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# Radio World

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See pages 25-30

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## NAB OKs Merger With NRBA

by Edward Wytkind

Washington DC ... The NAB and NRBA will merge if a proposal submitted by their executive committees on 31 December is approved by the board of directors of each association.

The agreement—the result of a series

### FCC to 'Clean Up'

by David Hughes

Washington DC ... The FCC has approved an AM deregulation rulemaking that, in part, calls for the deletion of signal quality requirements for AM stereo.

The FCC has also received comments from broadcasters showing that they generally support pending deregulation efforts involving FM stereo and subcarrier (SCA) rules.

These latest deregulation efforts are part of the Commission's campaign during the past three years to remove what it and broadcasters believe to be "burdensome" technical regulations. The FCC has announced continued plans to deregulate AM and FM rules in 1986.

FCC Mass Media Bureau Chief Jim McKinney told broadcasters at a NRBA sponsored "town meeting" in Los Angeles on 6 January that the Commission plans to release a previously announced major report on overall AM improvement by late January or early February.

McKinney said that the first rulemaking proposal to be generated from the report's findings would examine the use of synchronous AM transmitters to extend an AM station's coverage on the same frequency. The Notice of Proposed Rule Making (NPRM) is due by late winter or early spring.

Though the Commission's main deregulation efforts will be on AM this year, Michael Lewis of the FCC Engineering Policy Branch said an NPRM will be released this year to "clean up" FM regulations, including allocation procedures.

#### AM proposal approved

On 30 December, the FCC approved deletions and revisions it had proposed for AM rules, including the deletion of AM stereo "quality of service" transmission standards contained in section 73.40 of the rules.

With the FCC's order, AM stereo rules pertaining to minimum modulation levels, audio frequency distortion, audio frequency transmitting characteristics,

(continued on page 9)

of meetings held between NAB and NRBA executive committee members in Chicago and Washington, DC in November and December—would create a restructured NAB radio division with a larger radio board empowered to act or lobby independently from the NAB's television interests.

The NAB board approved the merger at a 13-17 January board meeting in St. Maarten, Netherland Antilles, NAB officials announced.

The NRBA said its board would vote on the merger on 21 February in Fort Lauderdale, Florida.

The accord was made possible by the NAB's willingness to change its bylaws and grant radio an independent voice, said NRBA Executive VP Peter Ferrara.

The merger proposal, he said, calls for NAB bylaw changes that would grant radio the power to act without having to seek approval from NAB's television board.

Ferrara said that past efforts to merge, conducted during the past two years, had failed in part because of the NAB's reluctance to give radio the freedom to lobby independently from other NAB interests.

The latest agreement would grant radio the independence sought in past merger talks while it would also benefit from the NAB's lobbying clout, fueled by its more than 4,500 radio and 880 TV members.

#### Organizational changes

The proposal calls for the NAB to institute organizational changes to include the addition of up to 12 NRBA members on the NAB board.

Negotiators agreed that the radio chairman would serve as the official spokesperson for the radio industry, Ferrara said.

The radio board will have a separate legal and government relations representative who will work primarily on radio issues, said Ferrara.

Though he has accepted a position as VP/GM at WBMW, Washington, DC, Ferrara said he will continue on an interim basis as a consultant to the NRBA in the role of executive VP until the transition is complete.

#### Radio industry the winner

John Dille, NAB radio board chairman and president of Federated Media, said, "The success of our joint sponsorship of the radio convention seems symbolic of an overwhelming industry desire for the NAB and the NRBA to get together in a way that will give radio the kind of unity that can take advantage of the strengths of the two associations while preserving radio's autonomy."

NAB Joint Board Chairman Ted Snider said the merger was recommended because the members of both executive

(continued on page 12)

### Mass RFR Deadline Waived

West Newton MA ... The state of Massachusetts has granted broadcasters a three-month waiver to implement administrative requirements mandated by the state's newly adopted radio frequency radiation (RFR) occupational standards.

The new effective date, which was revised from 23 December 1985 to 1 April 1986, will give broadcasters more time to conduct site surveys of RFR levels, to designate and train RF safety officers and to assess other details associated with the mandatory administrative tasks, according to Massachusetts Department of Labor and Industries Radiation Control Supervisor Frank Archibald.

Archibald said that, despite the revised date, other aspects of the regulation will remain the same, including the grandfather clause, which grants one-year waivers to broadcast facilities in operation prior to the formal effective date of 23 December 1985.

This waiver was granted after the Massachusetts Broadcasters Association petitioned for a date revision so broadcasters could prepare for the new RFR rules. For more information, call Frank Archibald at 617-969-7177.

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# Regulatory News

## FCC Files

To file a petition or comments with the FCC, send an original and five copies of your filing to the Office of the Secretary, Federal Communications Commission, Washington DC 20554. When filing comments in support of another party's petition or comments, send a copy of your filing to the original petitioner and provide the Commission with a signed statement verifying that this has been done. For more information about a particular proceeding, call the contact person listed.

### AM Improvement

The FCC plans to release a report in early 1986 that would examine a wide range of approaches, including future rulemakings, to improve the overall state of AM radio.

In a speech last September, FCC Mass Media Bureau Chief James McKinney said the Commission's report would examine the possibility of revamping the nation's clear channel service, instituting bandwidth reductions to reduce interference, permitting synchronous transmitters and translators, and relaxing the AM duopoly rules.

McKinney said that one of the first rulemaking proposals to be released would be on synchronous AM transmitters.

He said the Commission will propose allowing AM stations to extend their coverage areas by utilizing additional transmitters operating on the same frequency.

The FCC first addressed the issue in a Further Notice of Proposed Rulemaking released in July 1985 on Docket MM 84-752, which also proposed creating a single Class III category and instituting a 50 kW power ceiling for Class IV AM stations in Puerto Rico, the Virgin Islands, Alaska and Hawaii.

The NAB and others who commented asked the FCC to instead devote a rule-making proposal solely to synchronous

transmitters instead of having the plan as part of docket containing other issues.

For more information, contact Louis Stephens at the FCC: 202-632-7792.

### Broadcast Auxiliary

In late October, the FCC approved a plan that called for more flexibility in bandwidth use, lower transmitter powers and increased use of directional antennas, cross polarization and filters in the broadcast auxiliary bands.

The plan also divides the 944-952 MHz aural STL/ICR band into 25 kHz segments which could be stacked to form channels of varying bandwidths.

Docket number is MM 85-36. Contact Hank Van Deursen: 202-632-9660.

In a related issue, the FCC proposed that "cable and network business entities" be given access to several broadcast auxiliary bands between 2 and 7 GHz.

Docket number is GEN 82-334. Contact Donald Campbell at the FCC: 202-653-8171.

### Technical Deregulation

As part of its continuing deregulation effort, the FCC in October proposed eliminating FM rules that apply to stereo sound transmission and subcarrier (SCA) operations. "Quality of service" FM stereo regulations—including audio frequency response limits and allowable SCA modulation forms—are included in the

proposal. FCC action on the plan is expected in early 1986.

In an additional development, in late December the FCC approved a plan to delete AM stereo transmission standards, along with some AM technical and operational requirements. The order involves deleting AM stereo "quality of service" regulations, a variety of AM regulations dealing with antenna resistance measurements and some safety and installation requirements.

Last year the FCC completed a preliminary round of rule purging, eliminating many of the required audio proofs for monaural AM stations and FM's.

For more information on the deregulation plans, including comments on the FM proposals, see the article in this issue. The FM docket number is MM 85-325, and the AM docket number is MM 85-125. Contact Mike Lewis at the FCC: 202-632-9660.

### RF Radiation

During late 1985, the FCC released a technical bulletin containing guidelines to determine whether a broadcast facility complies with newly adopted radio frequency radiation (RFR) standards.

As of 1 January 1986, new stations and those stations up for license renewal or seeking a CP were to comply with the American National Standards Institute (ANSI) radio frequency radiation (RFR) exposure limit. The NAB, the Corporation for Public Broadcasting, the Electromagnetic Energy Policy Alliance and other groups had petitioned for a deadline extension to 1 June 1986.

The FCC did not give special consideration to multiple transmitter sites, which could collectively exceed the ANSI standard. The FCC also deferred its statutory right to preempt local and state governments from implementing standards that

contradict with the federal regulation.

Meanwhile, RFR cases are brewing on the local level. For example, Massachusetts officials adopted new RFR standards equal to the FCC levels, but with highly stringent compliance requirements for workers.

Docket number is GEN 79-144. Contact Robert Cleveland at the FCC: 202-632-7040.

### Cuban Interference

Several AM broadcasters have submitted complaints to the FCC regarding higher levels of interference from Cuban stations.

The increased interference seemed to start, broadcasters said, following the October 1985 inauguration of WAQI, Miami, a 50 kW Spanish language operation. Interference levels on 710 kHz (WAQI's frequency), 1160 kHz and 1210 kHz have been increasing.

The FCC said it plans to study the issue further. The US State Department, however, said no talks are scheduled with Cuba to address the problem.

Contact Louis Stephens at the FCC: 202-632-7792.

### FM Upgrades

In October, the FCC proposed a plan that could make it easier for FM licensees to upgrade their power classification.

Under the proposed plan, a new FM allotment would not otherwise be available for application by others. Rules now require that FM stations seeking upgrades must provide an additional equivalent class of channel to accommodate other interested parties.

Comments submitted to the FCC generally supported the plan. FCC action is scheduled for early 1986. Docket number is MM 85-313. Contact Joel Rosenberg at 202-634-6530.

### Frequency Coordination

In a request for rulemaking filed in September 1985, the Society of Broadcast Engineers (SBE) asked the FCC to require broadcasters and other users of  
*(continued on page 11)*

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## Regulatory News

# Directional AMs Cleared for ATS

by David Hughes

Washington DC ... Directional AM stations may now utilize automatic transmission systems (ATS), the FCC ruled 18 December.

ATS involves automatic monitoring, meter readings and parameter adjustments. Its use will create "increased flexi-

bility" for stations by "automating transmitter operations," the FCC said.

The Commission's ruling, which originated with a proposal for a rule change in April 1985, also allows ATS operations at television stations.

In 1976, the FCC authorized ATS operations at FM and omnidirectional AM stations. Directional AM and TV stations

were exempt due to a lack of equipment and problems with signal processing gear, said FCC Engineer Bernard Gordon.

With advances in transmitter stability and microprocessing, the FCC said it now believes the technology and equipment exist to allow reliable ATS operation at TV and directional AM stations.

"Because of the unresolved tolerance issue for AM directional antenna current phase factors (with directional systems)... the Commission deterred authorization of ATS for those services until the remaining technical considerations were resolved," the FCC said in its December order authorizing the additional ATS uses.

The Commission's ATS rules require automatic adjustments of all critical operating parameters, automatic warnings of system failures that impair station operation and automatic termination of transmissions in the case of a "continued and uncorrected condition" that might cause interference to other stations.

The FCC said the licensee is still fully responsible for ensuring compliance with all station operation requirements.

The Commission's order also establishes a common ATS rule applicable to directional or omnidirectional and commercial or noncommercial AM, FM and

*(continued on page 6)*

# FCC Extends CP Time Limits

by Edward Wytkind

Washington DC ... The FCC has granted broadcasters six additional months to construct radio, television and auxiliary broadcast services facilities following a rule amendment in December 1985.

Under the new rules, radio stations and auxiliary broadcast services now have 18 months to construct a facility, while TV stations are allowed 24 months. The FCC's old rules limited construction periods for radio stations to 12 months, and TV facilities to 18 months.

The Commission also created new criteria for determining whether to grant applications for additional time for modification and assignment/transfers of un-built—but authorized—facilities.

Radio stations and auxiliary services applying for modifications or assignment/transfers must file within nine months of receiving construction authorization. TV applicants must file within 12 months.

The FCC said it implemented the changes in order to eliminate administra-

tive problems created by the burgeoning number of applications for extension of time that are filed with the FCC each year.

The Commission added that the new rules recognize the "changes in the complexity and amount of equipment needed" for constructing and operating a broadcast station.

With hopes that the growing number of applications for extension would diminish, the FCC outlined criteria it will use in granting such requests.

To be granted an extension of time, a broadcaster must show that facility construction is complete and that testing has commenced, or show that "substantial progress" has been made in terms of equipment ordering, site acquisition and construction proceedings.

Under the rule change, an extension of time will be granted if a lack of progress in the construction of a facility is proven to be attributable to "reasons clearly beyond the control of the permittee," such as zoning ordinances or government budgetary processes, the FCC said.

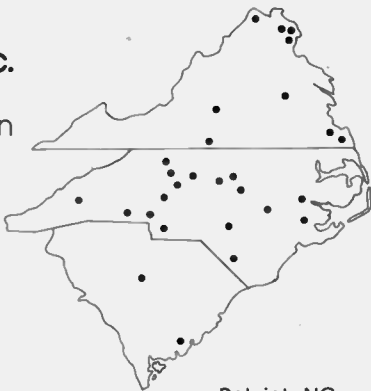
The Commission said that the criteria used for extensions of time will also be applied to modification and assignment/transfer applications.

The FCC maintained that it would no longer "entertain" applications for modification or assignment/transfer if filed after the initial construction period has expired.

For more information, call Freda Lippert Thyden, FCC, at 202-632-7792.

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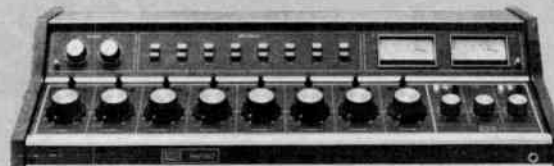
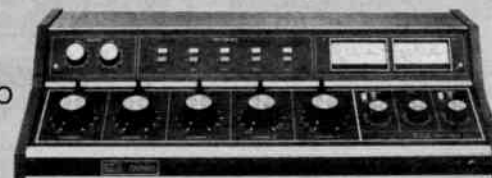
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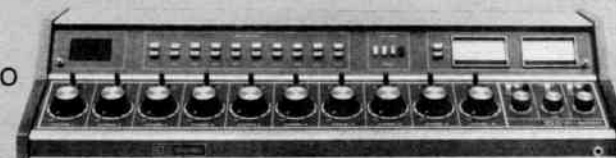
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# C-QUAM Fan Invites Comparison

by Oscar P. Kusisto

Schaumburg IL ... After reading Gerry LeBow's guest editorial (RW, 1 November 1985), I feel compelled to clarify the current status of AM stereo.

All AM radios should not be classified as low quality. In general, home and portable AM radios have low performance. They are an order of magnitude lower than a well-designed car radio. I should know, as we produced millions of car radios (Motorola) during my tenure as general manager of Motorola's automotive division.

## Guest Editorial

The environment for car radio is very volatile, with major swings in signal levels, temperature, humidity, dust, internal electrical interference, vibration and shock. The car radio has to perform in strong signal urban areas or low signal fringe. Customer dissatisfaction can result in prohibitive warranty costs and loss of goodwill.

Bandwidth seems to be the measure of quality in the minds of some people. There is nothing unique or difficult about bandwidth technology. TRF radios of the 1920s had wide bandwidth.

Several major car radio manufacturers are developing automatic bandwidth

Oscar P. Kusisto is Motorola director and VP—retired, Special AM Stereo Consultant, chairman ex-officio of ITA (Audio-Video Association) and answers to W9LJA.

control. This will give you the best of two worlds—urban and fringe.

In the meantime, some radio manufacturers will provide switchable bandwidth. Home or studio radios can readily tolerate side effects of wide bandwidth; for example, Marantz, Potomac and, soon, McIntosh.

I take great exception to the statement that radio manufacturers have no concern for AM stereo performance. Virtually all radio manufacturers have taken a fresh look at optimizing performance of C-QUAM technology. In addition, Motorola has, and is continuing to, encourage our radio manufacturer licensees to maximize AM stereo performance in C-QUAM radios.

