harris silence sensor, 3-1/2" rack mount, \$100. L Berg, WZNE, 8320 Starkey, Seminole FL 33543. 813-391-9988.

Comex CG-25 25 Hz gen, \$200. J Whitney, WPXY, 55 St Paul, Rochester NY 14604. 716-325-5300.

SMC automation equip comp w/7 Carousels, \$16,000. K Segars, WTIB, 1507 W Quitman, luka MS 38852. 601-423-1000.

Complete automation system call for details. J Parker, KKAN, Cottonmill Rd, Kearney NE 68847. 308-234-1367.

Want to Buy

Xerox of Metrotech 3000 automation sequencer schematic & layout, offer \$20? T Trott, TTA Prod, 5477 Carter, Lake Mary FL 32746. 305-323-0472.

Carousel 250's, need 4. B Kramer, WZZT, Box 373, Johnstown OH 43031. 614-967-6776.

Schafer 903 w/Carousels, B Kramer, WZZT, Box 373, Johnstown OH 43031. 614-967-6776.

Tone gen, 25 Hz, J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

Multi-cart PB unit, ie: Instacart, Audiofile, in gd cond. J Torsitano, KARZ, POB 50, Burney CA 96013. 916-335-5477.

CAMERAS (VIDEO)

Want to Sell

Ikegami HL-79A w/Angenieux lens, Sony BVH-500 port 1" w/AC adapter & chroma stabilizer, \$30,000. T Cereste, Lightscape Prods, 420 W 45th 4th Fl, NY NY 10036. 212-757-0204.

Panasonic 3990-B, cams, studio monitors, focus/zoom cables, tripod, 2 packages, \$3450 ea/BO. L Froom, SPS Video, 1901 Chapel Hill Rd, Silver Spring MD 20906. 301-598-5392.

CEI 287 (2), w/CCU, lens, all cables, new plumbs, clean, \$4500/both. C Potorti, Potorti Video, 10005 Lacy, Morrisville PA 19067. 215-945-3990.

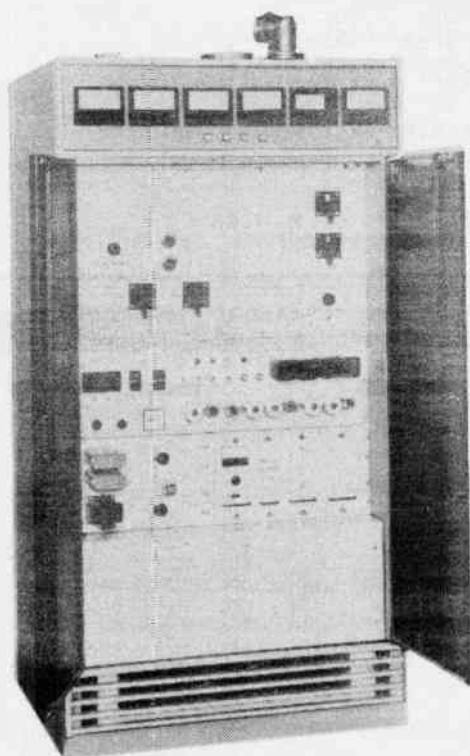
Fujinon 10:1 zoom lens, studio type for C-mount, BO. A Weiner, WOZI, POB 1117, Presque Isle ME 04769. 207-764-6022.

RCA TK-76A camera w/plumbicons, Anton Bauer battery bracket, Cine 60 belts, \$2200. L Whelden, Whelden Prod, Box 404 RD2, Muncy PA 17756. 717-435-0592.

Sony CMA-6 CCU for 1610 or 1640 cameras, \$175. R Weller, RSB5, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

Sony Tricon color camera mdl DCX 1210, needs work, \$150. F Moreland, 748 Yosemite, San Diego CA 92109. 619-272-7538.

Viewfinder, manual & lens for Sony DXC-1210; also Sony DXC-1610 (& manual) for parts or repair, reas. C Asplund, WATR, 79 Baldwin, Waterbury CT 06706. 203-755-1121.



CCA

Nearly a Quarter Century of
RELIABLE TRANSMITTERS

AM & FM Transmitters

10 W - 100 kW

Parts & Service
(404) 964-3764
Sales
(404) 964-3530

CCA Electronics Corporation
360 BOHANNON ROAD / P.O. BOX 426
FAIRBURN, GEORGIA 30213 PHONE: 404/964-3530

Rw

Broadcast Equipment Exchange

CART MACHINES

Want to Sell

NCA 8A-27 record/RT27 unit w/extra RT27 PB, mono 3 pcs. ready to use w/rack, \$250. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

ATC cart PB w/rec amp, \$495. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Gates Criterion 80 PBs (3), mono, single cue, excel cond, \$325 ea; Gates Criterion 80 R/PB (2), mono, single cue, excel cond, \$450 ea. T Baun, WEZW, 735 W Wisconsin #401, Milwaukee WI 53233. 414-272-1040.

Tapemaster X-700RP, mono, new in factory box, \$850. G Kippel, KAMB, 90 E 16th St, Merced CA 95340. 209-723-1015.

ITC Delta III 3 deck mono cart machine, new, \$3500. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

NCA RT-7 cart machines (2), J Gilchrist, WTBF, POB 747, Troy AL 36081. 205-566-0300.

Spotmaster 505 R/P & 505 PB only cart machines, gd cond, \$300/pr. F McCall, Performance Svcs, 1521 W St Marys Rd No 229, Tucson AZ 85745. 602-623-2110.

Tapemaster 700P, like new cond, \$300. R Wiles, Comm Svcs, 9421 BaMentine, Overland Pk KS 66214. 913-541-9674.

NCA RT-27 stereo (2) R/P, \$300 ea; 1P, \$200, rack mount. M Saady, First City Recdg, 141-60 84 Rd 3E, Briarwood NY 11435. 212-754-7727.

UMC 12-123-622 stereo cart recorder w/mono heads; over 350 Fidelipac grey & blue type 300 & over 50 red Master carts, mostly shorter lengths in gd cond. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

None program & cue cards for Gates Criterion, also misc parts. BO, C Larko, Larko Audio Prod, 124 W Washington, Ste 230, Ft Wayne IN 46802. 219-424-2405.

Criterion stereo, (3) plus recording amp, \$1000. G Arroyo, WONQ, POB 150207, Orlando FL 32808. 305-297-1140.

BE 2100 mono R/P in excel cond, 1 yr old, \$1300; BE 5300 mono triple deck, 1 yr old, \$2300. WEQX, POB 102.7, Manchester VT 05254. 802-362-4800.

Gates Criterion cart machines (2) w/stereo record unit, \$300. R Simonson, HDM Comm, Box 99, Mears MI 49436. 616-873-3817.

Nortronics QM-114 cart head precision mounts, new, BO, N Lederman, Oval Window Audio, 306 Congress, Portland ME 04101. 207-775-7292.

ITC PD-11 mono R/P, almost new. C Phillips, WOLA, POB 1530 Woodson Mall, LaFollette TN 37766. 615-566-1000.

Spotmaster 10-70, low hrs, w/cue tone & fast advance features R/P, \$600. A Weiner, WOZI, POB 1117, Presque Isle ME 04769. 207-764-6022.

ITC 3 deck stereo, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

ITC Record/playback stereo, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

ITC SP, mono, 3 tone, rebuilt, \$550. T Gaiser, 1313 Telegraph, Bakersfield CA 93305. 805-871-0221.

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.

Want to Buy

Spot Master 500 series table top or rack recorders & players, repairable; also ITC RP series motor, one w/rapid cue, also need some boards. C Asplund, WATR, 79 Baldwin, Waterbury CT 06706. 203-755-1121.

Sparta 500CDL cart recorder/delayed cart schematic. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Collins 642EE mono Twintape PB only or Gates Criterion mono PB only, J Vukelich, Metro Recdg, 4551 Flag Ave No, Minneapolis MN 55428. 612-537-1431.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Teac 80-8 8 trk recorder w/dbx, \$2000; Teac 3340 4 trk recorder, \$600. R Dias, Creative Snd, 602 Cree Dr, San Jose CA 95123. 408-224-1777.

Scully 280B mono, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Nagra IV-S stereo recorder, non-sync QHT leather case, CHQ carrying strap, QHP carrying handle, \$3500. G Craig, KNEW, POB 910, Oakland CA 94607. 415-836-0910.

Sony TC-355 stereo R-R deck, 3 speeds, working, clean, \$120. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Alai R-R cross field heads, tube type, perfect cond, stereo, 3 speeds, \$120. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Revex 877 recorder 7 1/2-3 3/4 speed, 1/4 trk, \$600; Tascam 80-8, gd cond, \$1200. T Roller, Hollywood Demo Svcs, 1626 N Wilcox #105, Hollywood CA 90028. 818-994-5368.

Ampex AG-440C PB only, excel cond, (4), \$1000/ea. T McGinley, First Media Corp, POB 10239, Wash DC 2A018. 301-441-3500.

ITC 750 R-R decks, excel, like new, PB only w/25 Hz sensors, \$1000 ea. S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

Technics 1506US 2 trk R&P, 4 trk PB, new head block, low usage, \$900. A Allegra, Calvary Baptist Press, 1360-B Valley Forge Rd, Lansdale PA 19446. 215-855-4008.

Sony TC-755 3 1/4-7 1/2 1/4 trk 10 1/2 reel, mint, new heads, \$600. J Pines, Creative Audio, 705 W Western, Urbana IL 61801. 217-367-3530.

Magnacord P76-R, Magnacord 1024, (2) Concertone 20/20. R Sauter, WSLU, Payson Hall St Lawrence Univ, Canton NY 13617. 315-379-5356.

Nagra III, gd cond, \$1200; Scully 8 trk w/motion sensor, roll around cart & 4 trk head stack, \$5000. T Cereste, Lightscape Prods, 420 W 45th 4th Fl, NY NY 10036. 212-757-0204.

Nortronics 8 trk 1" erase & R/P heads, R Robinson, TNA Records, 10 George St, Wallingford CT 06492. 203-269-4465.

Teac 80-8 w/servo & DX8 w/spare motor, manuals, new head, \$3000/BO. T Troit, TTA Prod, 5477 Carter, Lake Mary FL 32746. 305-323-0472.