Most all-C-QUAM licensed prototypes have been tested and critiqued by our research engineers. Some lab reports contain 45 pages and more of analysis and advice on design improvements.

The first generation of C-QUAM radios is only the beginning. Smarter second and third generation ICs, automatic bandwidth control, improved audio and impulse noise reduction are just a few of the improvements you can expect.

Gerry LeBow installed a Kahn AM stereo system on his station, declaring it to be technically superior without having tested C-QUAM—by his own admission. Why not have an objective comparison? Contrary to common opinion, synchronous detection can be used with C-QUAM. In-depth studies have been made by radio manufacturers on the merits of envelope versus synchronous detection.

Low distortion can be achieved with either method of detection. Synchronous

detection does provide slightly improved S/N levels at very low signal strengths unsatisfactory even for mono.

All of our tests of available multi-system radios demonstrate serious performance compromise, higher cost, complexity, and some stereo light falsing problems. Our large file of lab test data will be shared with interested individuals. Readers may contact Frank Hilbert at 312-576-4889 for details.

*We believe C-QUAM supporters are a very technically knowledgeable group.*

I disagree with Gerry that AM stereo system selection should be the domain of the broadcaster only. This should be a joint selection—broadcaster and radio manufacturer, through marketplace consensus. The radio manufacturer lives with the end result at dealer/consumer level, including customer complaints.

Cooperation is the name of the game if you really want AM stereo. Broadcasters and receiver manufacturers must pull together, not fight each other. Both have a common goal—listener satisfaction. The NAB/EIA AM Radio Improvement Committee is an excellent start in this direction.

We believe C-QUAM supporters are a very technically knowledgeable group.

To imply otherwise would be to criticize the technical judgment of the following:

- Major American, Japanese and European car manufacturers;
- Over 30 radio manufacturers, including three of the world's largest;
- Our semiconductor licensees—Toshiba, Sprague and Toko;
- Our broadcast equipment licensees—Broadcast Electronics, Delta, Continental, Harris and TFT; and
- The DOCs of Australia and South Africa.

Are 336 C-QUAM stations—including KDKA, WSM, KFI, WJR, WGN, WCCO, WHAS and WBZ—wrong? We respect the technical competence of our stations and are honored by their support.

We have a broad base of commitment by the broadcasters, broadcast equipment licensees, semiconductor manufacturers, car manufacturers and radio manufacturers. This is a wide spectrum of marketplace support; sufficient, we believe, to declare a "de facto" standard.

We estimate that 98% of AM stereo radios are C-QUAM (Motorola); 2% are multisystem. With 336 C-QUAM stations on the air, another 116 are or will be C-QUAM compatible (Harris-Magnavox conversions). The combined group represents approximately 84% of all AM stereo stations on the air. Among these are former Kahn supporters, including KDKA, WGN, KRLA, WSPD, WHEN and KIKI. In addition, there are seven more conversions anticipated.

### C-QUAM Box Score Summary of Support

1. 336 stations on the air
2. Over 30 radio manufacturers dedicated to C-QUAM, including three of the world's largest
3. Four existing or pending sources for I/C decoders: Motorola, Toshiba, Sprague and Toko
4. Six broadcast equipment sources: Motorola, Continental, Harris, Delta, TFT, Broadcast Electronics
5. National standard in Australia and South Africa
6. Major car manufacturers of US, Japan and Europe

Leonard, in the spirit of fair play, let's have your box score. Why not a Kahn/C-QUAM test comparison done by qualified, neutral engineers with published results of the test comparison?

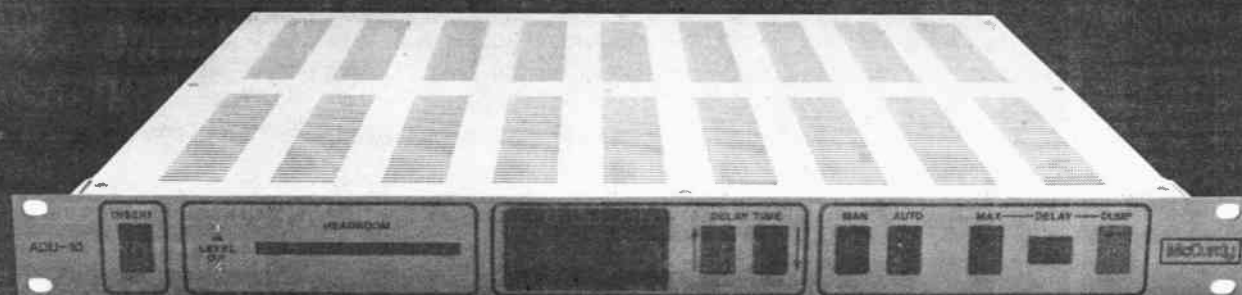
If you are serious about new listeners, go on with C-QUAM!

With C-QUAM you can be heard on 100% of existing stereo radios. With our surviving competitor, you can be heard on 2%.

AM stereo is the most exciting feature since the introduction of FM stereo. It should be the keystone for revitalization of the AM broadcast industry.

We have the tools—let's go! The future is bright.

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## 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).

### Wise Up

Dear RW:

Let's face it, the once high and mighty AM broadcast band has been in a state of decline over the past several years. In just the past five years we've seen great perennial AM music giants fall by the wayside and, rather quickly, I may add, have totally segued into the overly redundant world of satellite fed or locally produced talk-formatted radio.

What happened?

The answer today is clear, *FM stereo*. Why listen to music on a band whose technology dates back to the late 1940s, and sounds like it, too, when you can listen to the modern, crystal-clear sound of stereo music on the FM band?

As a result of this stereo phenomenon, radio manufacturers have been hustling over the past few years to find the cheapest, yet not the most high quality, way of enabling AM stations to transmit in stereo. The technology to transmit *high quality* AM stereo has been around since the early 1960s, when Leonard Kahn (the father of AM stereo radio) submitted his Independent Sideband AM Stereo system for approval to the FCC.

Unfortunately, Kahn's proposal fell upon deaf ears and was subsequently rejected so that FM would have a "fighting chance" to survive.

As a result of this bureaucratic blunder, the once stagnant and secondary FM band has all but devoured AM listenership.

Now the receiver manufacturers of the world, with the exception of Sony and

Sansui, are trying to pawn off an inferior AM system known as C-QUAM to the consumer as the "winning" or "defacto" standard by selling one-system C-QUAM radios.

I say *bull* to the receiver manufacturers and the station managers who allow this AM system to get into the hands of the unsuspecting public. The C-QUAM system will in no way save the sagging AM band from oblivion. In fact, it could spell its doom.

Recently I visited the Lake Placid region in upstate New York. Naturally my Sony SRF-A100 came along, too. With the exception of a 5000 watt daytimer (WIRD/920 kHz), Lake Placid almost completely relies on skywave for AM reception.

On 16 November 1985 at 8 PM I placed my SRF-A100 into the "B" mode for Kahn/Hazeltine AM stereo reception and tuned into Clear Channel WNBC/New York (660 kHz). Despite the inherent selective fading due to skywave propagation, WNBC suffered *no* platform motion whatsoever.

Next, I tuned into Zaven Masoomian's WQXR/New York (1560 kHz) and heard crisp, clear platform-motion-free classical music in stereo.

Next, I put the Kahn system to its  
**(continued on page 6)**

## AM Broadcasting Ills Numerous

by York David Anthony

Charlotte NC ... In the interests of "equal time," I would like to comment on Bart Walker's letter in the 1 December RW.

I really cannot understand why it has become a national sport to blame Leonard Kahn and his stereo AM system for the ills of AM broadcasting. The problems which plague our band are so deeply rooted in confusion and downright ignorance that it is plain silly to pin the blame on one man.

Bart, before you categorically conclude that "well, my GM-Delco car radio sounds just as good on C-QUAM as it does on FM," please run an audio proof of performance on your car radio.

If your car radio is like my factory equipped car radio, there is no rational basis for evaluating audio performance on such junk.

The radio chassis which came with my \$495 "Premium Sound" package in my 1984 Mustang SVO is a joke. Direct substitution of this radio with the Sony XR-33A (retaining the factory amp and

York David Anthony is director of engineering for DataSpan, Inc. He can be reached at 704-597-8317.

On 16 January the NAB Executive Board unanimously voted its approval of a proposal to merge the NRBA with the NAB.

Though the merger won't become final until the NRBA Executive Committee votes on the matter at a 21 February meeting, NAB and NRBA personnel expect approval, and are prepared to implement changes immediately.

Among those changes will be an increased autonomy for radio within the NAB political structure. Bylaw revisions will allow radio to act independently of NAB TV interests on issues where the two media differ.

Since the NAB/NRBA merger will give the radio broadcast industry a single voice for the first time in many years, there's no time like the present to consider giving radio its own convention.

## Merger to Offer New Role

Radio '85, jointly sponsored by NAB and NRBA, was marred by a lack of emphasis on engineering. However, despite rumors of NAB/NRBA infighting, a healthy attendance proved that a radio-only convention was—and is—both valuable and welcome.

Both the NAB and NRBA have stated that the 1986 fall show would give engineering equal weight alongside management, sales and programming. NAB and NRBA staff have already met and lined up many engineering related speakers and topics for the show.

While Radio '86 has the makings of being the most thorough radio convention to date, and while a stronger fall show can only be a boon to radio, the post-merger NAB ideally should split the gargantuan spring show to form a spring TV show and a fall radio show.

The spring show has outgrown nearly every convention site in the country, and, as the NAB Exhibitors Committee has found, there is controversy and crowding associated with grouping radio and TV booths.

Many stations' engineering budgets will be strained in trying to attend two NAB shows per year, and the NAB may find that it is competing with itself in luring engineers to both shows.

The new NAB has the chance to start a new tradition by providing radio with a strong, well-balanced show. Radio '87 could be such a show, and it would complement radio's new autonomy within the NAB.

—RW

## Radio World

Vol 10 February 1, 1986 No 3



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speakers) produced such a dramatic improvement in fidelity with respect to cassettes and FM that I seriously question the factory radio's design motives and objectives. It is clear that many car radios are actually corrupted in design so that FM and cassettes are made to sound more like narrowband AM!

## Guest Editorial

If we don't stop pointing fingers at each other (using the ever-present C-QUAM versus Kahn debate) and do something to improve the perception of AM in the public eye, we can all kiss our properties goodbye.

AM is not failing in the marketplace because there are no Kahn or C-QUAM receivers available. AM is failing because, when people compare their compact discs, cassettes, and even their offspring's Close-N-Play to narrowband AM, 99 out of 100 listeners can correctly conclude that narrowband AM sounds like crap. We cannot blame Motorola or Leonard Kahn for the hundreds of millions of 6-transistor wonders out there whose fidelity is surpassed by an ordinary C-message telephone circuit.

People aren't even aware that there are wideband receivers available. When the general public is exposed to the benefits of radios exemplified by the Sony XR-33A and SRF-A100, their image of AM as a low fidelity medium is instantly changed.

Nevertheless, I would like to submit several reasons why C-QUAM is a patently inferior AM stereo system.

It is not valid to state that "because there are more C-QUAM stations out there, with more C-QUAM receivers," that C-QUAM is the preferred system. This parallels the problems in coming up with an adequate color TV system. Had RCA thrown in the towel in the face of obviously superior 405 line "rotating disk" color TV, we would be stuck with a sorry broadcasting system today.

Station managers should be forced to shut up long enough to take one drive out to their 0.5 mV/m ground wave contour. They should then obtain one Sony SRF-A100 and force it into the C-QUAM mode, and then listen to the interfering carrier(s) move around in acoustical space.

The fundamental problem with C-QUAM is that the receiver cannot distinguish between the desired phase modula-

**(continued on page 8)**



# Readers' Forum, Continued

(continued from page 5)

toughest test by tuning into WBT/Charlotte, North Carolina (1110 kHz) on a frequency which is subject to interference from Canadian as well as West Coast AM stations. Despite the deep fading and overtaking from other stations on the frequency, not once did WBT's program of "Solid Gold Saturday Night" move from side to side due to platform motion. It just simply faded and returned.

I switched over to the "A" mode for C-QUAM reception and tuned to Clear Channel WLS/Chicago (890 kHz). WLS suffered from severe platform motion, plus the fact that a 1000 Hz offset whine from a Third World broadcaster seemed to superimpose itself on WLS's signal and also shifted from left to right and back again.

Next, I tuned to WPTR/Albany, New York (1540 kHz) and got more of the same lovely platform motion. Finally, I tuned to 1010 kHz to CFRB/Toronto. Not only did I hear very severe platform motion, but I also heard WINS/New York—a mono station—that seemed to be presenting its All News format complete with platform motion to boot. Not only does C-QUAM make AM stereo stations sound stereo, but it makes co-channel AM mono stations sound "stereo" too, complete with platform motion.

Putting Motorola C-QUAM "pseudo-

stereo" on the air and labeling it as the "winning" or "defacto" system despite the warnings of 11 out of 12 engineers surveyed, despite its lack of high fidelity, despite its vulnerability to heavy platform motion, seems, just for the sake of saving a few measly pennies per IC chip—highly illogical if not totally asinine to me. I am not a CE at an AM station, but I do know the difference between the real high fidelity/discrete stereo available through the Kahn system and the poor fidelity and platform motion of the C-QUAM pseudo-stereo.

If wishy-washy station managers do not begin to listen to their CEs and continue to bow to the pressure of the receiver manufacturers, they may as well use their AM transmitters as boat anchors because, in the end, the people just won't listen to inferior audio music.

Station managers, *WISE UP!* Or you can just kiss your AM audience goodbye.

Peter Quentin George (KA1NHJ)  
CE, WSHL-FM Easton, MA

Shocked

Dear RW:

I am shocked that a modern-day broadcaster could (and would) take the attitude of Bart Walker, owner of WGNS/Murfreesboro, TN (RW) 1 December 1985).

Mr. Walker, what works for your 1 kW/250 W-N AM on 1450 kHz will not work on my 10 kW/5 kW DA at 1510 kHz with a 50 kW only 83 air miles away in Boston (WMRE).

WNLC will celebrate 50 years of broadcasting in 1986 and is planning on going Kahn AM stereo. We did not decide this from a big ad in a trade journal. We talked with our peers that were stereo and made the wise choice. However, I support Mr. Walker's decision (however it was made) by saying that, with a mandate from broadcasters and consumers for multimode receivers,

we can all decide for ourselves.

We don't buy cheap equipment and don't think someone should tell us we have to. As broadcasters, we make decisions every day on equipment and programming to sound as good as we can. Connecticut and New York City have, for the most part, decided we want Kahn. It wasn't a group effort. WNBC, WTIC, WELI, WMMM, WILI, WQXR and others decided for themselves. It was management and engineering working together.

Good radio doesn't come out of engineers being "silenced by their management," as Mr. Walker suggests.

Bob Perry, Ops. Mgr.  
WNLC/WTYD

New London Broadcasting

## Directional AMs Get ATS

(continued from page 3)

TV stations rather than having separate rules for each service.

The FCC also retained the three-minute requirement as the length of time an ATS system has to remedy an out-of-tolerance condition before mandatory shutdown occurs. The NAB had asked for a 30-minute time period, saying that the 3-minute period was insufficient for a station operator to react to the malfunction and take corrective measures.

"Any deviant operation which is not automatically corrected within that (three minute) period would indicate a system malfunction," the FCC said in re-

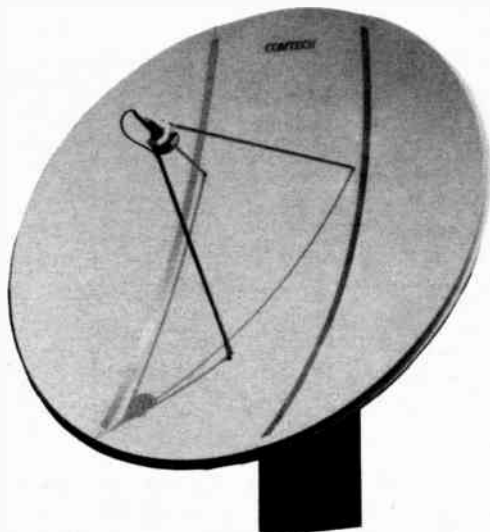
sponse to the NAB's request. "Any malfunction which would necessitate shutting down the transmitter is an interference condition."

In comments filed with the FCC, the NAB applauded the plan to permit ATS systems at directional AM stations, but added that an ATS system can often cost more than the transmitter it is to control.

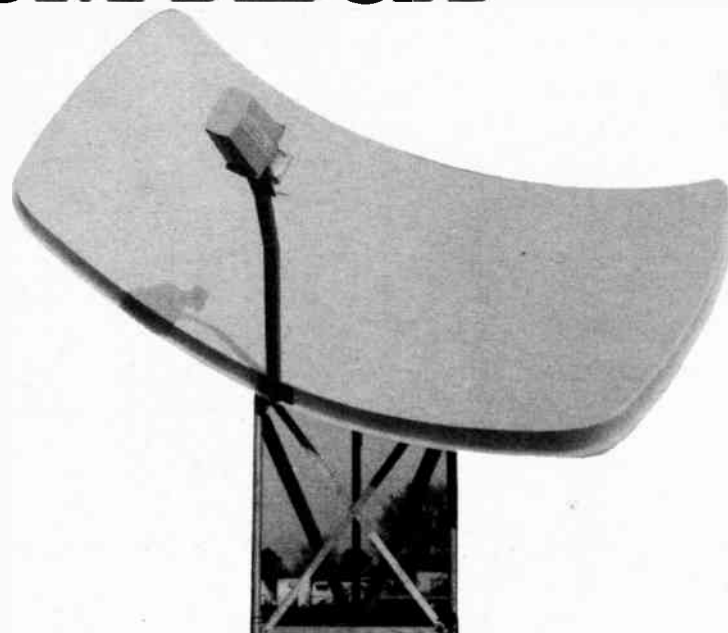
Other parties filing comments said that the previous ATS rules inhibited implementation of some innovative approaches to automatic transmitter control.

FCC docket number is MM 85-91. Contact Bernard Gordon at 202-632-9660.

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# AM Broadcasting Ills Numerous

(continued from page 5)

tion of the carrier, and the undesired phase modulation of the desired carrier caused by the summation of interfering signals on the same frequency. Thus, the presence of any interfering carriers causes platform motion to a greater or lesser degree.

For high fidelity AM, people do not listen to signals at the 20:1 interference ratio. An acceptable hi-fi AM signal might have an interference ratio of

1000:1. Nevertheless, interfering carriers 60 dB down are still going to float from channel to channel during quiet passages. (I actually find the forced C-QUAM mode useful to separate two interfering AM skywave signals while DX'ing, but it is a mental exercise to follow the desired signal through the acoustical space!)

There is some interference level at which the C-QUAM platform rotation becomes aesthetically equivalent to the

ordinary interference levels present in AM. The C-QUAM interference level is higher. Thus, C-QUAM reduces a broadcaster's coverage area, period. You guys with class IV AMs and an RSS average limitation on the East Coast of 17.4 mV/m (my calculation) have things bad enough without the effects of your 100 brothers providing phase confusion to your desired signal.

Skywave clobberage afflicts us *most* of the time. It's 9:30 AM right now, and I can still hear the effects of WWL New Orleans in WGTL, a local daytimer. Who wants to hear interference floating from channel to channel, let alone the platform rotation of the desired channel?

It is indeed sad that people who can't bias a class A transistor amplifier or who haven't experienced the joys of dialing in a recalcitrant directional antenna keep attempting to make a public policy decision which is strictly a matter of engineering.

Many of you out there have never actually heard platform rotation, or have lived with AM stereo radios for an extended period of time. Before you take one side or the other of the AM stereo issue, please take the time to become informed on all the issues of AM improvement. Buy a radio with a "narrow-wide" switch, and experiment. You need not have a C-QUAM station available (if you have a forced C-QUAM mode like

the Sony table radio) to observe the inferiority of this system. Any two interfering carriers will do fine.

I might note that no investment is required for millions of people to hear narrowband Kahn stereocasts. Two ordinary AM radios work just fine.

The only rational approach for broadcasters is to press the radio industry for wideband receivers. If we don't get AM radios to even approach the fidelity of a 1960s' cassette deck, there is no AM stereo system in the world which can reverse your fate.

Monaural stations would do well to purchase a few SRF-A100s, and do public demonstrations of the superior audio quality (for AM) of the wideband receiver.

The NAB, NRBA and SBE should try to have some nice, slick spots produced introducing the public to exactly what a "wideband" receiver is and does.

If you are one of those who are pointing fingers at Leonard Kahn and blaming him for poor ratings and billings, you are horribly misguided. Why don't we, as AM engineers, managers, and program directors, get off our collective kesters and work constructively to save our band. I refuse to believe for one minute that a country with 5000 AM outlets can't get the word out as to what wideband AM is all about.

It is critical that AM be brought to the public at levels of modern high fidelity audio. Then, and only then, can we even be able to begin to argue intelligently about the AM stereo issue.

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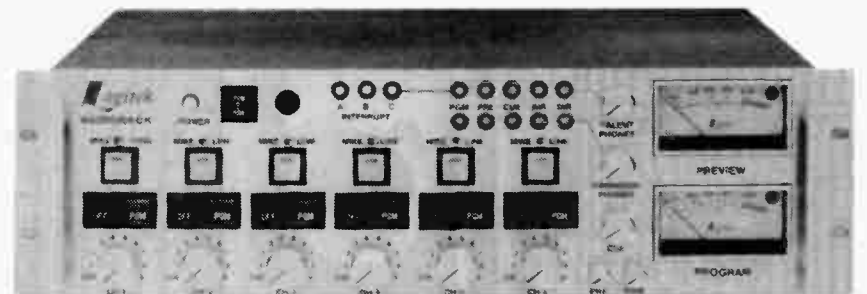
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# AM, FM Deregulation Ongoing

(continued from page 1)

carrier-amplitude regulation, carrier hum and extraneous noise levels, and stereo separation have been deleted.

Many similar regulations pertaining to mono AM stations had been deleted in an earlier order.

Regarding both mono and stereo AM stations, the rule changes delete the requirement that a station permittee must submit a detailed report on the procedures used to obtain the antenna resistance value when filing an application for a license, or when there is a major change in the antenna system. These changes affect rule section 73.54.

The Commission's order also deletes or simplifies a range of AM regulations dealing with transmitter safety and installation requirements, antenna resistance measurements and instrumentation regulations which primarily provide "engineering guidance." These changes affect rule section 73.49.

The actual text of the ruling had not yet been released by press time. However, the Commission's order to accept the NPRM, which was released in the spring of 1985, contained no significant changes, Lewis said.

## FM deregulation comments

On the FM deregulation side, broadcasters who filed comments in December generally supported a plan to delete additional FM regulations. In early November, the Commission released an NPRM that called for the revision of rule section 73.322, which contains the stereo FM transmission standards.

The proposed deletions include audio frequency response limits, the required phase orientation of the left channel signal to the right channel signal, the standards for separation between the channels

of a stereo transmission system and the nonlinear crosstalk limits.

The docket also examined whether "any alternate form of stereophonic transmission should be allowed as long as the operation of receivers designed

for the current method is not compromised."

The plan also called for the revision of section 73.319 involving SCA operations. It would remove restrictions on allowable forms of modulation for SCA

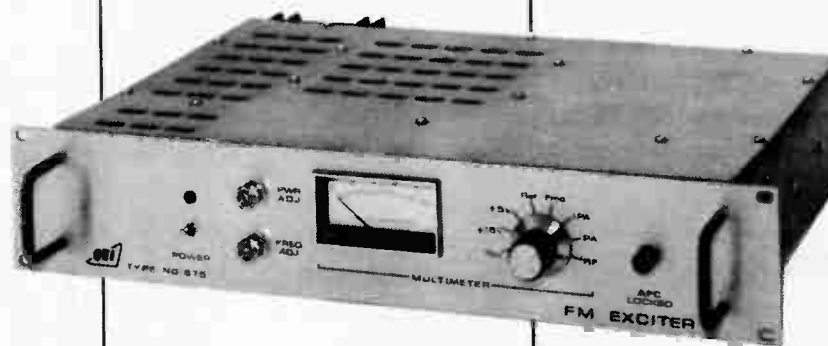
operation and limitations on the amount of crosstalk permitted in the main broadcast channel from SCA operations.

The NAB said it "generally supports" the Commission's FM proposals, but offered several "suggestions." While supporting the removal of the FCC's technical quality parameters for FM stereo signals, the NAB asked the Commission to  
(continued on page 10)

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# AM, FM Deregulation

(continued from page 9)

publish them in a technical bulletin. The NAB also asked the Commission to clarify its proposed rule, section 73.322(a), on stereo transmission standards to make it clear that the permissible pilot subcarrier frequency tolerance specification of  $\pm 2$  Hz is to be retained."

The NAB also suggested that implementation of the NAB-CBS FMX™ stereo transmission system be "unequivocally permitted."

Comments filed by CBS state that the FMX system "overcomes the noise penalty inherent in stereo reception, as compared with equivalent monophonic reception."

The NAB said that proposed rule section 73.322(a)(3) provides that the stereo subcarrier must cross the time axis with a positive slope simultaneously with each crossing of the time axis by the pilot subcarrier.

However, the FMX system uses a 19 kHz pilot frequency and a stereo subcarrier that crosses the time axis with a positive slope 90° in phase later than each crossing of the time axis by the pilot subcarrier, thereby falling outside the terms proposed in the new rule, the association

added.

Because of what it calls an "unnecessarily restrictive" limitation in the proposed rule, CBS said, "broadcasters may reject advances in stereophonic broadcast technology, such as that provided by the FMX system."

### Subcarrier support

Bonneville International Corp., which owns Radio Data Systems (RDS), an FM subcarrier/satellite news and data network, said it supported the overall FM rule changes, including the deletion of section 73.293, "which delineates the services subcarriers may provide."

"All of the proposed rule changes are based on the common realization that regulations are no longer required to ensure that FM transmissions will be protected from interference," Bonneville said in comments filed with the FCC. "The marketplace for FM main channel and subsidiary communications transmissions demands interference-free communications."

### Main channel protection

Regardless of regulations, Bonneville said it has a "primary mission" to protect main channel broadcasting and its SCA services from interference. Deletion of the SCA rules would allow RDS "to operate their subcarriers more freely (and) would not result in additional interference concerns since such interference would be noticed and not be permitted by the FM licensees who are leasing the sidebands."

Other companies that commented agreed that the marketplace provides sufficient incentives to minimize SCA interference concerns.

The NAB also urged the FCC to retain the FM 75  $\mu$ sec preemphasis characteristic in the rules because, like the pilot subcarrier frequency tolerance, it ensures transmission and reception compatibility.

The association also called for clarification of a broadcaster's responsibility in regard to proposed rule section 73.317(f) which states that stations have the means to monitor subsidiary communications. The NAB said the rule, as proposed, was ambiguous and provided "no real guidance" to broadcasters.

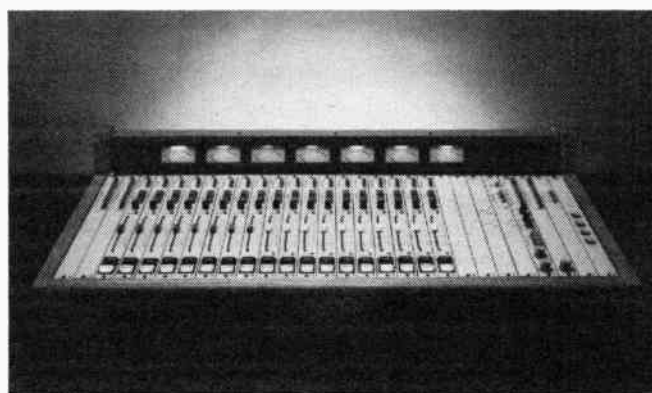
A ruling is expected on the docket in early 1986.

Docket number for the AM deregulation effort is MM 85-125. For more information see RW 1 June 1985. Docket number for the FM effort is MM 85-325; for more information see RW 1 December 1985. Contact Michael Lewis at the FCC: 202-632-9660.

# Multiple Choice:

### What do you need in an audio console?

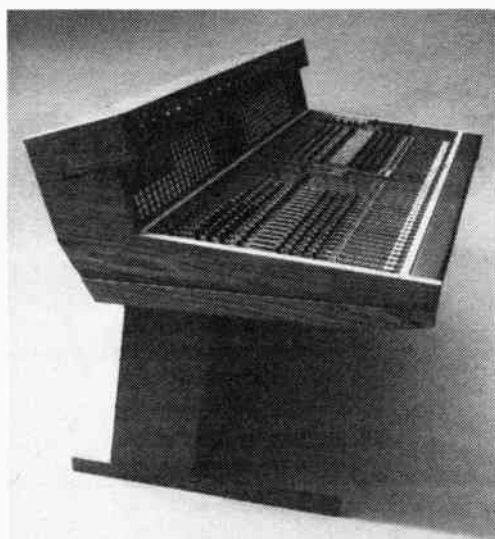
Every application is different; what are your requirements? Should the input section be stereo or mono, mic or line? What kind of outputs and subgrouping do you need? Is a matrix mix important? Do you require mix-minus capabilities? What about metering, timers, tape remotes, mainframes, future expansion?



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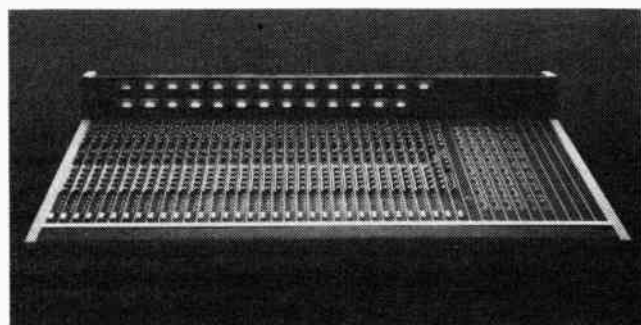
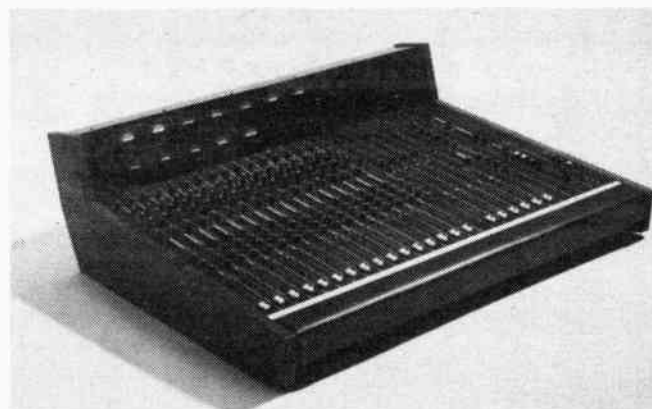
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# FCC Files

(continued from page 2)

auxiliary bands to work with local frequency coordinating committees.

The proposal also asked that applicants for new auxiliary broadcast licenses be required to contact the database administrator of the local frequency coordinating committee and notify the co-channel and adjacent channel licensees.

The NAB asked the FCC to set aside SBE's petition and, as an alternative, to begin a Notice of Inquiry to "gather additional public comment" on the coordination issues. Also, NAB has said it is planning to organize a national frequency coordination committee, which would include SBE participation.