Ampex 300 decks, mono, 1 missing T/U motor, \$100; Presto RC1024 deck w/2 electr w/schematics, \$50. R Robinson, TNA Records, 10 George St, Wallingford CT 06492. 203-269-4465.

Scully 280 SP-14, 2 trk stereo rec/rep, takes 14" reels, motion sensing, remote control, console, vgc (2), \$1800 ea. T Baun, WEZW, 735 W Wisconsin #401, Milwaukee WI 53233. 414-272-1040.

Ampex 351 mono w/tube electr, \$350; Ampex 354 electr only, \$100; Ampex 350 for parts transport & tube electr, no heads, \$150; Ampex SP-300 4 trk recorder, \$400. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

Ampex ATR's 102's & 104's, remotes, search to cue, VSO, spares, A Varner, Penynlane Studios, 1350 Ave of the Americas, NY NY 1A019. 212-687-4800.

Nagra IV-SL 1/4" stereo, RE15 mic, carrying case, \$3295. H Hillsman, Hillsman Tech Consult, 1152 N White River Rockway W Dr, Indianapolis IN. 317-634-9104.

MCI 1/2" 4 trk mdl JH-1.0A, mint cond, bought for display in museum exhibit, never used, eng inspected, \$5000. S Woodward, The Natl Learning Ctr, 800 3rd, NE, Wash DC 20002. 202-543-8600 X225.

MCI JH110 4 trk, WRTZ remote, excel cond, \$6000; Telex 1-3 mono duplicator, 3 mos old, like new, \$550; Telex 1-3 mono duplicator, new heads & complete Telex alignment kit, \$450/ail; Pentagon C10 mono 1-1 duplicator, excel, \$200. L Hansen, Orange Prod, 6055 Fond du Lac Ave, Milwaukee WI 53218. 414-461-3600.

Ampex 300 deck 1" Lipps head & MCI JHs elect capstan & stabilizer, BO. T Boddie, Boddie Recdg, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Ampex 1/2" 4 trk head assy, 20 hrs use, need cables, \$200. T Boddie, Boddie Recdg, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Tascam 122B bdct cassette, new, \$625. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Ampex 602 in case, fair cond, \$125; Magnecord 1021 mono, fair cond, \$325. L Collins, WJYJ, POB 422, Concord NH 03301. 603-228-9036.

Ampex AG-440, 2 trk C-transport, B-elect, excel, \$2000; Ampex AG-440, 2 trk PB only machine, \$1000. H Landsberg, Henry Engr, 750 E 5th St #83, Azusa CA 91702. 818-334-5580.

Revex A-77, \$600. J Sabella, KUTY, 38201 6th St East, Palmdale CA 93550. 805-947-3107.

Ampex 600 FT, vgc, \$150; Ampex 440A FT, \$1100; Ampex 440A-2, \$1200; 440B-2, \$1300; 350FT, \$300. M Saady, First City Recdg, 141-60 84 Rd 3E, Briarwood NY 11435. 212-754-7727.

Scully 280B 2 trk st recorder w/motion sense, excel, \$1600. M Persons, 218-829-1326.

Ampex MM1200 24 trk recorder, \$19,000. S Sallee, Monterey Snd, 230 S Orange, Glendale CA 91204. 818-240-9043.

ITC 740 tape decks (2), like new, excel w/25 Hz sensors, \$1000 ea, 2 trk stereo PB only, S Smedley, KJKL, POB 64, Seward NE 68434. 402-534-2071.

Teac 3340 4 trk w/simul sync in orig box, \$400. D Bailey, Rock Shoppe Prod, 12869 Montfort Dr No. 250, Dallas TX 75230. 214-386-7783.

Ampex AG-440 2 trk in console w/manual, mint, low hrs, \$2000; Ampex 354 2 trk in console w/manual, \$400; Ampex 300 manual, \$5. D Bailey, Rock Shoppe Prod, 12869 Montfort Dr No. 250, Dallas TX 75230. 214-386-7783.

Ampex ATR102 w/remote, excel cond, \$4500; Ampex ATR 104, w/remote, excel cond, \$6500; VSO search to cue, spare cards, etc. A Varner, Radio Band of America, 1350 Ave Americas, NY NY 10019. 212-687-4800.

Otari MX7800 8 trk & other equip, send for list, BO. S Delahoyde, ITT Tech Inst, 4837 E McDowell, Phoenix AZ 85008. 602-231-0871 X174.

Teac remote controls (many), \$50. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

Uher Royal DeLuxe C-1/4 tr R-R, \$150. M Tait, Tait Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

Magnecord 1022 electr, \$75 plus P/F. M Tait, Tait Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

Telex Copier 4 cassette & R-R recorders, \$650. M Tait, Tait Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

MAGNETIC RECORDING ELECTRONICS



Upgrade and O.E.M. models for studio tape machines, mag film recorders and high speed duplicators. Record/Play - Repro Only - Stereo conversions.

See your dealer or call...

Inovonics
SANTA CRUZ, CA (408) 458-0552

Pioneer RTV 44 quad R-R w/new headblock, \$1500. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

Ampex 440-C servo, great shape, BO. R Murphy, Darci Sound, 2736 N 11th, Beaumont TX 77703. 409-898-4556.

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

Shallcross access for SP-7 probably gd for SP-8 also, ABR 10" reel adaptor w/drive belts & NAB hub adaptors, APS pwr supply/battery charger, input/output connectors, \$200. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Martantz PMD-360 portable stereo cassette recorder, call for specs, \$250. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Sony TC-142 prof, portable, mono, cassette recorder, incl leather case & shoulder strap, \$150/BO. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Ampex 351 transport w/Novonics 355 2 chan elect in AG-440 console w/3 spd Beau motor & spare 7.5 & 15 ips Ashland motor, \$1500/BO. E Helvey, POB 1357, Winchester VA 22601 703-877-1191.

ITC 750 stereo recorder, P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Wollensak 1500 (2), excel, BO. S Morse, Morse Prod, 19 12th, Carle Place NY 11514. 516-334-5216.

Ampex 350 reel deck w/mono heads, tube electr, missing one reel motor, also one w/Novonics 375 solid state electr. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Ampex 300 w/351 elect cabinet & dolly, excel cond, BO. S Morse, Morse Prod, 19 12th, Carle Place NY 11514. 516-334-5216.

American Concertone deck carries up to 10" reels, excel cond, \$100. P Davis, Davis Radio, POB 615, Manasquan NJ 08736. 201-449-0963.

ITC 770 (4) PB stereo units w/25 Hz detectors, \$950 ea. R Rocks, KZLS, Box 23569, Billings MT 59104. 406-248-2681.

Ampex 350-351 (3) w/Novonics or 440 electr (mono), in use, rack mounted, D Green, Waves Sound, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Scully/Metrotech 400 Series logger recorder, lw hrs, excel cond, 10" logger tapes inc. BO. M Glaser, 2 Floyd Ln, Massapequa NY 11762. 516-489-1071.

Ampex PR 10, 2 trk, R/P record, \$475; Teac mdl 101, 2 trk, 4 trk PB w/3 motors, tube type, \$475. R Hillsman, HiHo Prod, 7855 S Halsted, Chicago IL 60620. 312-224-5612.

Ampex SP-300 R-R recorder w/electr, \$300; Ampex 354, no heads, gd cond, w/electr, \$250; Ampex 350 FT mono w/350 & 400 electr, \$350; Ampex 350/440 spare parts, write with wants. T O'Laughlin, WERN, 821 University Ave, Madison WI 53704. 608-266-6667.

Ampex 3200 stereo 2 trk duplicator, gd cond, some extra parts, sell all or parts, 4 slaves, BO. D Bisbee, 685 S Roys Ave, Columbus OH 43204. 614-279-6163.

Scully 280/Nortronics 4 trk 1/2" head stack, gd cond, \$200; Scully 280/Nortronics mono heads, E/R/P, gd cond, \$75. M Kuehl, Passage Recdg, 5106 Otter Lake Rd, White Bear Lake MN 55110. 612-429-4697.

MCI Pedestal for JH140 (fixed pitch), brown w/hinged cover, must go. M Glaser, 2 Floyd Ln, Massapequa NY 11762. 516-489-1071.

Teac 234 syncavet demo, \$750. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

Ampex 351 w/Novonics elec, 1/2 trk stereo (2) in rack, \$1200/pr. M Stein, KCHW, POB 2146, Menlo Pk CA 94026. 415-366-7504.

Sony 854-4S 4 trk studio type, mint cond, \$675; Sony TC-277-4 4 trk, 7" reels, \$175. B Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

THE VERY HEART OF YOUR TAPE MACHINE

Can you trust it to just anyone?



JRF
MAGNETIC SCIENCES

JRF is proud to offer a complete laboratory facility consisting of the latest in state of the art magnetic head refurbishing and optical alignment equipment.

Our staff represents over 20 years of involvement in the design manufacture, and precision service of magnetic recording heads; and it is dedicated to the continuous updating of techniques and procedures to meet the everchanging demands of the industry.

Our studies show that in most cases worn, unserviceable magnetic heads for RECORDING STUDIOS, TAPE DUPLICATING, MASTERING, AND BROADCASTING can be restored to original performance specifications for a fraction the cost of replacement. If in our FREE EVALUATION heads are found to be unrepairable, JRF maintains one of the largest inventories of premium quality direct replacement heads, as well as heads for custom and modification applications.

JRF/Magnetic Sciences, Inc.

The audio magnetic professionals with the track record to prove it.

101 Landing Road • Landing, NJ 07850 • 201/398-7426 • Telex: 325-449

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?

Broadcast Equipment Exchange

CASSETTES . . . WTS

Otari 5050B w/remote control. lrg. 4 sm reel retainers. \$1700. J Ripley, KORD, POB 2485, Tri-Cities WA 99302, 509-547-9791.

Scully 280 FT, w/Russlang cart. \$1000; Magnecord 1024 2 trk w/port cases, BO. B Rossini, WSPD, 125 S Superior, Toledo OH 43602, 419-244-8321.