Contact Mike Rau at the NAB: 202-429-5346 or Bob Van Buhler at the SBE: 301-338-6567.

## RF Lighting

Hoping to reverse FCC efforts to deregulate RF lighting devices, which can interfere with AM reception, the NAB has submitted an interference study to the FCC as part of a petition for reconsideration that it hopes will spur adoption of interim radiation standards.

In September 1985, the FCC modified certain regulations governing the use, marketing and certification of RF lighting devices. Deregulated areas include the triennial recertification requirement, which had required manufacturers to re-

test certain gear to ensure continued compliance with regulations.

The NAB report compared interference caused by home appliances with interference from RF lighting devices. Because the rules fail to address interference below 30 MHz, the NAB said the situation would allow RF lighting manufacturers to market devices which would make AM stations "especially vulnerable."

The FCC said it recognizes the potential AM interference problem, and plans to investigate through a separate Notice Of Inquiry.

Docket number is GEN 83-806. Contact Liliane Volcy at the FCC: 202-653-8247.

## Mexican Agreement

Delays continue in efforts between the FCC and the Mexican government to reach final accord on a plan to allow US daytimers operating on any of seven Mexican clear channels to add nighttime operation.

A preliminary US/Mexican broadcasting agreement was signed in August 1985, with plans for a final agreement to be signed by November 1985. However, a September earthquake destroyed some buildings housing Mexico's communications department and delayed the final agreement.

FCC officials said they are prepared to

implement the plan as soon as a final agreement is reached, which they said could be in early 1986. When signed, affected US daytimers will have to wait for show cause orders from the FCC to indicate their night power levels, which would range from a high of 500 W to lesser power levels needed in order to protect existing fulltime stations already operating on those channels.

The preliminary agreement also paved the way for a group of stations consisting mainly of Class III daytimers to extend their postsunset operations past 6 PM local time.

In a related issue, daytimers operating on any of seven Canadian clear channels received show cause orders from the FCC late last summer authorizing night operation. However, many stations said they received lower power levels than expected.

Docket number is MM 84-281. Contact Jonathan David at the FCC: 202-632-7792.

## AM Band Expansion

The FCC is preparing for the April 1986 Regional Administrative Radio Conference (RARC) in Geneva, Switzerland, which will examine expanding the AM broadcast band to 1705 kHz in the Western Hemisphere.

Most nations, including the US, seem to favor relatively low powered (5 kW) regional stations for the new band. The

band could be opened to broadcasters by 1990.

Docket number is GEN 84-467. Contact Jonathan David at the FCC: 202-632-7792.

## Remote Pick-Ups

Broadcasters filed comments on a FCC proposal to allow "cable interests," including cable networks and local systems, to share aural remote pick-up (RPU) frequencies with broadcasters. The FCC said the plan would increase spectrum efficiency.

Fearing increased crowding, many broadcasters commented that if aural remote pick-up frequency sharing is permitted, careful frequency coordination should take place.

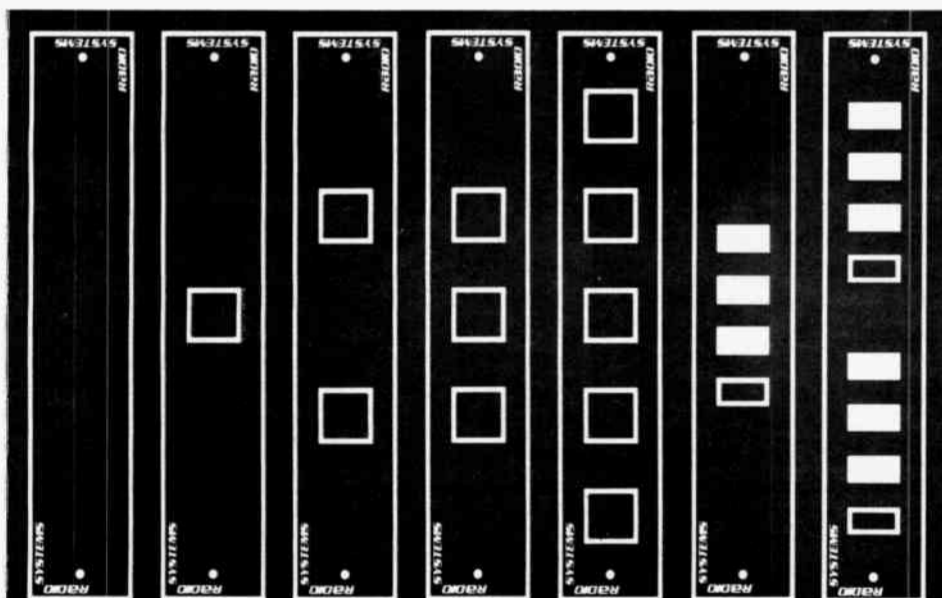
The FCC said it will act on the docket in early 1986. Docket number is MM 85-126. Contact Hank Van Deursen at the FCC: 202-632-9660.

## Automatic Transmission Systems

The FCC in December authorized AM directional stations to use automatic transmission systems (ATS). FCC rules already allow omnidirectional AMs and FMs to use ATS.

With recent advances in transmitter stability and microprocessing, the FCC said it now believes the technology and equipment exist to allow reliable ATS operation at AM directional stations.

(continued on page 12)



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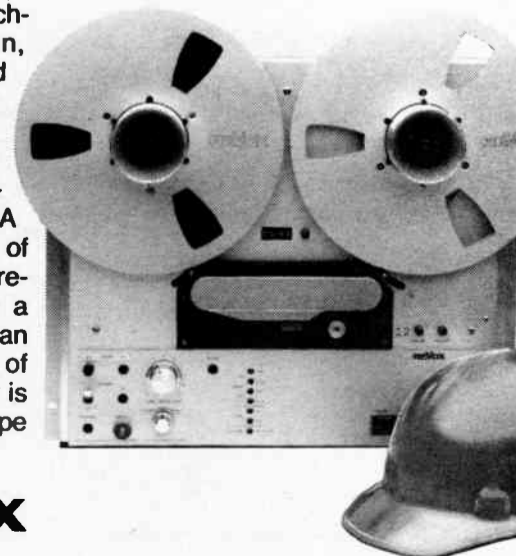
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# FCC Files

(continued from page 11)

Docket number is MM 85-91. For more information see the article in this issue or contact Bernard Gordon at the FCC: 202-632-9660.

## Directional Antenna Proofs

AM broadcasters with directional antenna (DA) systems no longer have to perform certain field strength measurements since the FCC approved a plan in late October that modifies DA proofs. The plan calls for the elimination of skeleton proofs and a revision of the partial proof requirement that will allow licensees to schedule partial proofs as needed.

Docket number is MM 85-90. Contact John Reiser at 202-632-9660.

## Aircraft Interference

The Federal Aviation Administration (FAA), in comments filed with the FCC in December, maintained that it will continue to enforce its regulations requiring that aircraft communications remain free of broadcast station interference. The FAA also warned the FCC not to upstage its authority in the matter.

The FAA reaction was in response to a FCC Notice of Proposed Rulemaking (NPRM), released in April 1985, aimed primarily at resolving FM broadcast station (88-108 MHz) interference with aircraft communications (108-136 MHz).

The FCC said it wanted to "eliminate

or substantially simplify electromagnetic coordination requirements with the FAA" by making broadcasters aware of the specific applicable interference standards. The Commission also said it wanted to define protection criteria needed to protect airborne receivers without restricting the growth of the broadcast industry.

In a related development, the FCC announced last summer that it had reached an agreement with the FAA to permit new broadcast stations to be built and modifications to be made at existing stations with less of a chance of receiving an air hazard notice. However, the FAA said it will continue to carefully monitor broadcast facilities to see that no avionic interference is actually produced.

The FCC, which has maintained that cheap aircraft radios are the main cause of the problem, said it would study all comments received on the NPRM before deciding whether to further update the proposal.

## NAB Board OKs Merger With NRBA

(continued from page 1)

committees believed radio would be the strongest with "one voice."

"It's an advantage for the radio industry as a whole," Snider added, especially for the industry's lobbying efforts on

FCC docket number is MM 85-108. Contact Ralph Haller at the FCC: 202-632-5414, or Jerry Markey at the FAA: 202-426-3269.

## AM "Birth Control"

The FCC voted in late October 1985 to delete its nontechnical restrictions regarding AM applications, otherwise known as "birth control" rules.

The NAB and the NRBA had agreed with a Commission proposal to repeal the so-called AM "birth control" measures which place restrictions on the filing of certain AM applications.

The rules excluded otherwise acceptable applications for new AM stations and major changes in existing AM stations unless those applications would bring service to unserved or underserved areas.

Docket number is MM 85-39. Contact Jonathan David at the FCC: 202-632-7792.

## Short-Spaced Stations

In late 1985, the FCC rejected a proposal to require short-spaced FM licensees to notify affected stations when

making facilities changes that would increase short spacing.

The FCC said its rules already prevent unauthorized modifications outside "permissible mileage separation areas," and it provides public notice regarding proposed changes. Therefore, the Commission said, the proposed rule, submitted by WRAL-FM, Raleigh, NC, was not necessary.

The rulemaking number is RM-4863. Contact Mark Lipp at the FCC: 202-634-6530.

## FM Translators

Chicago's Moody Bible Institute (MBI) in late 1985 asked the FCC to allow satellite and microwave feeds for FM translators. A similar MBI request in 1984 was rejected by the FCC.

MBI said that with FCC resolution of several issues—including the Docket 80-90 FM allocation procedures and the ruling on interference problems between noncommercial FM and TV-6 stations—the time is right for the reconsideration of its request.

Docket number is RM-5219. Contact John Reiser at the FCC: 202-632-9660.

Capitol Hill and at the FCC and other government agencies.

## Separate identity

NRBA President Bernie Mann said that if the NAB votes as proposed by the executive committees and gives radio a separate "identity," then it's a "good thing" for the industry.

Mann added that if the NAB's intention is only to be rid of a competing association, and it decides not to give radio the power recommended by the accord, then "I'm sure it wouldn't take long" for another radio-only association to surface.

Gary Grossman, NRBA Executive Committee VP/West and VP/GM of KRKT AM-FM, said negotiations have produced "a situation that will be best for the radio industry as a whole."

Ferrara added that "it (a merger)

would be a perfect deal because it gives both sides what they want without either one having to give up anything."

With the planned merger, some industry observers said the NAB's convention lineup could change. Industry sources speculated that the spring show may be changed to a TV-only format, while the fall convention would stay as a radio-only event.

Ferrara said that, "as a logistics question, it may be an ideal opportunity" for the NAB to split the shows. He added that any such move would be dependent on exhibitor preference.

NAB officials were not available to comment on possible changes regarding future conventions.

For more information, contact Susan Kraus of the NAB at 202-429-5350 or Wendell Wood of the NRBA at 202-466-2030.

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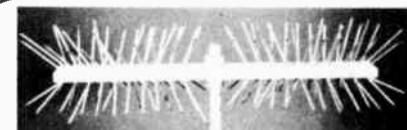


Circle Reader Service 24 on Page 23

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Circle Reader Service 12 on Page 23



# FM IM to Be 'Next Hot Topic'

by Jon P. Grosjean

South Woodstock CT . . . Since FM intermodulation interference promises to be the next hot topic among broadcasters, I would like to open up a rational dialogue by first pointing out what is currently possible to do in a receiver and then what tradeoffs will be necessary if improved IM performance is required.

During the last few years, a similar situation existed between AM broadcasters and receiver manufacturers, with each assuming the other was somehow not doing the best possible job to ensure good quality AM reception. After many papers, NAB meetings and the creation of a joint EIA/NAB committee on AM improvement, the situation has improved greatly. It is my hope that the FM intermodulation problem can be attacked in the same way.

### What is IM?

Unless you as a broadcaster have been directly affected, you may not know what IM is.

Basically, it is the same as IM with two audio signals but at FM frequencies. Two strong signals entering a receiver create harmonics due to the nonlinearity of the RF amplifier device. This results in the two strong signals being received at other frequencies where there may also be a third weaker signal.

Reduction in the level of *either* of the strong signals can eliminate the problem. For example, suppose strong signals at 98.1 MHz and 100.1 MHz are present at a receiver's antenna. These may produce spurious signals at:

$$2(100.1) - 98.1 = 102.1 \text{ MHz}$$

$$2(98.1) - 100.1 = 96.1 \text{ MHz}$$

Higher order harmonics can also produce more spurious signals but the above are the most common.

In another situation, three strong signals can produce a spurious response at another frequency. An example (from Louisville, KY) would be:

$$81.3 + 102.3 - 91.9 = 99.7 \text{ MHz}$$

Thus, a weak station at 99.7 MHz would be subject to interference. Again, reduction in the level of any one of the three signals could solve the problem.

### Receiver types

For the purpose of considering only FM tuners, there are essentially four kinds of receivers in existence today:

- Portable and table model
- Hi-fi
- Low-cost car
- Digital car

The portable and table radios, produced in huge volumes, generally use common-emitter bipolar RF stages. Two signals of approximately 1.5 to 2 mV at the antenna terminals will produce spurious IM responses.

Most home hi-fi receivers use a dual-gate MOSFET for an RF stage. They are

*Jon Grosjean of Jon P. Grosjean Consulting Engineers, is active in the EIA, and has served on the NAB-EIA AM Improvement Committee. He can be reached at 203-974-2035.*

somewhat better than the above type, and require two signal levels of about 5 to 7 mV to produce IM.

Low-cost car radios can range in quality anywhere between the portable and hi-fi types. If they come from Hong Kong, Korea or Taiwan, they are usually more like the portables, and those from Japan or the US are more like the hi-fi ones.

The designers of the high-end car ra-

dios, almost all of which are digital, are most aware of the IM problem and have been struggling with it for years. Most of these have IM rejections of from 10 to 50 mV. This is accomplished with complicated AGC schemes, which may cause the weak station to be noisy but also relatively free from interference.

One effective way to improve a receiver's IM performance is to add a local-distance switch which simply attenuates

all the incoming signals. Unfortunately, this may also eliminate the weak signal entirely, so many manufacturers are reluctant to add this type of switch.

### No easy solutions

Currently, there is no easy way to produce an FM receiver which is free of IM problems. Dual-gate MOSFETs have a spurious-free dynamic range of about 70  
*(continued on page 16)*



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Martin, Program Director at KZEL Radio, Eugene, Oregon. "A new operator can learn the Medalist quickly. We are in a very competitive market, where all stations have gone as loud as they can. We're winning because we're loud *and* clean. Forty percent of our music is on CD's, and the Medalist provides an excellent sound with this exceptionally clean source material."

### Staff morale builder

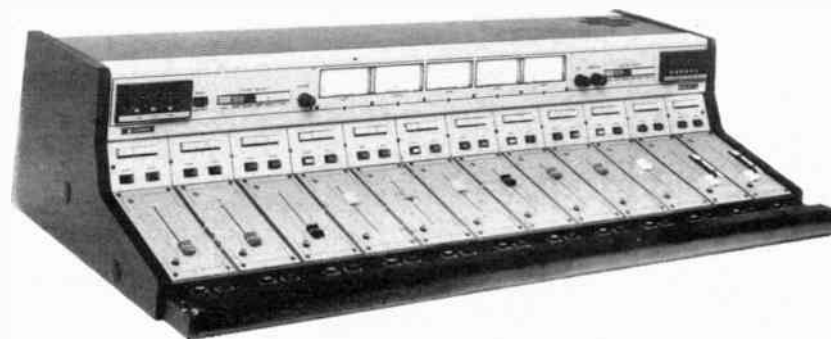
At Liggett Broadcast Group's WHNN Radio, Saginaw, Michigan, the Harris Medalist-12's impressive appearance and performance belie its modest price. "Our operating staff perceive they are working with a much costlier board," says VPM Dan Stewart. "The Medalist is a real morale builder."

### Better books

Both KLVI and KYKR Radio, Beaumont, Texas, enjoyed ratings gains in the latest survey. "This is due in part to the Medalist consoles," says VPM Candye Anderson. "The AM people were envious when the FM side got the first Medalist. Now we have two. Both stations sound great, and the operations people are quite enthusiastic."

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# Touch-tone Remote Control Affordable

*Editor's note: The following is part of a continuing series on alternatives to telco.*

by Bob Groome

Richmond IN . . . In November 1984 the FCC enacted Docket 84-110, amending the rules and regulations in Part 73 on Remote Control. Under the changes, broadcasters are still required to have proper control of the transmitter facility, but the method of doing that is now at the pleasure of the licensee.

In this brief article I will explain one way that existing systems can be upgraded to eliminate the dedicated leased telephone line.

If your transmitter site is already

Bob Groome is a Sales Engineer for Allied Broadcast Equipment. He can be reached at 317-962-8596.

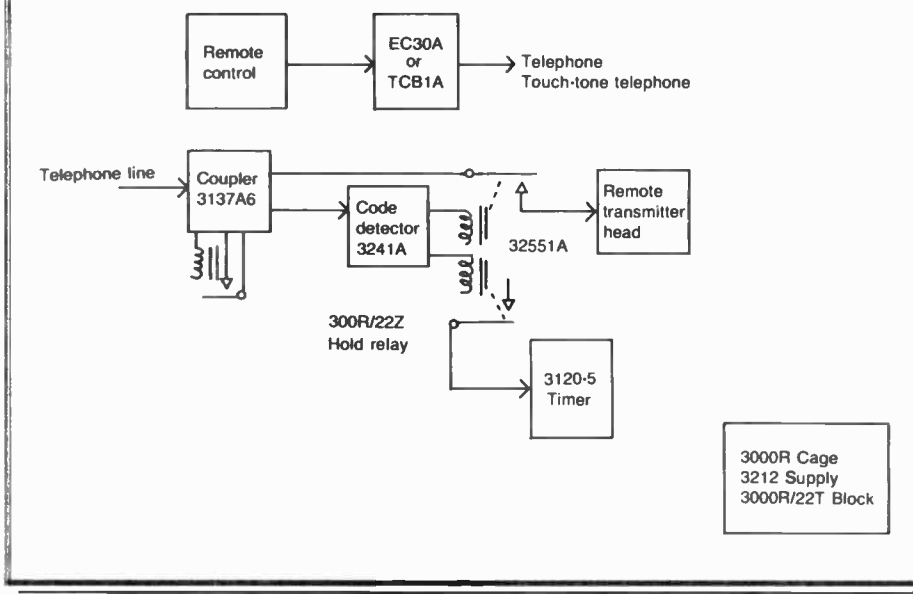
equipped with a dial-up telephone, the only additional equipment required will be that shown in Table 1. You will note that by the purchase of an additional remote control head, the remote control point could be anywhere where a touch-tone dial-up telephone is available.

### Configuration

Following the block diagram shown in Figure 1, the remote control head or studio unit is run through an approved telephone access device, such as the Elgin EC30A or the Comrex TCB1A. On the transmitter end of the circuit, the telephone line is attached to the Monroe 313746 Type Approved Coupler, and then passes through the code detector to allow an authorized user access to the remote control transmitter unit.

You will note the addition of the 3120-5 Timer Card, which will allow automatic transmitter turnoff should you lose the telephone line for an extended

Figure 1.



length of time.

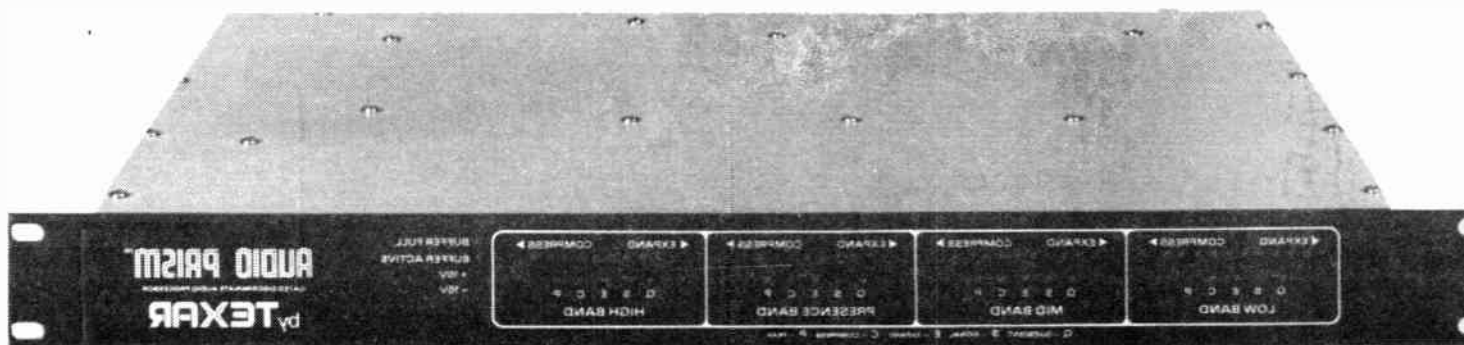
Summarizing the function of the individual blocks in Figure 1, the Elgin or Comrex Coupler simply allows the telephone instrument to touch-tone out to the transmitter site, pass along a security code and then allow coupling of the studio end of the remote control system

into the dial-up network.

The Monroe 313746 provides type-approved coupling to the dial-up network, auto answer, and telephone line holding so long as the telephone circuit is not interrupted.

The code detector permits a user a **(continued on page 16)**

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# Touch-tone Control Affordable

(continued from page 15)

multi-digit code to prevent unauthorized persons from having access to the remote control system.

Upon receipt of the correct tones, the remote control transmitter head is connected to the telephone circuitry, and the system works as if it were on a dedicated circuit.

The 3000R/22Z Holding Relay maintains the connection as long as the circuit does not go on hook for any reason. It should be noted that this scheme will not work with older step-by-step telephone exchanges, where there is not battery reversal or momentary interruption of the circuit upon loss of the connection.

The Monroe 3120-5 Timer Card was included as a fail-safe circuit, although its use may not be mandated by a strict interpretation of the rules. If the station does not have positive control of the transmitter, operation is supposed to cease, and this is one way to accomplish that end.

A more sophisticated approach to the

studio end of this unit could be devised with relays, etc., to alleviate the necessity of disconnecting and connecting the remote control head into the Comrex or Elgin Coupler.

A note here on the Comrex TCB1A: this device has a holding switch which would allow the telephone instrument to be put back on hook after acquiring control of the transmitter site.

## Options, cost

The Monroe components are sold individually, and interwiring between units will be the responsibility of the station engineer.

This scheme will not work with the older DC remote control type systems or a remote control system that uses DTMF or touch-tone frequencies that might upset the code detector module.

The block diagram in Figure 1 prices out at approximately \$800 for the transmitter site and around \$100 for the studio site, a cost which should pay for itself in a very short time, based against removal of a dedicated line circuit and replacing it with a dial-up telephone. A complete list of the necessary items are listed in Table 1.

Table 1.

Monroe Electronics:	
1	324A Code Card
1	3137A6 Auto Answer Card
1	3000R/22Z Relay Socket
1	3120-5 Timer Card
1	32551A Dual Relay Card
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1	3212 Regulator Card
1	3000R/22T Connector
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## IM Next Hot FM Topic

(continued from page 13)

dB. If selectivity is added between the antenna and the RF stage, the receiver sensitivity suffers, and it is difficult to make tuned circuit Q high enough to be very effective.

The best current IC mixers have an IM rejection of only about 5 mV, but they are noisy and must be preceded by an RF stage.

Table radios have relatively poor antennas and need as much sensitivity as possible to receive signals.

Thus, as always, the problem comes down to a tradeoff between cost, sensitivity and strong signal performance. Once a certain cost level has been reached—as in the expensive car radios—the tradeoff is between sensitivity and overload.

Do broadcasters want fewer listeners because the receivers are more expensive or less sensitive?

On the other hand, it is possible to produce low-cost receivers with somewhat better IM performance by changing the design slightly. Rejections of two signal levels of about 3 mV is not hard to achieve, and might be a good level for broadcasters to consider.



# Studio-Transmitter Hum Vexing

by John "Q" Shepler

Rockford IL . . . You've spent a month crouched under the control board with headphones and clip leads. That 30 lb audio analyzer has become your best and only friend. Finally, the new studio complex is finished. You push the cart, CD and turntable pots wide open. There is only the faintest hint of noise.

## Q-Tips

You crank up the monitors and the gentle hiss increases to audibility. Nowhere is there the slightest hint of hum. If there is even a trace of 60 or 120 Hz component, it is buried deep in the noise floor. Victory is at hand.

Now to christen the new air studio. You pull the left and right channel patch cords simultaneously, and you're on the air at last. It sounds great—clean and open. The music cart ends and clicks to a stop. You turn up the air monitor for a quick check and . . . Oh, no! Just above the expected background noise is a suppressed, but quite noticeable, hummmmm.

This is every studio engineer's nightmare and the vexation of every CE. The transmitter proofs out at -80 dB noise, all white. The studio equipment has been massaged until the thermal noise limit is starting to look like a real barrier. Yet, the sound on the air can hardly hold a candle to grandma's phonograph with the ceramic cartridge. You have been

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

done in by that no man's land of circuitry between the studio and the transmitter.

Let's step back for a minute and take a look at what can happen to your audio from the time it leaves the studio until it gets a final squeeze from the audio processing.

The test point for most studio measurements is at the board output, after a coupling transformer and perhaps an 8 dB pad. For proofs, this signal is strapped to the input of the audio analyzer which terminates in a nice, clean 600 ohm resistor. Well, that's how the factory checks out the equipment, anyway.

The measurements obtained with this arrangement are perfectly valid when the signal goes only 5' further to the input of a digital mastering recorder. Unfortunately, the board output connector is just the launching point for broadcast audio. In some plants, it's a short cruise down 50' of shielded pair to the audio processing rack and then into the exciter. Most of the time, though, the studio-to-transmitter connection spans many miles and includes a wide variety of circuits.

There are two accepted methods for connecting studio and transmitter locations. One involves wiring furnished by the phone company. The other is a wireless STL system using a microwave transmitter/receiver. Both of these schemes have their strong and weak points, and both have the potential to do a lot of damage to your audio.

In the first case, the audio exits the control board via a transformer output. The transformer often boosts the levels and also provides impedance matching. The VU metering is bridged to this point and is calibrated for +8 dBm=0 VU. Next comes a selectable resistive pad

which is strapped for 8 dB loss to give a 0 dBm output when driving a 600 ohm load.

This is a very common arrangement in control boards designed for broadcast. The 0 dBm level is just about right for phone lines. If you try to go much higher, you risk crosstalk into other phone circuits and the wrath of the local phone company.

If the reference level is much lower, your quality will be limited by the noise and crosstalk from other circuits. It's the same touchy tradeoff between headroom and noise floor that you have with cart machines.

From the board output, the audio goes down the hall to a telco termination point. It is your responsibility to provide a shielded and balanced circuit to this

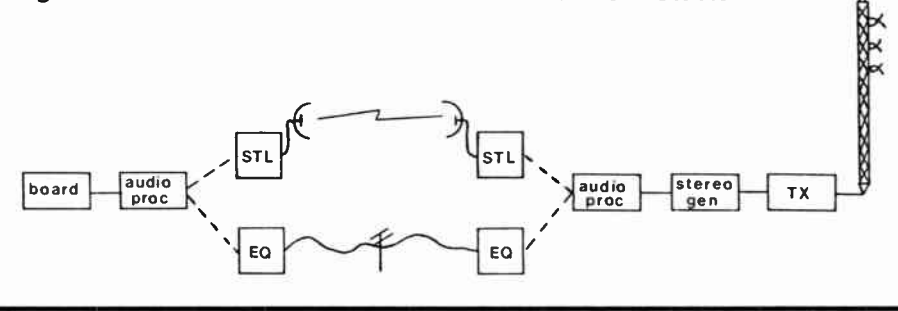
point. I'd certainly advise shielding the audio as far as possible, since it's bound to run near fluorescent light ballasts and other electrical noisemakers.

Once the phone company has the signal, they'll probably run it through an isolation transformer of their own and then into an equalizer or right into the common bundle of twisted pairs.

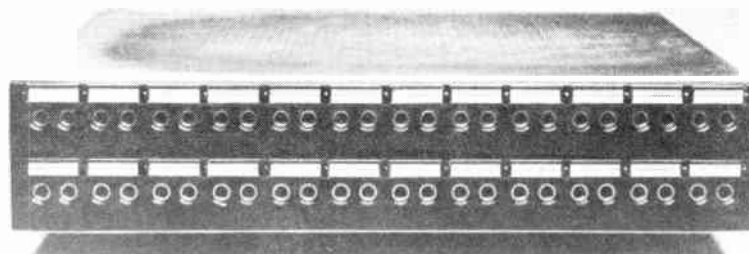
At the far end, the circuit will terminate in another box which contains more equalizing circuits to compensate for line losses. A 15 kHz equalized loop should be transparent to the audio that passes through it. In reality, though, your signal is bound to pick up at least a little hum and noise, if not frequency, phase and amplitude distortions. There are no transparent phone lines.

*(continued on page 18)*

Figure 1. Common Audio Links to Transmitter from Studio

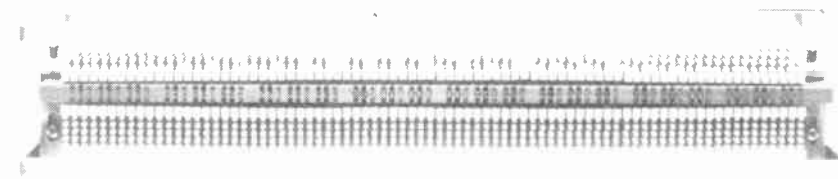


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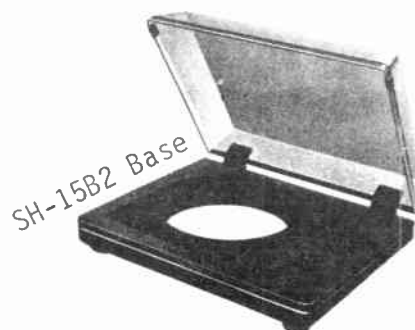
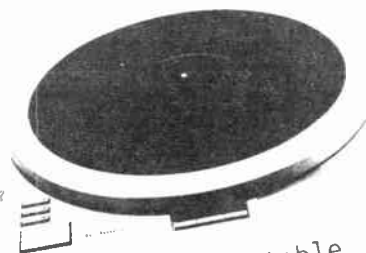
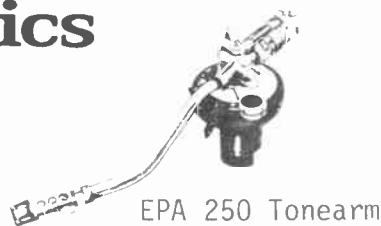
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# Studio-Transmitter Hum Vexing

(continued from page 17)

The equalized loop has been a staple of broadcasters for a lot of years and works pretty well for the most part. The major headaches come if either side of that balanced line gets shorted to another circuit or to ground. Sometimes water in the lines is enough to upset the balance. Then the noise level rises and your only recourse is to get on the phone with the phone people.

The passive equalizers provided by the

phone company keep the response flat, but knock your signal down to  $-10$  or  $-15$  dBm at the transmitter. The audio processor will accommodate this low level, but you have to be extra careful not to pick up any additional noise between the phone box and the processor. Such weakened audio is also more susceptible to RFI problems. Don't forget the shielding and grounding.