Ampex 351-2, fair cond. \$1000. H Sewell, Oakridge Music, 2001 Elton, Haltom City TX 76117, 817-838-8001.

Pioneer RT1020L R-R, gd cond. \$295/BO plus post. J Funk, Chris O'Brien Prod, 1027 Orchard Grove, Royal Oak MI 48067, 313-547-1144.

Scully 250 recorder, excel cond, service manual, \$700. J Deans, Rockland Recdg, POB 272, Rockland ME 04841, 207-594-7679.

ITC 850 stereo in console, \$700. P Anderson, First Media Corp, POB 960, Provo UT 84603, 801-373-8550.

Nortronics mono heads (E/R/P) for Scully 280, gd cond, \$75. M Kuehl, Passage Recdg, 5106 Otter Lake, White Bear Lake MN 55110, 612-429-4697.

Want to Buy

Motor for Concertone 90 series, 7.5-15 ips. T Boddie, Boddie Recdg, 12202 Union Ave, Cleveland OH 44105, 216-752-3440.

Owners/service manual for Teac A2340 R-R, purchase or copy. E Wilkie, KTAAR, 301 W Osborn, Phoenix AZ 85013, 602-274-6000 X284.

Inovonics 375 record amp schematic or photocopy. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575, 813-446-0957.

Ampex MR-70 electr; Ampex MR-70 console, original only. M Tait, Tait Recd Srvs, 1347 S Capitol, Wash DC 20003, 202-488-3905.

Working slave Eit plus 2 trk head nest less heads for Ampex AG350. C Larko, Larko Audio Prod, 124 W Washington Ste 230, Ft Wayne IN 46802, 219-424-2405.

2 chan elect for Ampex tape deck, prefer solid state but gd tube unit OK, need not be working. D Bisbee, 685 S Roys Ave, Columbus OH 43204, 614-279-6163.

CATV-MATV EQUIP.

Want to Sell

Catel FM stereo modulator, used 6 mos. \$1000. J Sabella, KUTY, 38201 6th St East, Palmdale CA 93550, 805-947-3107.

B-T new BPP's ch 10 & 13, \$75 ea; B-T MCA b amps ch 3, 6, 7 & 8, used, \$75 ea. R Weller, RSBS, 6117 Code Ave S, Edina MN 55436, 612-925-2162.

CONSOLES

Want to Sell

Collins IC-10A audio console, you ship or pick up, \$2000. J Zikos, KMC Comm, SR1 Box 133, New Braunfels TX 78130, 512-885-7684.

Microtouch mono. R Baker, Bdct Parts & Srvs, POB 426, Fairburn GA 30213, 404-964-3764.

LPB 10 channel stereo, excel cond. R Baker, Bdct Parts & Srvs, POB 426, Fairburn GA 30213, 404-964-3764.

Harris 5 chan stereo, needs work. R Baker, Bdct Parts & Srvs, POB 426, Fairburn GA 30213, 404-964-3764.

Gates 5 pot stereo board, Solid Statesman type, fair cond, \$900. F Morton, KMGZ, POB 7953, Lawton OK 73506, 405-536-9530.

Arrakis 150SC 6 chan, 18 input stereo board, less than 50 hrs use, \$1700. R Reeves, WZGC, POB 54577, Atlanta GA 30247, 404-881-0093.

Gates Stereo Statesman, 5 chan, new in '71, vgc, \$1000. T Baun, WEZW, 735 W Wisconsin #401, Milwaukee WI 53233, 414-272-1040.

Gatesway 8 chan tube type, \$400. J Gichrist, WTB, POB 747, Troy AL 36081, 205-566-0300.

Harris Medalist 12 chan stereo lin attn, 100m u/d +12 hr timers 6m preamps, new, \$7900; BE 4M50 4 chan mono console, excel cond, \$600. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061, 301-761-1590.

Custom Hollowman design, 26x24 rec console, many features, 2 yrs old, \$13,500. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033, 805-488-0901.

Gates Stereo Statesman 5 chan vgc spare modules, \$1400. C Asplund, WATR, 79 Baldwin, Waterbury CT 06706, 203-755-1121.

Altec-Lansing 1567-A w/case, \$100. T Taggart, WSPD, 125 S Superior, Toledo OH 43602, 419-244-8321.

Sony MX-16 8 in 4 out, \$350. T Cereste, Lightscape Prods, 420 W 45th 4th Fl, NY NY 10036, 212-757-0204.

Ampex 8 pot, 32 input, mono, 8D8, SN2342, excel cond, \$1500. M Keith, Dean Jr College, Main St, Franklin MA 02038, 617-528-9100 X287.

Audio Design ADM-700 series console, modules, switching, amps, etc, part out or sell all. J Grimshaw, Fred Arthur Prod, 1218 E 18th Ave, Denver CO 80218, 303-832-2664.

McCurdy SS8670 consoles (2), well equipped, avail immed. M Sacks, WWRG, 8121 Georgia Ave, Silver Spring MD 20910, 301-587-4900.

BE 4 chan mono console, no mods, some paint worn off front panel, \$450. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46124, 317-266-9700.

Sparta A-15 stereo bdct console. (2) Russco stereo preamps, (2) Rek-o-Kut TTs, new Audiotronics 1/2 trk stereo reel duplicator, 30 plus prof 7-1/2" reel hard-shell cases, also monitor & cue amp, all for \$2000. W Lawhorn, Fellowship Travel Int'l, POB 15360, Richmond VA 23227, 804-264-0121.

Gates Bimote 2 mic inputs, VU meter, program level output headphone & line outputs, \$175; Bogan pre AM mixer, mdl I 108 LOM, 5 inputs, Hp, line outputs, \$130; Rauland pre AM mixer mdl 1904 tube type, 4 inputs, line out remote control, \$105. R Hillsman, HiHo Prod, 7855 S Halsted, Chicago IL 60620, 312-224-5612.

Console, 12x2, needs new pots, \$1000. D Strecker, WTLT, 100 S Brainard, LaGrange IL 60525, 312-482-9585.

McMartin B-802 8 chan stereo, now in service, gd cond, \$1500. D Gibson, WRQQ, POB 100, Lexington KY 40590, 606-252-6694.

Sparta A-15 & other equip, send for list, BO. S Delahoyde, ITT Tech Inst, 4837 E McDowell, Phoenix AZ 85008, 602-231-0871 X174.

Harris Stereo Statesman restored, new caps, switches, pots & lamps, \$2200. D Bailey, Rock Shoppe Prod, 12869 Montfort Dr No. 250, Dallas TX 75230, 214-386-7783.

RCA 76-2B mono, gd cond, w/pwr supply, \$200. S Bartkowski, WEDC, 4923 W 28th, Illinois 60650, 312-863-3090.

API 2001 console mainframe, pedestal, cords, parts, no faders or meters, \$2000. M Saady, First City Recdg, 141-60 84 Rd 3E, Briarwood NY 11435, 212-754-7727.

GE BA-31 dual channel stereo (3); (2) BA-21 dual chan; hundreds of spare parts, BO. L Tighe, WRNJ, Box 1000, Hackettstown NJ 07840, 201-850-1000.

Tascam mdl 10 8x4 recording console w/Pacific Recorders' mon module & 4 trk remote control. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123, 619-565-6006.

DJ bdct mobile unit, w/remote 8 input stereo mixer on roll-a-round folding console w/dual turntables, \$800; Altec dual pwr mixer mdl 1592B in like new cond, solid state type, \$200. F McCall, Performance Srvs, 1521 W St Marys Rd No 229, Tucson AZ 85745, 602-623-2110.

Tascam mdl 3, 8x4, used once, \$700. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702, 217-787-0800.

Interface mdl 200 portable, call for specs, \$800. E Helvey, POB 1357, Winchester VA 22601, 703-877-1191.

Vanco MM-7, small prod or disco mixer, mono/stereo, 6 inputs, \$150/BO. E Helvey, POB 1357, Winchester VA 22601, 703-877-1191.

Tascam mdl 3 console, 8x2 ch, like new, \$750. B Davidson, Davidson Comm, 2712 Eastlake Ave E, Seattle WA 98102, 206-325-5550.

Shure M-68 mixer, vgc, P Combs, Only Son Prod, 2316 Forest Home, Dayton OH 45404, 513-236-2340.

Gatesway 8 tube-type, no pwr supply, \$250; RCA BC2B, old, \$150. L Houck, Rollin Recdg, 210 Altgelt, San Antonio TX 78201, 512-736-5483.

M 67 mixer, excel cond, \$150. J Ripley, KORD, POB 2485, Tri-Cities WA 99302, 509-547-9791.

Cotec Centurion 1, 32 in & 3 mono out, parametric EQ, PS & mon amp, vgc, \$3500. B Betlej, WKDW, POB 2189, Staunton VA 24401, 703-886-2376.

Collins 2122-1 remote mixer, gd cond, \$125; Gates Studioette, fair cond, solid state amps, \$75. B Rossini, WSPD, 125 S Superior, Toledo OH 43602, 419-244-8321.

Want to Buy

Collins 122 remote amp schematic. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575, 813-446-0957.

Collins 212M mono audio console schematic and/or manual or copy. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575, 813-446-0957.

Gates Stereo Statesman output module, working or not, also stereo Q pots, T Trott, TTA Prod, 5477 Carter, Lake Mary FL 32746, 305-323-0472.

RCA BC-7A stereo console transistorized modules needed to replace some stolen: BA-71 pre-amps, BA-73 program amps, BA-74 monitor amps & hi level isolation units 600/600, buy or trade. M Glaser, 2 Floyd Ln, Massapequa NY 11762, 516-489-1071.

WE 25B w/table; RCA or WE portable tube type mixer, R Van Dyke, Van Dyke Inc, Squires Ave, E Quogue NY 11942, 516-728-1327.

DISCO & SOUND EQUIP.

Want to Sell

Ecoplate II, excel cond, \$1600; Lexicon M92, excel cond, \$500. J Pines, Creative Audio, 705 W Western, Urbana IL 61801, 217-367-3530.

Orban 111B reverb, \$490; MicMix XL210A reverb unit, new, \$500. G Chapekis, Mirror Image, 8505 E Temple #447, Denver CO 80237, 303-694-6642.

Recording studio, complete 8 trk, offer. L March, 2516 W Armitage Ave, Chicago IL 60647, 312-227-2600.

EMT 140 mono tube reverb, newer tubes & clips, works great, \$2400. L Hansen, Orange Prod, 6055 Fond du Lac Ave, Milwaukee WI 53218, 414-461-3600.

AKG BX10 reverb, gd cond, \$700. T Roller, Hollywood Demo Srvs, 1626 N Wilcox #105, Hollywood CA 90028, 818-944-5368.

Recording Pressing Plant, comp w/2 semi-auto Firebilt presses, vacuum feed system, etc, \$15,000/BO. T Boddie, Boddie Recdg, 12202 Union Ave, Cleveland OH 44105, 216-752-3440.

Recording Studio, complete 4 trk, like new equip, Teac, Tascam, Sony, dbx, Marantz, etc, \$6750. Twila Stoller, 2320 Eade Ave, Ft Wayne IN 46805, 219-484-7390.

Sound Workshop 242C stereo reverb, \$250. P Cibley, Cibley Music, 138 E 38th St, NY NY 1A016, 212-986-2219.

AKG BX20E reverb, one spring needs minor repairs, \$1100. R Robinson, TNA Records, 10 George St, Wallingford CT 06492, 203-269-4465.

JBL horns w/large diffraction lenses, \$250/both. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033, 805-488-0901.

E-V Sentry 5 speakers in oak cabinets, vgc, \$325/pr. D Green, Waves Sound, 1956 N Cahuenga, Hollywood CA 90068, 213-466-6141.

Altec 1592A mixer, 6 inputs, mono w/in-put trans, \$90. D Green, Waves Sound, 1956 N Cahuenga, Hollywood CA 90068, 213-466-6141.

Ursa Major BX-32, digital reverb unit, \$2200. K Mac Gregor, 98 River View, Fairfield CT 06430, 203-259-7159.

Orban 622B, parametric EQ, \$500. K Mac Gregor, 98 River View, Fairfield CT 06430, 203-259-7159.

Audio Envelope Systems Minicube direct box, \$60. K Mac Gregor, 98 River View, Fairfield CT 06430, 203-259-7159.

B&W drivers, many on hand. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181, 617-235-8427.

White full band room EQ's (2), BO. R Murphy, Darci Sound, 2736 N 11th, Beaumont TX 27703, 409-898-4556.

Dolby B mdl 330 stereo encoder, 2 chan encode/decode unit, \$1000. G Lewis, Lewis Recdg, POB 3671, Arlington VA 22203, 703-521-1871.

Altec A7 15" spk system, \$700; JBL D130 15" woofer, \$100; JBL 2205A 15" spk, \$125; JBL 18", \$200. F McCall, Performance Srvs, 1521 W St Marys Rd No 229, Tucson AZ 85745, 602-623-2110.

Dolby M-16 NR unit, hardly used, willing to trade for tape mach, etc, \$5000; also have various rare mics & other equip. C Egnoin, Original Sound Stds, 7120 Sunset Blvd, Hollywood CA 90046, 213-851-1147.

AKG BX-10-IE stereo reverb, has EQ volume level adjs, doesn't need mixer, \$600. G Lewis, Lewis Recdg, POB 3671, Arlington VA 22203, 703-521-1871.

Ursa Major Space Station, \$1400; MXR delay, \$450; Delta Lab DL-2 acoustic computer, \$850. D Kocher, 1901 Hanover Ave, Allentown PA 18103, 215-776-1455.

Want to Buy

Pultec or Lang EQ tube EQP-7A, EQP-7S, EQH-2, MEQ-5, \$250-\$400. J Pines, Creative Audio, 705 W Western, Urbana IL 61801, 217-367-3530.

Advent, Sony, Teac dual process Dolby units. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181, 617-235-8427.

JBL Harfields, Paragons, 375, 150-4C, EV Patricians, Altec Laguna, 288 BC, 515B plus related raw speaker components. C Dripps, Kurluff Ent, 4331 Maxson, El Monte CA 91732, 818-444-7079.

LIMITERS

Want to Sell

RCA BA-6A, mint, manual, new tubes, \$525. J Pines, Creative Audio, 705 W Western, Urbana IL 61801, 217-367-3530.

CRL FM4, excel cond, \$3500. T Gaiser, 1313 Telegraph, Bakersfield CA 93305, 805-871-0221.

Volumax 410, \$175. R Baker, Bdct Parts & Srvs, POB 426, Fairburn GA 30213, 404-964-3764.

Orban 8100 A/XT 6 band limiter, like new, \$1800; Harris Solid Statesman FM limiters (2), gc, \$150 ea; Harris Solid Statesman AGC, gc (2), \$150 ea. M Holderfield, WOOF, POB 1427, Dothan AL 36302, 205-792-1149.

RCA 96A antique limiter, BO. R Robinson, TNA Records, 10 George St, Wallingford CT 06492, 203-269-4465.

Optimed studio chassis for 8100, excel cond, \$500. F Morton, KMGZ, POB 7953, Lawton OK 73506, 405-536-9530.

FM Solid Statesman limiters. S Wilson, KLIR, Columbus NE 68601, 402-534-2071.

Optimed 8100 XT six band limiter chassis, like new, \$2000. R Lafore, WLGA, POB 1327, Valdosta GA 31603, 912-244-8643.

Elcom composite clipper, works well, \$300; CBS Volumax 4111 stereo FM, works well, \$500. H Landsberg, Henry Engr, 750 E 5th St #63, Azusa CA 91702, 818-334-5580.

Elcom WBL composite clipper, \$200. G Kippel, KAMB, 90 E 16th St, Merced CA 95340, 209-723-1015.

UREI BL-40 Modulimiter & Harris AM limiter, \$800/both. B Miller, WBBX, POB 815, Kingston TN 37763, 615-376-4720.

CBS Labs Audimax 400 series, stereo, rebuilt, \$325. T Taggart, WSPD, 125 S Superior, Toledo OH 43602, 419-244-8321.

Orban 8000A, \$2350 firm, clean & recently checked out. S Wilson, KLIR, Columbus NE 68601, 402-534-2071.

Distributor Directory

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

HY JAMES
the audio professional
Aphex
Broadcast Electronics
dbx Eventide
Gentner JBL
Nakamichi Pro Orban
Otari
Straight Wire Audio
Tascam UREI
And a whole lot more!
Call Paul Grzeblak:
313/471-0027
In Michigan: 800/482-2291
24166 Haggerty Road
Farmington Hills, MI 48024

One Source the best prices
CALL: SPENCER BROADCAST
1-800-221-6941
P.O. Box 26899 • Phoenix Arizona 85068

TRANSMITTER PARTS
Vacuum caps Mica Caps
Rectifiers RF AM Meters
Transformers Rebuilt Tubes
Coils Etc
Broadcast Parts & Service
360 Bohannon Rd.
P.O. Box 426
Fairburn, Georgia 30213
(404) 964-3764

CeCo communications, inc.
Franchised Distributors of Electron Tubes and Semi-Conductors
ANTHONY IANNA
Broadcast Radio Manager
Call 800-221-0860
2115 Avenue X
Brooklyn NY 11235
718-646-6300/TWX235125

audiotechniques
MCI CHECK US BEFORE you buy!
If you have MCI equipment, you need "The Book." Free to end users. Call or write Bob Berliner c/o Audiotechniques, Inc. 1619 Broadway New York NY 10019 Phone: NY: 212-586-5989 or CT: 203-359-2312

STANDBY POWER
Are You Ready To:
• Protect your equipment?
• Be on the air?
• Reduce total downtime?
Call Peter Palagonia at 512-726-0130 for 3 reasons why NORAC is the best in STANDBY POWER.
"we believe you should be ready!"
NORAC BROADCAST POWER SYSTEMS
1305 Corpus Christi St. Laredo, Texas 78040

Your Best Buys are at
RADCOM INCORPORATED
Towers, Transmitters, Coax, Antennas, Studio, SMC Automation, RPU & STL
CALL TOM BUTLER
501-253-8556
RADCOM, INC
P.O. Box 191
Eureka Springs, AR 72632

SURCOM ASSOCIATES
• CORNELL-DUBILIER MICA CAPACITORS
• ITT JENNING'S VACUUM CAPACITORS
FROM STOCK
305 Wisconsin Ave. Oceanside, CA 92054
619-722-6162

Can't Find It? Call 1-800-426-8434 For Immediate Action! Want To Sell It?

Broadcast Equipment Exchange

LIMITERS . . . WTS

Dorough 310 stereo processor, ready for use, \$800. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

CBS Volumax 4111, \$150; CBS Audimax III, \$125. R Simonson, HDM Comm, Box 99, Mears MI 49436. 616-873-3817.

Harris MSP-90 AM limiter, excel cond, \$600. M Persons, 218-829-1326.

Collins U-26 limiter/compressor recon, tube type, \$60. R Hillsman, HiHo Productions, 7855 S Halsted, Chicago IL 60620. 312-224-5612.

UREI LA-4 compressor/limiters (2), \$550/both or \$325 for one. K Mac Gregor, 98 River View, Fairfield CT 06430. 203-259-7159.

Atac 436B compressor, gd cond, \$50. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Dorough DAP-310 FM audio processor, missing to EQ card, w/extra FM peak limiter PCB. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Orban 8000A just back from factory, sounds great, \$2000. R DePas, KZKX, 212 So 1st, Lincoln NE 68434. 402-474-4113.

Orban 8000A, \$2000. H Bright, WWOQ, POB 5157, Wilmington NC 28403. 919-763-9977.

Harris MSP-100 (2) AM audio processors, \$1000 ea. M Persons, 218-829-1326.

CBS R-111-2 tube predecessor to Volumax. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Inovonics MAP-II AM multiband processor; Inovonics 215 processor w/chassis, pwr supply, & basic output card. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Volumax 400; Volumax 411, stereo for FM. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Processing Plus tri-band AM audio processor, almost new, bargain. C Phillips, WQLA, POB 1530 Woodson Mall, LaFollette TN 37766. 615-566-1000.