The other method of getting your signal to the transmitter is to transmit the two

channels or composite audio on a 950 MHz carrier and recover the baseband audio at the transmitter site. The signal may travel dozens of miles through space, but the wiring problem is limited to a few feet of cable at each end.

The STL system sounds ideal, but it has its own compromises. First, the dynamic range limitations are even less forgiving of levels than telco lines. The STL transmitter has a 100% modulation limit just like the big transmitter.

The system has a maximum audio level it will pass and a noise floor which is probably a lot higher than your new recording studio control board. If you stay within that dynamic range, all is well. But, if you don't get the levels right or some other problem occurs, your carefully created audio can get very mangled indeed.

Here are a few other things to watch out for with STLs. Got an old system? One with tubes? Better check for hum and noise as often as every week. Tubes poop out with age and as they lose their amplification, you slowly lose your fade margin.

The STL's cousin, the Remote Pickup Unit (RPU), suffers from the same problem. All of a sudden, you've got noise problems where there were none yesterday.

Tubes also like to develop filament-to-cathode shorts which let heater AC (60

Hz hum) into the signal. If that's not enough to worry about, any equipment that's running hot is bound to dry out its electrolytic filter caps sooner or later, resulting in more hum.

Here's something else to think about. Many audio people think they're safe from RFI if they can get a few miles from the transmitter. What about that STL transmitter on the roof? Some of its power will surely find its way to the studio and into the audio circuits.

Maybe that's getting a little too paranoid, but if you are having strange noise problems, try shutting down that RF source and see what happens. The same applies even more to CBs, business band two-way and RPU talk-back transmitters.

One technique that will help phone lines and STLs alike is to do as much audio processing as possible at the studio. Then the transmission system will be dealing with a more limited dynamic range audio signal.

Final limiting or clipping has to be done at the transmitter to take care of glitches between the processor and the modulator.

But, if you move the gain reduction circuits to the studio, there won't be any amplifiers at the far end trying to pull up low level sound passages from the noise floor. The limitations of the loop or STL will still be there, but they will have much less effect.

If you can get the audio safely to the transmitter site, you will be ahead in the battle against hum and noise.

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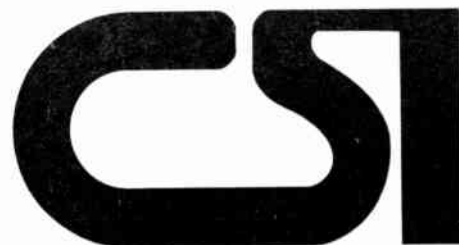
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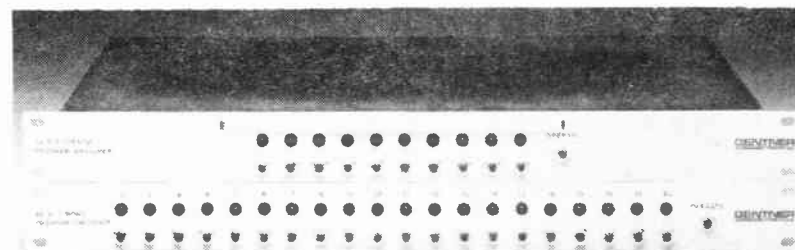
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# VRC-1000 Vocal

by John E. Leonard, Jr.

San Jose CA ... With the creation of the new remote control rules, Sections 73.1400 and 73.1410 in November 1984, the FCC encouraged the development of equipment that now permits the use of dial-up telephone service for remote control of AM, FM and TV transmitters.

### Cost effective

On the practical side, we all know that dedicated telephone circuits have become very expensive. In the San Jose area, the typical dedicated data circuit, unconditioned, for many existing remote control systems has a monthly charge of \$130.

A standard business telephone line is \$8.25 per month, with Touchtone adding \$1.70 per month, for a total of \$9.95. While this is metered service, that would only add \$2 to \$5 on a typical basis, bringing the total to some \$12 to \$15 per month. That represents a savings of some \$115 per month or \$1380 on an annual basis.

Beyond cost, the reliability and serviceability of standard dial service versus data circuits must be considered.

### New rules

In preparing the new rules, the Commission noted that it is not in the business of telling us how to accomplish remote control. In fact, the new rules are devoid of "how to" or methodology provisions,

*John E. Leonard is president of Gentner RF Products. He can be reached at 408-926-3400.*

and have eliminated most of what we have known as remote control.

The key area that now must be followed is to have absolute carrier control so that the operator can turn the transmitter off if it causes harmful interference or is operating out of law or treaty. This capability must be accomplished in some way other than through the use of the dial system. This provision has been interpreted as the presence of program audio or even the squelch relay of an STL receiver being energized.

While fail-safe requirements were specifically deleted, the key area is to have a means of turning off the carrier at will. In considering this approach to remote control, the requirements of EBS and tower lights must not be overlooked, even though they are outside the realm of remote control itself.

### Dial-up R/C equipment

To take advantage of possible savings and to further enhance the new possibilities, a drastically different approach to

the equipment used for remote control had to be taken. To accomplish this, Gentner RF Products has designed a remote control unit to function specifically on the dial telephone system.

The VRC-1000 Remote Control Unit, now available, will permit transmitter remote control from any place having a telephone—at home, in the car (with cellular), at a pay phone, in the studio—while also meeting the requirements in the Commission's new rules.

*(continued on page 20)*



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Circle Reader Service 50 on Page 23

Circle Reader Service 49 on Page 22



# Gentner RCU Responds Vocally

(continued from page 19)

Utilizing the latest technologies, the VRC-1000 is microprocessor based and employs extensive memory and real-time clock circuitry.

To permit remote control from anywhere, Touch-Tone (DTMF) signals are used to command the unit; the VRC-1000 responds with synthesized voice. The words spoken by the VRC-1000 are selected by the user at time of unit setup from a vocabulary of some 600 words,

letters and numbers stored in the unit's memory.

Multi-level security codes (also user-defined) are incorporated to prevent unauthorized command of the unit.

The VRC-1000 accepts up to 16 metering inputs, each with four tolerance limits. Each input may be linear, undergo automatic power-to-linear conversion, or be a calculated indirect power reading. The inputs are presented as four digits, with the decimal point determining the

use of "teens," "hundreds," "thousands," etc. in the voice output. Also included in the VRC-1000 are 16 status channels and 32 command outputs.

### Auto dial/auto answer

Two modes of operation—automatic dialing and automatic answering—are possible.

Automatically dialed calls are generated in response to pre-established alarm conditions on either metering or status

channels. With an alarm condition, the VRC-1000 progresses through up to five telephone numbers until it receives an answer, and, more importantly, the access security code. When it gets the correct code it says, "Thank you," and then announces the alarm condition.

An example is "Alarm condition detected, Metering Channel 11, Transmitter Output 11.3 kilowatts, above first high limit of 10.5 kilowatts, time was 3:48 AM July 20, 1985."

At this point the alarm message can be cleared or repeated. The alarm remains stored until cleared by the authorized person.

In addition to the synthesized voice mode of operation, the VRC-1000 also has available an Internal Modem Option that enables the unit to provide a digital data output. This option includes software that stores in the unit's memory a video display presentation, as well as printing functions, for automatic logging of all metering and status channels.

Transmitting standard ASCII information, in the data mode the VRC-1000 can communicate with almost any CRT, printer or any size of computer. As with the voice output, the data output can be accessed in either the automatic dial or automatic answer mode. The unit can be toggled between voice or data with any connection as needed.

### Automatic command

With the "smarts" and other capabilities within the VRC-1000, the automatic command capability was included as standard in the unit. Any of the things that can be classified as an alarm can also be used to issue automatic command outputs.

Further, the VRC-1000 has 20 time functions included in its software. These functions could take care of pattern changes, etc. At present, the ATS rules are awaiting revision from an action initiated by the Commission that will cause them to resemble very much the new remote control rules.

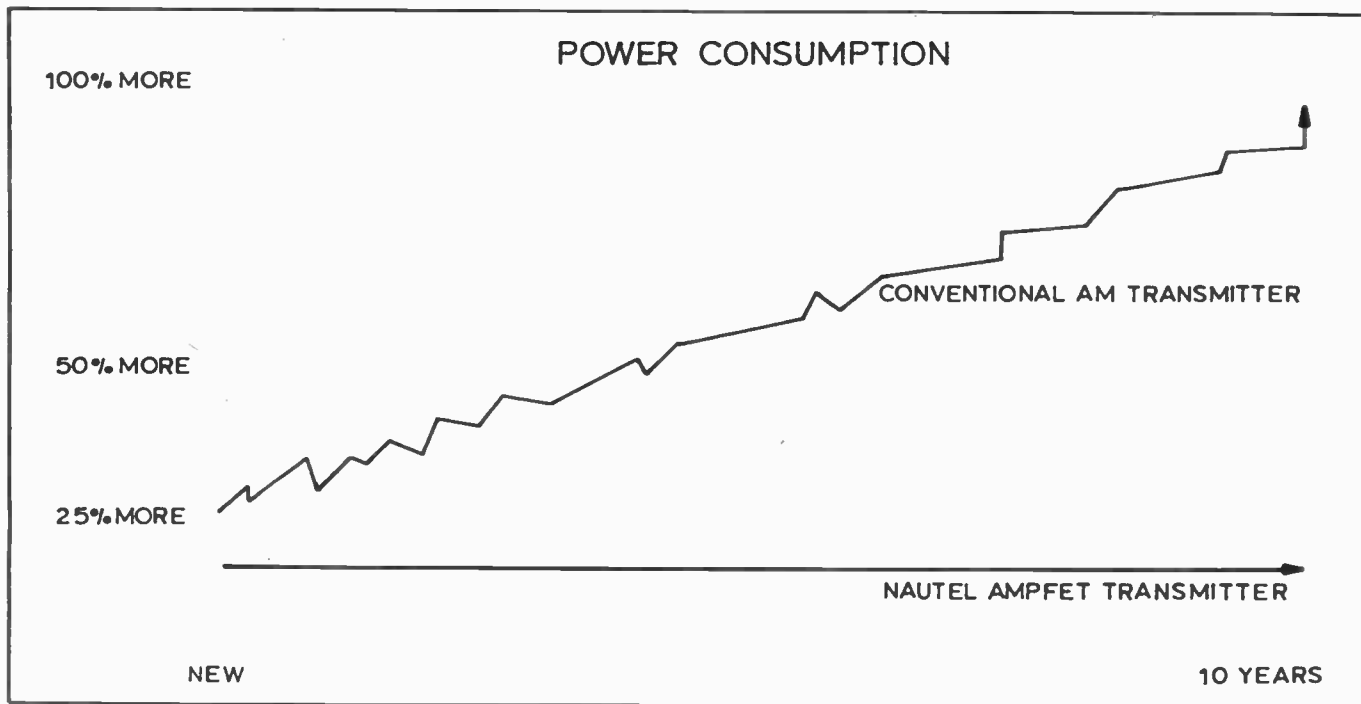
### User mobility

With the various modes available with the VRC-1000, it is easy to see how the unit would permit access to authorized personnel from a telephone at home (for those middle-of-the-night off-air situations), at a pay phone (from a restaurant, allowing a problem to be taken care of without having to leave) or a cellular telephone. For situations where DTMF capability is not available, Gentner RF Products offers a variety of fixed and portable automatic dialers that will permit operation of the VRC-1000 following connection through a pulse dial system.

Other options include the Internal Modem Option mentioned earlier, a battery pack to keep the unit fully functioning during a power failure (memory functions and the real-time clock have an internal 10-year/life lithium battery backup), and various Versiblock and Punch Block interface accessories.

The VRC-1000 is intended to function as a primary remote control or as a backup remote control. The unit is priced at under \$3000, clearly reducing the cost of remote control not only in basic costs, but also in the operating (telephone) costs.

## Designed for efficiency



## AMPFET SERIES

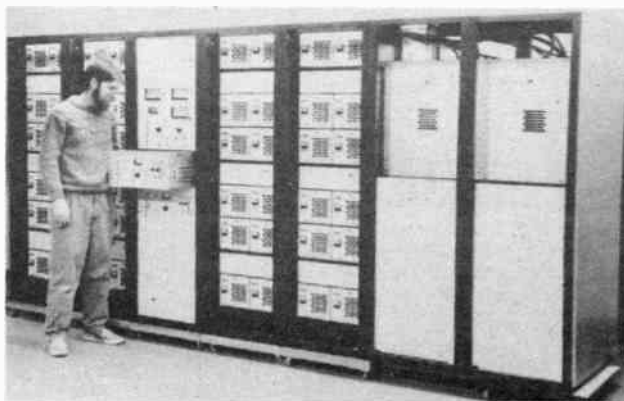
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# Bridged-tee Combiner Features

by Grant Bingeman

Dallas TX ... A combiner allows two or more RF sources of the same frequency to share a common load. This is in contrast to a diplexer or multiplexer, which allows two or more RF sources of different frequencies to share the same load.

## Designer's Notebook

There are several types of RF combiners. Most high-power combiners are designed for maximum isolation between sources. Some low-power combiners have a deliberate amount of coupling between sources, causing remaining sources to be loaded more heavily when one source fails. This prevents a serious loss of RF power output during a failure, and is commonly used in solid-state drivers.

This article discusses in detail the bridged-tee combiner. It does not cover the 90° hybrid in its lumped-parameter or transmission line forms or combiners with limited coupling.

The bridged-tee combiner is essentially two 45° L networks bridged by a capacitor and a reject or "waster" load,  $R_R$  (Figure 1). When each RF source produces the same output magnitude and phase, no current exists in  $R_R$ .

If one source fails entirely, then half of the remaining power is delivered to  $R_R$ , yet the load impedance presented to the source remains constant. Thus, if two 10 kW transmitters were combined to produce 20 kW in an antenna, and one transmitter failed entirely, the antenna power would fall to 5 kW. The other 5 kW would appear in the reject load.

Usually some form of automatic switching, sensing the loss of RF power from the failed transmitter, would switch the good transmitter straight to the antenna after a delay of a few seconds. Thus the reject load would not waste all that power.

Each component of a bridged-tee combiner (Figure 1) was varied individually  $\pm 10\%$ , and the changes in input impedance, isolation and reject current were noted (see Table 1a and 1b). Reject current was not tabulated because it was insignificantly small when only a 10% change in component values was made.

Isolation was determined by using a single generator at one input port, and measuring the relative voltage present at the other port, with no load on the other port. If a 50 ohm load had been used in place of the missing generator, the isolation figures would have been about 3 dB lower.

Bear in mind that this study assumes that both generators are operating with equal voltages and phases. If, for example, only one generator were operated at a time, the results of the analysis would be considerably different. You will not get the same values as those in Tables 1a and 1b.

Grant Bingeman is a senior engineer at Continental Electronics, a division of Varian Associates, Inc. He can be reached at 214-381-7161.

and 1b if you use a network analysis program that allows only one generator.

Several general statements can be made about the adjustability of the bridged-tee combiner:

- The reject arm or bridge components ( $R_R$  and  $C_2$ ) have very little effect on the input port impedances;
- The common or shunt leg components of the tee ( $R_L$  and  $C_1$ ) have the same effects on either port;
- When the series arms of the tee ( $L_1$  and  $L_2$ ) are ganged, or adjusted identically, the same effects are noted at either port;
- The shunt capacitance affects only input port resistance;
- The load resistance affects only the input port reactance;
- The series arms, when ganged, affect only the input port reactance, but isolation degrades more rapidly than in the preceding statement;
- The series arms, when inversely ganged, primarily affect the input port resistance (one up, one down), and isolation is better than with the effect of shunt capacitance;
- A single series arm more or less affects both input port reactances equally, but affects input port resistances in an

opposite manner.

The lead lengths in a switch matrix (Figure 2) often differ such that when a good impedance match is obtained in one switch mode, a poor match is had in another mode. Since it is not always mechanically convenient to have equal-inductance leads, a series capacitor may be inserted to tune out the inductance (Figure 3).