BE CLE-AM & CLE-FM, BO. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

Want to Buy

CBS Volumax 410 schematic; CBS Dynamic Presence EQ mdl 450 schematic. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Teletronix LA-2A or UREI LA-2A, \$500. J Pines, Creative Audio, 705 W Western, Urbana IL 61801. 217-367-3520.

MICROPHONES

Want to Sell

Sennheiser MD421U mic, new, \$190. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Astrolite sportscaster headset w/mic, like new, never used, BO. C Phillips, WQLA, POB 1530, LaFollette TN 37766. 615-566-1000.

RCA 77DX mic, excel cond, \$250. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

Neumann U-64 tube type w/pwr supply (2), BO or trade for U-84. A Varner, Pennylane Studios, 1350 Ave of the Americas, NY NY 1A019. 212-687-4800.

WE-Atac 639 mics, complete w/442 jack & WE to 5/8 stand adaptor, \$250; WE 618 dynamic mics w/jack & mount, \$150. EA Roche, Crown Recording, 1238 Pennsylvania St, Kansas City MO 64105. 816-221-6226.

AKG C-414EB/P48 condenser mics, w/H-17 shock mounts, excel cond, (3), \$550 ea. S Boucher, WDAY, 301 S 8th, Fargo ND 58103. 701-237-6500 X363.

Atac 21B tube mic w/power supply, \$250. R Robinson, TNA Records, 10 George St, Wallingford CT 06492. 203-269-4465.

EV-666 gd appearance, \$50. T Taggart, WSPD, 125 S Superior, Toledo OH 43602. 419-244-8321.

AKG C60 (2), excel, \$400 ea; (4) AKG C28, excel, \$475 ea; 1 AKG D1000, \$100. J Pines, Creative Audio, 705 W Western, Urbana IL 61801. 217-367-3530.

RCA 44 w/yoke mount & cable, gd cond, \$374/BO; Neumann U-87 mic, excel cond, guar perf, \$750 or trade for excel Evenide Harmonizer. V Taft, RHG, 1326 Midland, Syracuse NY 13205. 315-475-2936.

E-V DL-42 dynamic shotgun mic comp w/shock mount & wind suppressor in carry case, new cond, \$100 plus ship. I Kaufman, Natl Recd, 460 W 42nd, NY NY 10036. 212-279-2000.

Shure SM58-B mic, \$325. D Green, Waves Sound, 1956 N Cabuenga, Hollywood CA 90068. 213-466-6141.

AKG C12-A, immac tube mic w/orig pattern-selectable PS & B&K test plot documentation, \$1175/BO. V Taft, RHG, 1326 Midland, Syracuse NY 13205. 315-475-2936.

Want to Buy

Old mics & mic badges wanted, parts of same OK too, I'll pay shipping. M Glaser, 2 Floyd Ln, Massapequa NY 11762. 516-489-1071.

MISCELLANEOUS

Want to Sell

Patch bay (2), tip-sleeve, unwired, also several patch cables, \$100. K Schipper, WMAD, Box 7727, Madison WI 53707. 608-249-9277.

Patch panel, never used, new cond, \$75. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Patch panels, 5 dbl row, w/T332A jax, \$35 ea; 2 single row patch panels, \$25 ea. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Apple A3M0025 letter quality printer, gc, BO. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

Ampex AA-602 (2) in Samsonite cases w/cords, \$125 ea. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

Rusiang S series dbl pedestal cabinet (2), new, \$350 ea. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Xformer, 120 V primary, 6.2 kV CT, 300 mA for 3 kV plate supply, 40 lbs, \$100. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Hazeltine 1421 computer CRT & keyboard, RS-232 interface, \$150. K Schipper, WMAD, Box 7727, Madison WI 53707. 608-249-9277.

Jennings coax switch w/LC connectors, \$395. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

Radio Station, class A FM/daytime AM in Ohio, only stations in county, includes 2 acres of land, \$350,000 cash, no terms. G Davis, POB 227, Waverly OH 45690. 614-947-2166.

Eidson crystal for 1490 kHz, BO. B Miller, WBBX, POB 815, Kingston TN 37763. 615-376-4720.

FM Search Software for Apple II computers, inc many databases, legitimate copy, \$50. S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

Motorola radio cabinet, 6', 2 doors, \$100. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63112. 314-427-7584.

Plate transformers, 230 V pri, 3600 V CT sec at 1 amp, \$75. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

TT 144PP patchbay, BO. R Murphy, Darci Sound, 2736 N 11th, Beaumont TX 27703. 409-898-4556.

Radio station, 5000 W, F-T in NC, gd & growing radio market, \$425,000 w/\$75,000 down. Gary Whittle, The Whittle Agency, 8304 Druids Ln, Raleigh NC 27612. 919-848-3596.

Equip racks, (4) 2 6-1/2", 2 29". D Strecker, WLTL, 100 S Brainard, LaGrange IL 60525. 312-482-9585.

Heavy duty springs for Luxo boom, 1 set, new, BO. C Larko, Larko Audio Prod, 124 W Washington, Ste 230, Ft Wayne IN 46802. 219-424-2405.

Cabinet, 40 x 25 x 25 w/24" RP screen & front surface mirror, BO. S Morse, Morse Prod, 19 12th, Carle Place NY 11514. 516-334-5216.

Panelmeters, various types, RF, volt & amp AC or DC, 2-1/2 & 3-1/2 RD, state need's, \$4 ea. S Bartkowski, WEDC, 4923 W 28th, Illinois 60650. 312-863-3090.

Telex 33, system tele-typewriter, ribbon punch, less stand, BO. R DePas, KZKX, 212 So 1st, Lincoln NE 68434. 402-474-4113.

Complete studio, xmtr facilities, 1 kW AM Class A FM, 3 room house on 3 acres & more, \$370K. J Robillard, KLVU, 1803 N First East St, Haynesville LA 71038. 318-624-0105.

Dummy load, 1-5/8" EIA flange, 1 kW cont. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

Kohler generators, 3.5-5.00 kW, 4 cyl, \$100. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63114. 314-427-7584.

Misc Bdct Gear: inc RCA MI-11723 passive audio filter; ATR 6 VDC to 110 VAC 150 W pwr inverter; TV relative field strength meter (homebuilt); Lenkurt 37717 75 baud rcvr filter unit; RCA OP-6 portable line amp; Gate MM5548A console pwr supply/amp. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Propane tanks, 150 gal, \$100. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63114. 314-427-7584.

UTC audio transformers, (2) A-22, (2) A-24, A-21, (2) A-39 & (2) A-33 magnetic shields, \$125/all or \$20 per transformer \$5 per shield. E Helvey, POB 1357, Winchester VA 22601. 703-877-1191.

Microwave racks, 6' high, \$75. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63114. 314-427-7584.

Directional Loop antennas, new (5). R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Want to Buy

LPTV or translator CP, prefer UHF but would consider VHF. J Reichard, Satellite Video, POB 557, Mechanicsville MD 20659. 301-373-3339.

All bdct equip in any cond, cart machines, consoles, xmtrs, exciters, will pay small price plus ship, used xmtrs & rcvrs need quick, also used FM translators, working or not. C Washington, CCW Comm, POB 1232, Lady Lake FL 32659. 904-753-1098.

MONITORS

Want to Sell

Gates M02639 complete for parts, AM mod monitor, \$50 plus frt. T Trott, TTA Prod, 5477 Carter, Lake Mary FL 32746. 305-323-0472.

RCA BW-66 AM mod monitor (2), \$40 ea or 2/\$75; Continental RF amp/detector, tuned 1370 tube type, works, \$35. T Taggart, WSPD, 125 S Superior, Toledo OH 43602. 419-244-8321.

McMartin TBM-2500 FM monitor RF amp. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

GR 1181A freq mon for 600 kHz; GR 1931-A AM mod mon. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

RCA Lissajous type phase monitor; Nems-Clark 112 phase monitor w/remote panel. P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Want to Buy

Chan 12 aural modulation, freq monitor, HP or GE type OK. S Smedley, KJKL, POB 64, Seward NE 68434. 402-534-2071.

MOVIE PRODUCTION EQUIP.

Want to Sell

Steenbeck 4 plate 16mm editing mac; Magna-sync 16mm recorder; Nagra & Sennheiser equip. BO. R Van Dyke, Van Dyke Inc, Squires Ave. E Quogue NY 11942. 516-728-1327.

Bush Pressman camera w/101mm lens, \$125; Federal enlarger mdl 10 w/lens & easel, \$160; RCA 12" spkrs in caddy, \$65; EV crossover mdl XX335, \$25. R Hillsman, HiHo Prod, 7855 S Halsted, Chicago IL 60620. 312-224-5612.

Want to Buy

C-mount zoom lenses, stiff, repairable, any cond. C Asplund, WATR, 79 Baldwin, Waterbury CT 06706. 203-755-1121.

RECEIVERS & TRANSCEIVERS

Want to Sell

Regency TR-200 VHF 2 way, new cond, on 161.73 MHz, hardly used, \$450; Motorola HT 220, UHF, 4 W output, 4 chan on 450.450/455.450, clean, \$500. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Collins R-105A aircraft shortwave rcvrs, one converted to 110 VAC, \$60. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

Reachcaster 2000 sub-carrier paging terminal plus 75 tone & voice pagers avail, terminal \$3000 & \$50 ea for pagers or BO. F Mastick, 76 O'Hara Ln, Jackson TN 38305. 901-668-7922.

Heath HW 12 75 meter transceiver w/PS, mint, \$200. F Peerenboom, WMIQ, POB 10, Iron Mtn MI 49801. 906-774-4321.

McMartin TR66, \$20; TR66A, \$25; TR55D, \$45; TN66 & 77, \$20; Browning ST300A, \$25. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

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: _____

POSITIONS WANTED

Xmtr Engr looking for position as xmtr chief/super or solo xmtr man, have managerial, chief & super exp, exc refs. I love xmtrs & they love me. Jerry, 402-534-2071.

Program Dir, 12 yrs exp in variety formats, pref west USA top 50 mkt AOR/A-C/CHR. Write: Box 509, Roy UT 84067.

Eng w/genrl & 34 yrs exp all phases radio looking for job in medium market, midwest or south. MW Nicholas, Rd 2, Toulon IL 61483.

CE, hard working, looking for FT pos, will consider announcer, well qual, 9 yrs exp, worked w/a former FCC eng, int in KS, parts of CO, MO, NE, OK & TX, avail immed. L Timmons, RR 2 Box 41, Stockton KS 67669. 913-425-6509.

Program Dir avail immed, willing to relocate, tape on request. B Zolnowski Jr, 865 Seneca Creek Rd, W Seneca NY 14224. 716-825-6042.

1st phone, SBE cert eng for consulting, recdg, audio for video, remotes, NYC metro only. M Saady, First City Recdg, 141-60 84 Rd 3E, Briarwood NY 11435. 212-754-7727.

Studio Mgr at Original Sound Studios seeking extra work or FT/PT position in recording, mixing or production, 15 yrs exper. C Egnolan, Original Sound Stds, 7120 Sunset Blvd, Hollywood CA 90046. 213-851-1147.

PD/Eng, exper, knowledgeable, reliable. Write RW, POB 1214, Falls Church VA 22041. Attn: Box 12-2.

Video/Film cameraman w/10 yrs documentary & industrial exper, avail for freelance or staff assignment. Call 312-465-7506.

DJ position wanted, exper in jock work, news, programming, & light eng, will relocate, strong personality & prod. Write RW, POB 1214, Falls Church VA 22041. Attn: Box 11-1.

HELP WANTED

Bdct Eng needed for northern Virginia consulting firm. Knowledge of RF systems & studio equip. College degree & exper preferred, send resume, salary history. EOE. Write: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 1-2.

Working partner wanted at WKM/West Haven Marine Radio, must have/get FCC 2nd Telegraph license, investment of time, not cash involved. Call 203-937-5074.

WANTED CHIEF ENGINEER WDAY AM/FM—FARGO

We're looking for an aggressive, hard-working professional to handle 5 kW AM and 100 kW FM. Individual must be well experienced in transmitter and studio maintenance as well as experience with directional arrays, STL's and RPU's. Salary commensurate with experience.

Send resume and salary requirements to:

General Manager
WDAY Radio
P.O. Box 2466
Fargo, North Dakota
58108



970 AM RADIO

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?



Broadcast Equipment Exchange

RECEIVERS . . . WTS

Halicrafters SX-62 mint, \$100; Collins R-105 shortwave rcvrs (2), \$30 each. T O'Laughlin, WERN, 821 University Ave. Madison WI 53704. 608-266-6667

GE 150 MHz tube 2-way rcvrs (2), P Wells, KLZZ, 8665 Gibbs Dr. San Diego CA 92123. 619-565-6006.

GE 2 W UHF portable w/acc, \$500; CE 30 W UHF base w/antenna, \$400. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

Motorola UHF ENG system inc 6 MX-300-S 5 W HT's, 6 Syntor 100 W mobile units. Spectra-Tac rcvr & comparator, antennas, chargers, other access, has been modified for wide audio bandwidth, 1 yr old, details avail. P Wells, KLZZ, 8665 Gibbs Dr. San Diego CA 92123. 619-565-6006.

McMartin TR-66-C, \$50. L Berg, WZNE, 8320 Starkey, Seminole FL 33543. 813-391-9988.

Want to Buy

VLF rcvr, Collins R-389, WRR-3A, TMC VLRB1 or other. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

SCA rcvrs, table models for household use. R Malone, Christian Radio Network, POB 6336, E Rochester NH 03867. 603-335-2005.

UHF mobile 2-way for news gathering mobiles only. D Miller, KWWW, 304 S Mission, Wenatchee WA 98801. 509-662-7135.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Gates RDC-10 remote control wire system, \$100. J Gilchrist, WTB, POB 747, Troy AL 36081. 205-566-0300.

Moseley sub carrier generator & demodulator, never used. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Motorola 890-960 MHz rcvr/xmtr, (2 sets), \$350 ea set. B Fornoff, KKEI, 402-534-2071.

Anixter Mark 4' diameter dish antennas, 940-960 MHz (2), \$350 ea. B Fornoff, KKEI, 402-534-2071.

Marti ASO-200 automatic rcvr switcher, like new, \$150. K Schipper, WMAD, Box 7727, Madison WI 53707. 608-249-9277.

Rust RC 1000 remote control, in working cond, \$900/BO. B Webster, WLAK, Ste 9020 Sears Tower, Chicago IL 60606. 312-329-8844.

QEI 7775i ATS interface, \$200. J Robillard, KLVU, 1803 N First East St. Haynesville LA 71038. 318-624-0105.

Moseley TRC-15 metering gen/demod cards, panel meter & front panel. P Wells, KLZZ, 8665 Gibbs Dr. San Diego CA 92123. 619-565-6006.

Marti R200/950, excel cond, mono only, antenna included, \$750. D Miller, KWWW, 304 S Mission St. Wenatchee WA 98801. 509-662-7135.

SCA paging system inc 100 pager terminal & 10 pagers, \$1450; also CRL SCA gen & Comex digital audio delay, all equip in mint cond. C Veirs, WBHT/WTBG, POB 198, Brownsville TN 38012. 901-772-3700.

Comtech/Fairchild digital satellite rcvr system, including 3.4 meter dash, LNA, cue-chan cards & cable, 15 kHz, 7.5 kHz, avail now, \$7,000 or assume lease at \$85/mo; also (2) ABC talk radio decoders, Epsom MX-70 printer & cables, \$1400. M Brown, KMJK, 9500 SW Barbur, Ste 302, Portland OR 97219. 503-245-1433.

Grids & solid dishes, 4'-6'-8'-10', \$75-\$100. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63112. 314-427-7584.

Wegener 1621 dual de-mod, BO; Wegener 1645 tone decoder, BO; Wegener 1646 tone decoder, BO; all in excel cond. T Peloubet, WRCL, POB 1844, Midland MI 48640. 517-631-3151.

Want to Buy

Moseley TCS-2A remote control, G Wachter, KFYI, 631 N First, Phoenix AZ 85003. 602-258-6161.

SCA gen, 67 kHz, prefer Moseley SCG-8 or equiv. T McGinley, First Media Corp, POB 10239, Wash DC 2A018. 301-441-3500.

Marti RR-50/540 rcvr on or near 455.55 MHz, in working cond. S Boucher, WDAY, 301 S 8th St, Fargo ND 58103. 701-237-6500 X363.

Moseley TRC-15AW remote control, must be in working cond. J Harrell, WSMG, POB 727, Greeneville TN 37744. 615-638-3188.

STEREO GENERATOR

Want to Sell

Moseley SG3-T stereo gen, \$200. R Simonson, HDM Comm, Box 99, Mears MI 49436. 616-873-3817.

Moseley stereo generator, latest model, never used. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

SWITCHERS (VIDEO)

Want to Sell

RCA 50 & 51 control & production, need reassembled, all manuals, also for parts, mdl 50 for \$3800 & mdl 51 for \$5500 or BO. D Leiner, Preach My Word Media, 902 Hwy St, McKeesport PA 15132. 412-673-7130.

Echolab SE-4 & other equip, send for list. BO. S Delahoyde, ITT Tech Inst, 4837 E McDowell, Phoenix AZ 85008. 602-231-0871 X174.

Cohu 9500, worn but worked when removed, \$700. S Shumate, WVIR, 503 E Mkt St, Charlottesville VA 22901. 804-977-7082.

Want to Buy

Small prod switcher w/dsk edger capability. S Shumate, WVIR, 503 E Mkt St, Charlottesville VA 22901. 804-977-7082.

TAPES, CARTS & REELS

Want to Sell

Audio Pak dbl A3 carts, 126 comm length carts, approx 25 music length carts, approx 75 empty shells for rebuilding, comp carts \$1 ea, shells \$.50. B Umberger, W-Lite, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Ampex 671 Tape-bulk, used (60 per ctn), \$.35 ea/\$21 per ctn, plus UPS; Ampex (406 & 456) & 3M (206 & 208) mastering tapes, avail on reels & hubs, used, excel prices; NAB metal reels, not warped, used (25 per ctn) \$1 ea plus UPS. Burlington Audio, 1-800-3191 or 516-678-4414.

American Music Formats has developed two winning formats. **PURE COUNTRY** is based on 1953 to 1972 Country Music and targets a 40 plus audience. **ROOTS OF ROCK** is based on 1954 to 1963 Pop/Rock and targets a 35 plus audience.

For more information write:
15205 W Lynwood
New Berlin WI 53151.

NAB 1/4" hubs, black, yellow, blue, 250 plus at \$.15 ea plus frt. K Monteith, Linden A-V, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Ampex metal tape reels, 10 1/2 x 1" for \$3 ea & 10 1/2 x 1/2" for \$2 ea. J Grimshaw, Fred Arthur Prod, 1218 E 18th Ave, Denver CO 80218. 303-832-2664.

Record library, instrumental only, all 78 rpm, 700 records, BO. J Grimshaw, Fred Arthur Prod, 1218 E 18th Ave, Denver CO 80218. 303-832-2664.

Fidelipac 300 cart shells, \$30/100. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Tapes in boxes, perf for auto music tapes, \$3 ea. J Geedy, Plough Bdctg, POB 1467, Wilmington NC 28402. 919-395-6157.

Boxes, for 1/4" or 1/2", new, BO. S Morse, Morse Prod, 19 12th, Carle Place NY 11514. 516-334-5216.

Half-inch tape, various short lengths, BO. S Morse, Morse Prod, 19 12th, Carle Place NY 11514. 516-334-5216.

Ampex & Scotch 2" recording tape, on 10" & 14" reels, cheap. K Mac Gregor, 98 River View, Fairfield CT 06430. 203-259-7159.

Fidelipac Type C large carts, 1200' tape, mint cond, BO. R Brooks, NE Comm, POB 907, Southington CT 06489. 203-621-5842.

Want to Buy

Records, light jazz, Fred Arthur, 1218 E 18th Ave, Denver CO 80218. 303-832-2664.

1" shippers & reels, N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Pre-recorded R-R tapes half or quarter trk. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

r. Demento radio programs, any format. B Czerwinski, Dimestore Video, POB 527, Iron River MI 49935. 906-265-2345.