However, if a shunt capacitor is used, there is no need to break the lead or insulate the capacitor from ground. The effect of the shunt capacitor on resistance

is typically small enough to ignore. For example, an impedance of  $50 + j10$  shunted by  $-j260$  produces  $52 + j0$ , a VSWR of only 1.04.

The shunt current is much smaller than the series current, so a small mica capacitor will typically suffice. Although the voltage across the capacitor is higher in shunt than in series, mica capacitors normally reach their current rating before they reach their voltage rating in medium-wave work. Thus the voltage increase will generally not be found significant.

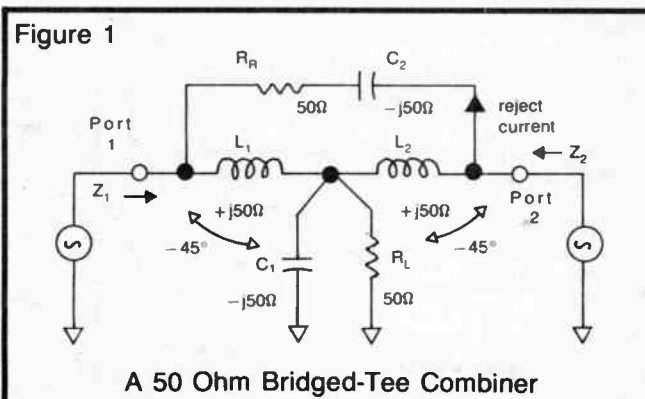
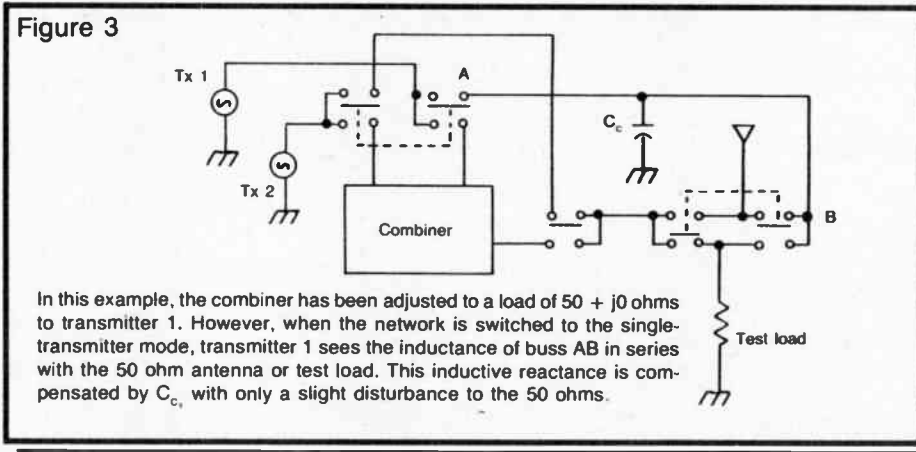


Table 1a.

Component	Value	Z <sub>1</sub>	Z <sub>2</sub>	Isolation
L <sub>1</sub>	+j45	47.6 - j2.5	52.9 - j2.7	-26 dB
	+j55	52.7 + j2.6	47.9 + j2.3	-27
C <sub>1</sub>	-j45	44.9 + j0.3	44.9 + j0.3	-26
	-j55	54.9 + j0.3	54.9 + j0.3	-27
C <sub>2</sub>	-j45	50.0 + j0	50.0 + j0	-26
	-j55	50.0 + j0	50.0 + j0	-27
R <sub>R</sub>	45	50.0 + j0	50.0 + j0	-26
	55	50.0 + j0	50.0 + j0	-27
R <sub>L</sub>	45	49.9 + j5.3	49.9 + j5.3	-26
	55	49.9 - j4.7	49.9 - j4.7	-27
L <sub>1</sub> , L <sub>2</sub>	+j45, 45	50.1 - j5.0	50.1 - j5.0	-20
	+j55, 55	50.1 + j5.0	50.1 + j5.0	-21
	+j45, 55	45.6 - j0.4	55.7 - j0.5	-42

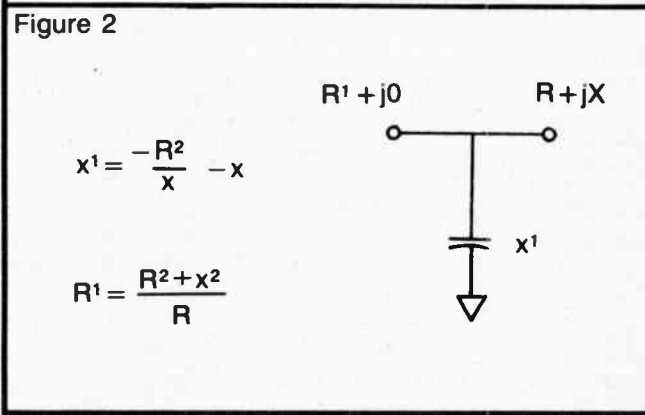


Table 1b.

Direction Change of Input Port Impedances

Component Being Adjusted	Component Value Up				Component Value Down				Component Being Adjusted
	R <sub>1</sub>	X <sub>1</sub>	R <sub>2</sub>	X <sub>2</sub>	R <sub>1</sub>	X <sub>1</sub>	R <sub>2</sub>	X <sub>2</sub>	
L <sub>1</sub>	↑	↑	↑	↑	↓	↓	↓	↓	L <sub>1</sub>
L <sub>2</sub>	↓	↓	↓	↓	↑	↑	↑	↑	L <sub>2</sub>
C <sub>1</sub>	↑	↑	↑	↑	↓	↓	↓	↓	C <sub>1</sub>
R <sub>L</sub>	↓	↓	↓	↓	↑	↑	↑	↑	R <sub>L</sub>
L <sub>1</sub> + L <sub>2</sub>	↑	↑	↑	↑	↓	↓	↓	↓	L <sub>1</sub> + L <sub>2</sub>
L <sub>1</sub> - L <sub>2</sub>	↓	↓	↓	↓	↑	↑	↑	↑	L <sub>1</sub> - L <sub>2</sub>

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## Broadcast Computing

# Calculate Ratio

by Dale Heidner

Belgrade MT ... With this month's short toolbox program you can calculate the turns ratio for a transformer. All you need to input are the primary (input) im-

pedance and the secondary (output) impedance.

As Figure 1 shows, the program takes the square root of the ratio of both numbers. Line 12115 rounds that final number to a single decimal place.

Your computer might have a different BASIC command to replace the "SQRT" listed in line 12110.

Dale Heidner opens up his toolbox each month. You can contact him at 406-388-4281.

Figure 1.

```
12000 REM*TRANSFORMER WINDINGS RATIO BY GILDER AND HEIDNER
12010 CLS:PRINT
12020 PRINT" TRANSFORMER TURNS RATIO"
12030 PRINT: PRINT: PRINT: PRINT
12040 PRINT"THIS PROGRAM CALCULATES THE TURNS"
12050 PRINT"RATIO REQUIRED FOR A TRANSFORMER GIVEN"
12060 PRINT"THE DESIRED INPUT AND OUTPUT IMPEDANCE"
12070 PRINT: PRINT: PRINT
12080 INPUT"ENTER PRIMARY IMPEDANCE:";Z1
12090 INPUT"ENTER SECONDARY IMPEDANCE:";Z2
12100 PRINT: PRINT: PRINT
12110 T=SQRT(Z1/Z2)
12115 T= INT(10*T+.5)/10
12120 PRINT: PRINT: PRINT
12130 PRINT"THE TURNS RATIO FOR A TRANSFORMER WITH"
12135 PRINT
12140 PRINT"PRIMARY IMPEDANCE OF ";Z1;" OHMS"
12145 PRINT
12150 PRINT"AND A SECONDARY IMPEDANCE OF ";Z2;" OHMS"
12155 PRINT
12160 PRINT"IS ";T;" / 1"
12199 END
```

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Figure 1.

```
65 REM: SCOTT ROBERTS/TERRY GREEN 5/84
120 PRINT"INPUT '?' AT ANY PROMPT IF:PRINT"VALUE IS UNKNOWN":PRINT
130 PRINT"ENTER FORWARD (INCIDENT) WATTS = ";F$="?":INPUT F$
150 PRINT"ENTER REFLECTED WATTS = ";R$="?":INPUT R$
160 IF LEFT$(F$,1)<"?" AND LEFT$(R$,1)<"?" THEN 200
170 PRINT"ENTER VSWR = ";V$="?":INPUT V$
180 IF F$="?" THEN 220
190 IF R$="?" THEN 240
200 A=1+SQRT(VAL(R$)/VAL(F$)):B=1-SQRT(VAL(R$)/VAL(F$)):C=A/B
210 PRINT"VSWR IS ";INT(C*1000)/1000;" TO 1.000":PRINT:END
220 V=VAL(F$):R=VAL(R$):F=R/((V-1)*(V-1))/((V+1)*(V+1))
230 PRINT"FORWARD POWER IS ";INT(F);" WATTS":PRINT:END
240 F=VAL(F$):V=VAL(V$):R=F*((V-1)*(V-1))/((V+1)*(V+1))
250 PRINT"REFLECTED POWER IS ";INT(R*10)/10;" WATTS":END
READY.
```

## Power, VSWR Values

by Terry Green and Scott Roberts

Chico CA ... The short 14-line program in Figure 1 can be used to accurately compute forward or reflected power in watts or VSWR with just two inputs.

This method is much easier to use than looking up charts. The math is simple and straightforward, as lines 220 and 240 are variations of the standard VSWR formula in line 200. By rearranging the formula, any missing piece of information can be calculated.

This program was originally written for the Commodore 64, but the BASIC can be adapted to others. Lines 210 and 250 contain a rounding routine to make up for the C-64's lack of a "PRINT USING" function. The program as configured will not support commas within the input values, so be careful when typing in numbers.

Terry Green is CE at KFMF in Chico, and Scott Roberts was formerly assistant engineer at KSJO/KHTT in San Jose. You can reach Terry at 916-343-8461.

Figure 2 shows several sample runs of the program. Note that you only need to supply one of the two input variables if that is all the information you have available.

Figure 2.

```
INPUT '?' AT ANY PROMPT IF
VALUE IS UNKNOWN

ENTER FORWARD (INCIDENT) WATTS = ?
ENTER REFLECTED WATTS = 200
ENTER VSWR = 1.8
FORWARD POWER IS 2450 WATTS
RUN
ENTER FORWARD (INCIDENT) WATTS = 14500
ENTER REFLECTED WATTS = ?
ENTER VSWR = 1.15
REFLECTED POWER IS 70.5 WATTS
RUN
ENTER FORWARD (INCIDENT) WATTS = 16500
ENTER REFLECTED WATTS = 350
VSWR IS 1.34 TO 1.000
```

## Broadcast Database

by Dave Biondi

Houston TX ... With all the sources of information available to the broadcaster today, it is a blessing that the personal computer came along to sort, file and retrieve this data. The process of transferring the data from the typed page to disk is time consuming, and data storage media are costly.

The big problem with data storage has been getting the data into the computer. Now, through the Broadcasters Database, a broadcast engineer can dial a local telephone number in most major cities and retrieve thousands of programs and text files already cataloged and sort-

ed by category.

In February 1985 I put the Broadcasters Database on line. The database allows remote users access to many programs and files for downloading (transferring them from the database computer to the user's computer) where they can be stored onto disk for later retrieval. Most any computer with a modem can access the data.

The text files are regular ASCII, so even a dumb terminal with a printer can get a hard copy printout. An electronic mail (E-Mail) feature allows private or public messages to be sent to and retrieved by other users on the system.

(continued on next page)



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# Broadcast Computing

## Database Boon to Stations

(continued from previous page)

There is a resume and job opportunity section, and a new and used broadcast equipment and supplies posting.

The most popular feature, however, is the Files Section, where menus provide listings for engineering, programming, sales and management staff.

Engineers will find many broadcast related programs available for download. Most are written for IBM and Commodore, but they can be converted for other types of computers.

There are text files on subjects ranging from wiring an XLR connector to stereo TV generator alignment. There are also several versions of Star Trek and other games. Figure 1 shows a sub-menu of different sections of the data base.

Figure 1.

HOW TO LIST	DESCRIPTION
L:UTILS	I.B.M. UTILITIES
L:ENGINEER	ENGINEERING PROGRAMS
L:RATINGS	RATINGS PROGRAMS AND INFORMATION
L:SALES	SALES PROGRAMS AND FILES
L:MGMT	MANAGEMENT PROGRAMS AND FILES
L:GAMES	VARIOUS GAMES FOR ALL TYPES OF COMPUTERS
L:NEWS	NEWS ROOM RELATED PROGRAMS AND FILES
L:STARTREK	STARTREK GAMES
L:FINANCE	FINANCE AND ACCOUNTING
L:RBBS-PC	RBBS-PC SYSTEM
L:PICS	PICTURES AND GRAPHICS
L:MISCPGMS	MISC. PROGRAMS
L:MISCUJUNK	MISC. FILES
L:SOUND	COMPUTER MUSIC AND SOUNDS
L:UNPROT	UNPROTECTION SCHEMES
L:STOCKS	STOCK MARKET PROGRAMS
L:SHOPPING	BROADCAST RELATED PRODUCTS LIST
L:CHARTS	MUSIC INDUSTRY CHARTS
L:MAINT	BROADCAST EQUIPMENT MAINTENANCE INFO
L:DATEBOOK	* DAILY DATEBOOK (PROGRAMMING)
L:LISTS	* MUSIC LISTS (PROGRAMMING)
L:CO-OP	* CO-OP INFO (SALES)
L:FCC	* F C C UPDATES (ENGINEERING)
L:LAW	* BROADCAST LAW (MANAGEMENT)
L:PROMO	* STATION PROMOTIONS
L:RESUMES	* RESUMES
L:JOBS	* JOB AVAILS
L:RATINGS	* RATINGS
L:COMEDY	* DAILY COMEDY SHEETS
L:C-64	C-64 PROGRAMS
L:APPLE	APPLE PROGRAMS
L:STARBASE	* STARBASE (ARTIST INFO)
L:COMMPGMS	MODEM COMMUNICATIONS PROGRAMS
L:UPLOADS	NEWLY UPLOADED FILES

Figure 2.

FILENAME	EXT	LENGTH	DATE	DESCRIPTION
COMPLEX	BAS	4480	01-01-80	COMPUTES COMPLEX FORMULAS
DIPOLE	BAS	2048	01-17-80	DEMENSIONS FOR DIPOLE
DCPWRSP	BAS	2219	09-18-85	UNREGULATED POWER SUPPLY DESIGN -
ECONOLVE	BAS	3584	01-16-85	SOLVES HEAVY EQUASIONS
FHINFO	TXT	2432	08-13-85	MILEAGE SEPARATION/HEIGHT POWER FM INFO
FRAC	BAS	5120	01-01-80	4 FUNCT FRACTION CALC
FREQ	BAS	2653	03-03-85	FREQUENCY RESONANCE CALCULATOR
GEOSYNCH	BAS	4608	01-01-80	FINDS THE SATELLITES - GR REQ
MAXPOWER	BAS	463	08-19-85	ANALYZES FOR MAXIMUM POWER TRANSFER
OHMS12R	BAS	640	01-01-80	POWER CALC
OHMSR	BAS	1024	01-01-84	OHMS LAW CALC
POWER	BAS	997	03-07-85	POWER CALC
RESONANT	BAS	2652	03-07-85	RESONANT CIRCUIT CALC
SINE	BAS	3328	01-01-85	DISPLAYS SINE TO PRINTER - REQ GR
SPFXCALC	BAS	812	08-19-85	SERIES/PARALLEL RESONANCE CALCULATOR
STLRPUFX	HOU	4702	03-02-85	LIST OF HOUSTON STL & RPU FX IN ASCII
STLSTDYA	BAS	3304	03-07-85	STL PATH STUDY
TVSEPP	BAS	5003	04-07-85	CK SEPARATION FROM GAIN & PHASE - TV
TVSEPP	PAS	8370	04-07-85	PASCAL VERSION OF ABOVE **COURTESY OF MODULATION SCIENCES**
VECTORA	BAS	5376	01-01-80	VECTOR ANALYSIS

Engineers will find many broadcast related programs available for download.