TAX DEDUCTION EQUIP.

Non-profit found needs studio equip & 200 ft tower, can supply tax letter for IRS. C Riddle, POB 1700, Woodbridge VA 22193. 703-670-7764.

Non-profit, tax-exempt Christian radio station needs 150' Utility tower, 5 kW AM xmr, various phaser parts, transmission line. P Fakoury, WPRZ, POB 3220, Warrenton VA 22186. 703-349-1250.

FOR FREE LISTINGS IN BROADCAST EQUIPMENT EXCHANGE

CALL BROADCAST SUPPLY WEST

TOLL FREE

1-800-426-8434

TEN LINES TO SERVE YOU



Open For Business When You Are 12 Hours Daily - In Your Time Zone

PACIFIC

6:00 AM to 6:00 PM

MOUNTAIN

7:00 AM to 7:00 PM

CENTRAL

8:00 AM to 8:00 PM

EASTERN

9:00 AM to 9:00 PM

Free listings in Broadcast equipment exchange are offered to all United States Broadcasters AM/FM/TV and all Pro-Sound end users. Broadcast Supply West will accept up to three listings by telephone. For more than three listings BSW will send you an ad order sheet for your convenience. BSW will list each ad for a period of three full months.



BROADCAST SUPPLY WEST • 7012 - 27th ST. W. • TACOMA, WA 98466

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**

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?

RW

Broadcast Equipment Exchange

TAX DEDUCT EQUIP

Donation, or reasonably priced audio board for School of Creative Missions, 12-16 chans powered or unpowered, variable atten, 20 dB pads, 2 foldbacks, 2 aux inputs w/monitoring & separate EQ loop. J Berger, YWAM, POB 1324, Cambridge Ont N1R 7G6, Canada. 519-622-0545.

TEST EQUIPMENT

Want to Sell

Delta OIB-3 & RG-3 gen impedance set, will not split. \$2800. J Bush, WRPZ, POB 2656, Cincinnati OH 45201. 513-451-8691.

Tek spectrum analyzer 1L20, RM31A main-frame & type CA & D plug-ins, \$1200. G Kippel, KAMB, 90 E 16th St, Merced CA 95340. 209-723-1015.

Spectrum analyzer 200 Hz to 15 MHz, great for AM stereo, \$850; Tek 105 square wave gen, works great, \$150. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

GR 916A RF bridge, needs repair, \$175. L Collins, WJYY, POB 422, Concord NH 03301. 603-228-9036.

OIB-1 bridge w/Potomac SD-31 gen-det RX31 comp w/carry case & cables, never used, \$3000. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Sans Research Mod RFV, 1-300 V RF, needs thermocouple, \$35; Gertsch FM-6 freq meter, 20-1000 MHz, no box, clean, \$60. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Tek 526 vectorscope & 529 waveform monitors, N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Potomac AA-51 & AG-51 audio test set, \$2200. D Taylor, WNSC, POB 11766, Rock Hill SC 29730. 803-324-3184.

Impedance bridge 1650-A, \$200. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Nems Clark AM field strength meter, \$500. D Taylor, WNSC, POB 11766, Rock Hill SC 29730. 803-324-3184.

HP-6080 signal gen, 10-420 MHz, D Taylor, WNSC, POB 11766, Rock Hill SC 29730. 803-324-3184.

Tek RM-529 waveform monitors, gd CRT's, working, S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

alta CPB-1 common point bridge, trade for OIB-1 or OIB-3 bridge, P Koegh, WNFL, POB 11907, Green Bay WI 54307. 414-499-1336.

RCA WX-2A field strength meter, gd cond, \$450; Nems-Clark FIM-135 solid state AM field strength meter, lighter than FIM-21, \$650. C Anderson, 1519 Euclid Ave, Bowling Green KY 42101. 502-781-2067.

TIrbn unijunction test set, rack mt, as is, \$20. D Bailey, Rock Shoppe Prod, 12869 Montfort Dr No. 250, Dallas TX 75230. 214-386-7783.

Potomac Inst audio proof test set, excel, like new, \$2000 or will trade for U-matic video tape equip, xmt equip or radio station equip, S Smedley, KJKL, POB 64, Seward NE 68434. 402-534-2071.

HP 4000 audio voltmeter, excel, \$300. M Persons, 218-829-1326.

Sencar FE160 bench FET VOM, excel, \$100. M Persons, 218-829-1326.

HP 650A test osc, excel cond, \$150; Jerrold 900 sweep gen, excel cond, \$100. P Davis, Davis Radio, POB 615, Manasquan NJ 08736. 201-449-0963.

HP 204B audio osc, B&W dist anl mdl 400, Heathkit sine sq wave, \$300. S Barukowski, WEDC, 4923 W 28th, Illinois 60650. 312-863-3090.

HP 303 dist analyzer (3), gd shape, \$200 or BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Trompeter type LPL-75 video patch plugs (20), \$4 ea; Conelrad monitor, Motorola type DS 9660-A (5) xtal pos plus variable tune, \$75; HP freq counter, type 524B w/200 MHz plug in type 525A, \$100. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

OVER 80 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FM's: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

ALL IN OUR INVENTORY.

World leader in AM and FM transmitters.

BESCO INTERNACIONAL
5946 Club Oaks Drive
Dallas, TX 75248

R.E. (Dick) Witkovski
Owner. 214-630-3600

HP 608 VHF sig gen, gd shape, \$300. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Want to Buy

Thermistor needed for GR-1309 audio osc. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

Field meter, will trade, J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

TRANSMITTERS

Want to Sell

Electro-Impulse DPTC-10 KFM line terminator, \$1000; Jampro JF-25FM harmonic filter, 25 kW rating, \$3000; Sparta 680 exciter, works, BO; AEL FM-15QE/SG stereo gen, mfd by QEI, \$500. G Kippel, KAMB, 90 E 16th St, Merced CA 95340. 209-723-1015.

AM & AM dummy loads, 15 W, 80 kW. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

McMartin B910 exciter, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

CCA FM 30000, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Collins 310Z-1B exciter boards, as is, BO, K Schipper, WMAD, Box 7727, Madison WI 53707. 608-249-9277.

Gates M6095 tube exciter on 91.2 MHz w/106.1 crystal & Gates M-6146 stereo gen, spare tubes, \$375. L Collins, WJYY, POB 422, Concord NH 03301. 603-228-9036.

LPB low pwr AM xmt's from 2 to 25 W (16), tube & transistor mdls in various cond; also Raytheon 9 chan mono board w/power supply & Raytheon RL10 limiter, R Sauter, WSLU, Payson Hall St Lawrence University, Canton NY 13617. 315-379-5356.

Collins KWS-1 10-80 mtr trans & power supply, mint, \$950. F Peerenboom, WMIQ, POB 10, Iron Mtn MI 49801. 906-774-4321.

Collins 21-E 5 kW AM trans spare plate transformer, gd cond, \$6500. J Gilchrist, WTB, POB 747, Troy AL 36081. 205-566-0300.

Gates FM 5B, \$8000 less exciter, clean, exc; RCA BTA 5H FM, \$15,000 w/exciter, exc, S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

RCA BTA10H very clean w/spares, will tune to your freq, \$7000. T McGinley, First Media Corp, POB 10239, Wash DC 2A018. 301-441-3500.

Gates BC-250GY 250 W AM 100% working, reas, T Osenkowsky, WLAD, 198 Main, Danbury CT 06810. 203-744-4800.

Harris extended control panel for FM-25K, \$150. M Holderfield, WOOD, POB 1427, Dothan AL 36302. 205-792-1149.

Collins FM 2.5 xmt, 1974 mdl 831 D-1, w/exciter, SCA & tubes, gd cond, \$11,500. J Blake, WMQT, POB 467, Ishpeming MI 49849. 906-485-5523.

RCA 1kW mod reactor, 50 H, 0.670 A, 4.5 kV, \$300 w/ship. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

LPB TX2-30 30 W AM, 1 MHz xmt, used 1 yr, like new, \$600. L Tighe, WRN, Box 1000, Hackettstown NJ 07840. 201-850-1000.

Harris 40K center cabinet, inc 2 MS-15 base-band exciters, 2 IPA drive amps, autostation switcher for above, test system for exciters & amps, less 90 degree splitter, 3 yrs old, in service, avail in 1/86, \$4500 plus ship, J Bridges, WYAY, 200 Galleria Pkwy NW Ste 900, Atlanta GA 30339. 404-955-0106.

DC filter choke, 3 H, 3.5 A, 7.5kV, \$250 w/ship. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

CSI remote meter panel Ep-ip-ant curr, lo/high, BO, J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

Sintronics S1-10E exciter, mint cond, \$1700. D Gibson, WRQQ, POB 100, Lexington KY 40590. 606-252-6694.

LPB SW AM xmt on 730 kHz, w/coupler, \$350. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46124. 317-266-9700.

Mod xmt for RCA BTA5F/10F rebuilt, \$500 plus ship, J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Gates 5000 W FM xmt, excel, no exciter, \$8700. S Smedley, KJKL, POB 64, Seward NE 68434. 402-534-2071.

Collins 490M-10 ant coupler 1.6-30 MHz cont & automatic, 1 kW pep & avg max, 150 W min, no more than 1.3:1 VSWR, unused, \$500. R Sumner, CAVU Corp, 3351 Contessa Ct, Annandale VA 22003. 703-560-0233.

Want to Buy

Chan 12 vestigial sideband filter needed, even chan 12, for 5-50 kW pwr input, or ch 12 filterplexor, S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

FM translator, 1 W, recent mdl & retuneable, T Taggart, WSPD, 125 S Superior, Toledo OH 43602. 419-244-8321.

Harris or RCA 5 kW FM xmt w/ or w/o exciter, C Edwards, WWJM, 210 S Jackson, New Lexington OH 43764. 614-342-1988.

Chan 12 VHF or chan 16 UHF xmt, 1-50 kW, in operating cond, will remove, S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

Amp, 10 W for Harris TE-3 exciter or complete transistor kit for same, W Slucki, KNIM, POB 278, Maryville MO 64468. 816-562-1163.

RCA BTA-50H or J complete, need not be working, J Wilk, WJJD, 180 N Michigan, Chicago IL 60601. 312-977-1815.

Chan 11, 12, 13.5-25 kW color xmt, Standard Elect, GE or RCA, will disassemble & remove, B Fornoff, KKEI, 402-534-2071.

Collins 21E/M or other 5 kW AM xmt, 1-30 kW FM xmt any cond, inc junkers for parts needed for overseas project, S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

TUBES

Want to Sell

RCA 872A tube, (3) in original boxes, 9 yrs old, never used, \$1 ea. K Cummings, Cummings Services Co, 5816 Lane Ave, Raytown MO 64133. 816-356-3895.

DEF Johnson Cat No. 123-0211-001 tube sockets, in original boxes, never used, \$7 ea. K Cummings, Cummings Services Co, 5816 Lane Ave, Raytown MO 64133. 816-356-3895.

Want to Buy

Electron tubes, pwr, industrial, all kinds, duds, cores, etc. C Dripps, Kurloff Ent, 4331 Maxson, El Monte CA 91732. 818-444-7079.

TURNTABLES

Want to Sell

Thorens TD-165 w/arm no cartridge, excel cond, \$125. T O'Laughlin, WERN-ROC, 821 University Ave Rm 7135, Madison WI 53706. 608-266-6667.

Reh-O-Kut disc lathe, mono, cold head, 45 & 33-1/3 screws, \$100 plus frt. T Trott, TTA Prod, 5477 Carter, Lake Mary FL 32746. 305-323-0472.

Technics SP-15 w/base & Audio Technica ATP-12T arm, new, \$750. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Reh-O-Kut B16H 16" TT's (2), 4 Gray viscous damped arms & cart shells plus 9 chan Raytheon mono console, no meters or transformers, just pots & switches, \$400/all. R Vincent, WAYB, POB 57, Fishersville VA 22939. 703-942-4242.

Presto 6M, Grampian head, Gotham amp, great cond, \$500/trade. T Roller, Hollywood Demo Svcs, 1626 N Wilcox #105, Hollywood CA 90028. 818-994-5368.

Audio-Technica ATP12-T tone arms, never used, \$175. R Simonson, HDM Comm, Box 99, Mears MI 49436. 616-873-3817.

QRK & Collins 12" TTs, some w/teararms; Micro-Trak 6405 stereo phono preamps, P Wells, KLZZ, 8665 Gibbs Dr, San Diego CA 92123. 619-565-6006.

Russco Fidelity Pro preamp, mint, \$50; BSR TT w/Stanton cart, great for PD's & MD's, \$35. D Bailey, Rock Shoppe Prod, 12869 Montfort Dr No. 250, Dallas TX 75230. 214-386-7783.

Thorens TD-165, excel cond, no cartridge, \$100. T O'Laughlin, WERN, 821 University Ave, Madison WI 53704. 608-266-6667.

Scully disc lathe, BO, M Tait, Tait Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

Want to Buy

CCA/Reh-O-Kut B12-71 TT motor, new or used, J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5273.

VIDEO PRODUCTION EQUIP.

Want to Sell

Tek 1420 vectorscope, mint cond, trade for Tek 528 WFM or sell, \$1450. M Paraiso, Ultimate Image, 7200 Dunfield Ave, LA CA 90045. 213-410-1009.

Control Concepts 601 sync gen, BO, N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Chyron, 2P char gen, clean, 2 chan, w/color DSK, 2-8" drives, \$2000. M Paraiso, Ultimate Image, 7200 Dunfield Ave, LA CA 90045. 213-410-1009.

Sony 2860A converted for use w/ECS-1B, T Cereste, Lightscape Prods, 420 W 45th 4th Fl, NY NY 10036. 212-757-0204.

Microtime 2020+ TBCs (4), need work, \$2000 for all, N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

NEC DVP-15 digital video effects box for NEC FS-15, mint, w/manuals, \$1500. M Paraiso, Ultimate Image, 7200 Dunfield Ave, LA CA 90045. 213-410-1009.

ISI 660 chroma keyer plus 550 pwr supply, 19" rack frame for 6 more cards, vgc, \$500. R Tidwell, Media Services, 250 Winding Way, Lynchburg VA 24502. 804-239-2439.

Sync gen's, GV 750-1 (2), \$50 ea; (2) Cohu type 2614-400 waveform multiplexers, cables & manuals, \$50 ea; Vital type VI-500 video stab amp, \$200. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Chyron II, dual disc, (3) keyboards & cable, font compose, dual channel, \$5500. S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

Faroudja Record 1 record image processor w/pilot, \$795; Faroudja Record-Ex record image processor, \$495. D Brennan, Custom Video Labs, POB 26126, Birmingham AL 35226. 205-823-0088.

Want to Buy

Service manual for Conrac CNA8 B/W monitor, S Shumate, WVIR, POB 769, Charlottesville VA 22901. 804-977-7082.

Video equip: SEG & char gen, TBC & switcher, gd deals only; 8 chan stereo console under \$2000; radio station control room or prod room furniture, cheap; used 3/4" editing system under \$5000. J Funk, Chris O'Brien Prod, 1027 Orchard Grove, Royal Oak MI 48067. 313-547-1144.

VIDEO TAPE RECORDERS

Want to Sell

DAWR 1, (2) VR2000; 20 spare heads, dist equip sync gens, vectorscopes, waveform monitors, etc, offer, N Macrae, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844.

Video carts for Quasar VR-1000 VTR (40 VC60 & VC120), \$10 ea; Quasar color VCR VR-1000 time machine, both in vgc, \$250/both, F McCall, Performance Svcs, 1521 W St Marys Rd No 229, Tucson AZ 85745. 602-623-2110.

Collectors Cartavision new in box w/manuals (2) color, \$200/both; carts for Cartavision, some sports pre recorded titles, \$10 ea, F McCall, Performance Svcs, 1521 W St Marys Rd No 229, Tucson AZ 85745. 602-623-2110.

RCA TR-50 remote control panel MI-40691B; RCA TR-50 module extender MI-557301, \$25 ea, B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Ampex VR-2000, 3M DOC, vel comp, EECO editor, full monitoring (2), \$6000 ea. S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

Sony BVU-100, new heads, colorizer, U-matic portable, vg, \$700; Sony BVH 500, 1" portable color, \$17K, M Saady, First City Recd, 141-60 84 Rd 3E, Briarwood NY 11435. 212-754-7727.

JVC 5300 player, \$600; NEC 8307 recorder, \$675. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

Want to Buy

Sony BVU-100 parts, boards, color CCU, etc, early model, C Asplund, WATR, 79 Baldwin, Waterbury CT 06706. 203-755-1121.

TRANSCOM CORP.

Fine Used AM & FM Transmitters
and Also New Equipment

For the best deals on Cablewave cable,
Rohn towers
and Celwave antennas.

Special on Revox PR-99
and B-225 CD Player
Call for Super Low Prices!

PO Box 26744, Elkins Park PA 19117
215 379-6585

Can't Find It?

Call 1-800-426-8434 For Immediate Action!

Want To Sell It?

SIDEKICK SCA

The One Box Solution

Now, an integrated SCA generator and audio processor that dramatically reduces cross-talk and answers technical objections to SCA operation is finally available. Cost effective. A super performer. Modulation Sciences presents a revolution in sub-carrier generation — a technological breakthrough.

AVAILABLE NOW
\$2450⁰⁰

*"...bright,
clean, and
loud..."*

Jim Davis
General Manager
Radio Station WVAF

WVAF

P. O. Box 4318
Charleston,
West Virginia
25304
(304) 925-4947

October 6, 1983

Mr. Eric Small
Modulation Sciences Incorporated
99 Myrtle Avenue
Brooklyn, N.Y. 11201

Dear Eric;

As I was connecting up my new Sidekick to our Harris 20 K, I was thinking back about all the electronic marvels that Eric Small has contributed to the radio business. From early development work on the Optimod, to that clever Upstart unit, your contributions have been many.

And now, I'm happy to report that I can add another unit to the long list of developments and place it in its own very unique category.

When the local paging company inquired about usage of the SCA, my first thought was of the new sidekick SCA generator. You promptly shipped it to us. I didn't realize however that the paging company was going to make available a McMartin generator for our usage as well. Well, it gave us the opportunity to audition both units on the air. The comparison was like night and day. I was expecting the typical "background music" sound. However, much to my delight, the Sidekick was bright, clean, and loud. Almost resembling the sound of the main program channel! The McMartin sounded pale, by comparison.

Once again, I don't know how you did it...all I know is that it works! and it works very well!

Best regards,



Jim Davis
General Manager
Radio Station WVAF

Optimod® is a registered trademark of Orban Associates, Inc.

A Capitol Broadcasting Corporation Station

- Excellent RF shielding.
- Built in transmitter tuning aid.
- Stable over a wide temperature range.
- Compatible with compander, data or telemetry systems.
- Integral audio processing can be optimized for music or speech.
- Peak holding deviation meter eliminates need for a modulation monitor.
- Quartz crystal controlled synthesizer can be programed to any SCA frequency.

modulation sciences, inc.

115 Myrtle Avenue, Brooklyn, New York 11201

Telephone: (718) 625-7333

Imagine the most creative, complex production you can think of,

To be competitive, you gotta think competitive.

With an ABX production console, you're already one leg up. Creating your own distinctive ID's, spots and programs for today's radio requires a console specifically engineered to handle sophisticated multitrack production — and that's precisely what an ABX can do. But that's not all.

An ABX is also designed to be an on-air board too. It's got all the features you need to do double-duty when you need it, instantly, easily.

In fact, there isn't a production board around that has so much, yet is so easy to get to know. And that's a distinct advantage for the owners of PR&E

consoles because all are nearly identical in operation and layout (like our on-air BMX Series).

The standard models of the ABX include mainframes for 18, 26 (pictured) and 34 inputs. The spec's are impressive, the features and options extensive,

and the quality is what you expect when you invest in the best that money can buy.

Stop dreaming about all the things you can do with an ABX, and start producing the kind'a stuff a #1 station creates. Give us a call now for all the details.

It's easy with an ABX.