Several broadcast oriented publications are available, although the bulk of the files and programs are contributed by other users of the system.

Sending in a file is just as easy as receiving one. Most contributions are from broadcast engineers that have a computer and have written a few programs that they are willing to share.

Several of the programs that have been listed in radio publications have been punched in and are available for download. The NAB and several broadcast equipment vendors have also contributed programs and files to the Broadcasters Database. A typical list of programs available for downloading is shown in Figure 2.

Recently the database hooked in with Tymnet, providing local telephone access numbers in 540 US cities and 65 foreign countries. Rates and billing procedures are similar to Compuserv and The Source.

Although the system was initially set up as an engineering database, there are now many files and programs for other areas of broadcast management. Current music charts, ratings information and broadcast operations programs enhance the system for the broadcaster who wants to keep on top of the competition by keeping up on the industry.

Find out how you can sign up and access the Broadcasters Database by calling Dave Biondi at 713-623-4011.

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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

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003	023	043	063	083
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005	025	045	065	085
006	026	046	066	086
007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
016	036	056	076	096
017	037	057	077	097
018	038	058	078	098
019	039	059	079	099
020	040	060	080	100

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# 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

BE Spotmaster TT preamps, stereo, balanced outputs (2), \$100 ea. L Wagner, Ard-nigva Radio Net, POB 1788, Orlando FL 32802. 305-299-1299.

McIntosh MC 250 50 W/chan stereo amp in gd cond, \$175. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Atac 15708 165 W tube amps, vgc (2), \$175 ea. W Busetti, Lizard Electr, 114 N Robinson, Florence CO 81226. 303-784-3540.

McIntosh MI-75 super mono amp in gd cond, \$200. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Nakamichi stereo amp, 60 W/chan, new, \$225; Biamp TC60, \$250. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

UREI 6500, still in box, \$1599. L Schara, Pyramid Audio, 450 W Taft, S Holland IL 60473. 312-339-8014.

Peavey CS-800 amps, vgc, \$450 ea. S Hofmann, Cameron Univ Theater, 2800 W Gore, Lawton OK 73505. 405-244-2200 X428.

Custom freq amp, controls speed of recorders & electr equip, \$100. G Nichols, Creative Prod, 200 Main, Orange NJ 07050. 201-676-4418.

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

Dakane 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 Taft, Taft Recd Svcs, 1347 S Capitol, Wash DC 20003. 202-488-3905.

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

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.

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. 608-266-6667.

### 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, 8B, 9, 10B, 16, 19. M Gasman, Gasman Audio, 779 Worcester, Wellesley MA 02181. 617-235-8427.

## ANTENNAS & TOWERS

### Want to Sell

Utility tower 130' on ground, w/guys, BO, JP Robillard, 1803 N First East St, Haynesville LA 71038. 318-624-0105.

Collins 6SCPS, 4 bay FM antenna, 3 yrs old, tuned to 92.5 MHz. B Harlan, WFAH, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

Fisher Pierce Ma. 63364DA photo light control, new in box, \$100; Code Beacon 300mm KG-114, vgc w/amp, \$300. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

Miller 7872 tower RF chokes, 20 amp, (4), gd cond, \$20 ea. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

Collins 6 Scps 4 bay FM antenna, excel cond, \$2500. B Harlan, WDJQ, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

Andrew 47R-3, 1-5/8" EIA FL connector for use w/Heliac, new w/coupler, \$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, WQLA, 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.

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

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 92123. 619-565-6006.

NCA FM isocoupler tuned to 94.1 (ancient); Auto-Dryair 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 92123. 619-565-6006.

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

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

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

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

NCA 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.

### Want to Buy

Self-supporting 240' tower for TV ant; 2-bay CP antenna on 92.7 MHz; isocoupler on 92.7 MHz to handle up to 10 kW. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-981-4245.

FM 2 or 3 bay, tuned to 98.3; also 75-95' guyed or self supporting tower, close by. B Taylor, KQSS, Box 292, Miami AZ 85539. 602-425-4378.

Tower, 150', FM antenna 96.3 MHz. C Stover, Stover Bdctg, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

## AUDIO PRODUCTION (OTHER)

### Want to Sell

Opamp Labs reverb units (3), \$100 ea. L Wagner, Ard-nigva Radio Net, POB 1788, Orlando FL 32802. 305-299-1299.

Orban 622B parametric EQ w/transformer output option, as new, unused, in carton, \$600. M Hoffman, Hoffman Telecomm, 4976 Dick, San Diego CA 92115. 619-287-4961.

Gates V-22 volume indicator, w/book, like new, \$180. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

Eventide 80955 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 80955 stereo digital delays, 15 kHz, 3.2 sec, never used, \$5500. L Henry, KIQQ, 6430 Sunset #1102, Hollywood CA 90028. 213-469-1631.

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

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.

### Want to Buy

Burton NR units, (2) one impulse & one broadband. J Stitt, WLTT, 250 W Court Ste 300E, Cincinnati OH 45202. 513-241-9500.

Bdct & prod quality equip needed for new station, console preferably 10x4, R-R's, cart machines, etc. A Samuels, Spanish Radio Net, 17446 Kingsbury, Granada Hills CA 91344. 818-368-5662.

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

## AUTOMATION EQUIP.

### Want to Sell

IGM 78 tray Go-Cart, \$3500; IGM 48 tray stereo Insta-Cart, \$22500; IGM MOS automation control unit, 1000 event memory, 4 voice chans, scan follow, alarm, cue & remote panels, PAL encoder, decoder, Teletype Corp printer, \$3500, all excel cond. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

Country Stations, great sounding modern country format on reels for automation or live assist. Weekly updates. Equal to the best at half the cost. QABS 507-895-2065.

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

IGM 20ARS Carousel, \$1000. G Bissell, WEAV, Box 157, Peru NY 12972. 516-561-0960.

Sono-Mag DT-5 data terminal w/Extel printer & video monitor, \$800 plus shipping. C Larsen, KOOC, POB 1580, Cozad NE 69130. 308-784-1580.

SMC DP2 automation system, call for details, BO over \$18,000. D Fields, KBYG, POB 1713, Big Springs TX 79720. 915-263-7326.

SMC automation system, 4 Carousels, 5 R-R's, computer logging & printer, more, \$24,000. C Scott, WVTS, POB 280, W Terre Haute IN 47885. 812-533-2141.

Harris 9000, inc 3 ITC 750 R-R's, time announce deck, network R/P deck, 2 IGM Instacarts, \$45,000. J Quesenberry, WCIR, 305 Reservoir Rd, Beckley WV 25801. 304-252-6452.

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

Harris 9401 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 Baxter, WMAV, POB 460, Springfield IL 62705. 217-629-7077.

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

IGM 48-5 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 Bdct 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 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.

### Want to Buy

Automation equip, need w/4 R-R's, must be stereo, w/time announce. B Walters, WEKY, POB 747, Richmond KY 40475. 606-623-1340.

Sat Master, BE, Sonomag or equal satellite automation controller. R Meyers, Benchmark Comm Corp, 4700 SW 75th Ave, Miami FL 33155. 305-264-5957.

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

## CAMERAS

### Want to Sell

Motorola & Philips closed circuit TV cameras w/monitor, \$80 plus frt. J Baltar, Reel Comm, 67 Green St, Augusta ME 24330. 207-623-1941.

Sony 1800 color camera, used 25 hrs, like new w/case, \$1400. C Potorti, Potorti Video, 10005 Lacey, Morrisville PA 19067. 215-945-3990.

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

### Want to Buy

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.

## CART MACHINES

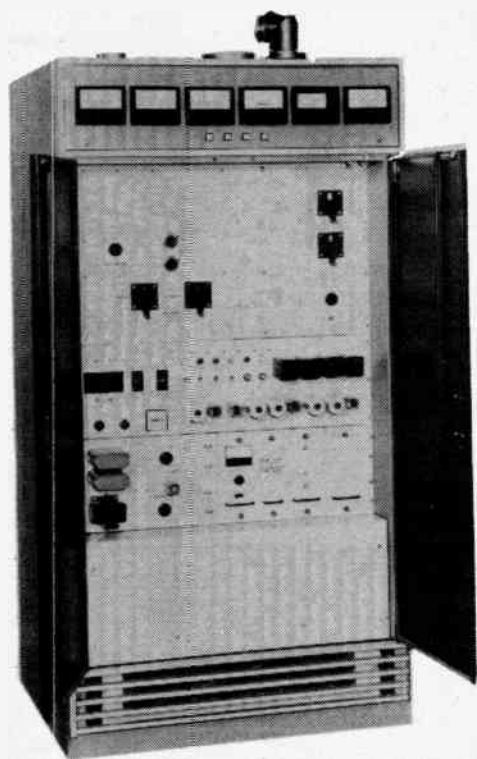
### Want to Sell

Tapocaster 700-RP stereo R/P, like new, under 200 hrs use, \$850. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

BE Spotmaster 3200 PS stereo cart machine, PB only, excel cond, \$1100; BE Spotmaster 3200 RPS stereo cart machine, R/P, excel cond, \$1900. L Wagner, Ard-nigva Radio Net, POB 1788, Orlando FL 32802. 305-299-1299.

ITC 99, (2) mono PB, used for 20 hrs, \$2300 ea. S Borden, York Prod Group, 4537 28th Ave S, Minneapolis MN 55406. 612-722-4597.

ITC WP, (2) rack mount, almost new, mono, \$500 ea. D Hastings, WKYB, POB 1000, Hemming SC. 803-558-2558.



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# Rw Broadcast Equipment Exchange

**CART MACINES . . . WTS**

**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.

**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.

**RCA BA-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.

**Tapecaster 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.

**RCA RT-7 cart machines (2), J Gilchrist, WTB, 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.

**Tapecaster 700P, like new cond, \$300.** R Wiles, Comm Svcs, 9421 Ballentine, Overland Park KS 66214. 913-541-9674.

**UMC 12-123-022 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.

**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.

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

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

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

**Want to Buy**

**Cart machine, any rack mountable machine for ED FM station.** B Gray, Gray Audio, 223 W Mtn Rd, W Simsbury Ct 06092. 203-658-7786.

**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.

**CASSETTE & REEL-TO-REEL RECORDERS**

**Want to Sell**

**Otari MX-7800 1" 8-1/2" w/remote & digital counter, low hrs, \$8500.** L Schara, Pyramid Audio, 450 W Taft, S Holland IL 60473. 312-339-8014.

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

**Scully 280A 4 trk recorders (2), both in custom-built walnut roll-around cabinets, one has re-lapped heads, both in gd cond, \$1850 ea.** D Weinstein, Cinema Snd Ltd, 311 W 75th, NY NY 10023. 212-799-4800.

**Teac 80-8 8 chan, 1/2" recorder, vgc w/dbx DX-8 NR unit, also vgc & Teac alignment tape YTT-1144, \$3000.** W Busetti, Lizard Electr, 114 N Robinson, Florence CO 81226. 303-784-3540.

**Ampex 351, electr only in gd working order, \$125/pr.** I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

**Nortronics tape recorder heads for Crown, Magnacord or Presto, (13) mdl 8406 1/2 trk, (17) mdl 8208 FT, for Scully mdl 9202 FT w/mounts, brand new record head 8401, erase 9128, a few extras.** S Russell, 80441 CR 3585, Decatur MI 49045. 616-782-9258.

**Scully 280-8, excel cond, \$4700; Ampex 351-2, roll-around console, excel, \$1400.** D Lundy, Lundy Recdg, POB 408, N 25E, Heidrick KY 40949. 606-546-6650.

**Scully 280 (2) 1/4" mono recorders, gd cond, \$800 ea.** B Harlan, WDJQ, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

**Ampex 351, tube elect only (4), \$100.** L Entz, KGEI, 1400 Radio Rd, Redwood City CA 94063. 415-591-7374.

**Teac 80-8 w/servo, DX-8, rack, factory manuals, spares, \$3500/BO.** T Trott, Little Caribou Std, 5477 Carter Rd, Lake May FL 32746. 305-323-0472.

**Dart MTR-90 wired 2" 24 trk, 8 trks installed w/autolocate, \$20K/BO.** T Trott, Little Caribou Std, 5477 Carter Rd, Lake May FL 32746. 305-323-0472.

**3M 20x20 AFV routing switcher; (2) Ampex 440C FT ATRS; Ampex Vari Speed accessory for 440C; Telex 300 R-R, cassette dubber.** J Grahne, US Senate Rec, ST-71 US Capitol, Wash DC 20510. 202-224-4977.

**Technics RP9690 wired remote for 1500 series, mint, \$50.** S Hofmann, Cameron Univ Theater, 2800 W Gore, Lawton OK 73505. 405-248-2200 X428.

**Ampex 440B 1/4" 2 trk mounted in roll around rack w/manual, \$1500; Ampex 440B, 1/2" 4 trk, \$2800.** P Gregory, Snd Concepts, 30 Hazel Terr, Woodbridge CT 06525. 203-397-1363.

**Ampex AG440 1/4" & 2 trk head assy, 7 1/2-15 ips electr, rebuilt, gd cond, \$1100; Ampex MM1100 24 trk w/16 trk & 24 trk head assy, well maint & extras, \$16,000.** R Oren, Mirromere Audio, 7150 W 38th Ave, Wheatridge CO 80033. 303-431-2348.

**Sony PCMF1 audio digital recorder, mint cond, never used, \$1599.** R Kunn, POB 11069, Las Vegas NV 89111. 702-733-3902 X521.

**Scully 280, (2) 1/4" mono, 3 1/4-7 1/2, gd cond, \$800 ea.** B Harlan, WFAH, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

**Ampex 300-4 1/2" 4 trk recorder in gd working cond, you pick up, \$500.** I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

**Ampex 3200 hi-speed R-R tape dup system, gd cond, in use, \$1500.** D Weinstein, Cinema Snd Ltd, 311 W 75th, NY NY 10023. 212-799-4800.

**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.

**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.

**Alakai 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.

**Revox B77 recorder 7 1/2-3 1/4 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 PT6-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 Trott, 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, Penrylane 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 JH110 4 trk, w/RTZ 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/all; 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 electr, 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 bdcct 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, WJYY, 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 #63, Azusa CA 91702. 818-334-5580.

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

**MCI 1/2" 4 trk mdl JH-110A, 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.

**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 AG440 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.

**Uber 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.

**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 27703. 409-898-4556.

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

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**Stallawax 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.

**Marantz 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 1580 (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, Manassas 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, 1w 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.

**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 Other 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.

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

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Revox A-77 machines needed; xmtr doors needed, front & rear for Gates FM-5C; FM monitor & stereo monitor; FM exciter, Gates tube type OK. R Van Zandt, WGNV, POB 88, Milladore WI 59454. 715-457-2288.

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

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

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

Working slave Ek 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.

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

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

Opamp Labs console, 20 in, 10 out, very clean, sound, \$6500. L Wagner, Ardnigva Radio Net, POB 1788, Orlando FL 32802. 305-299-1299.

Interface 300 recdg console, 24-16 main frame w/20 308-B modules, 8 out, talk/back, console VU meters, excel cond, \$4900. D Lundy, Lundy Recdg, POB 408, N 25E, Heidrick KY 40949. 606-546-6650.

Gates TV-10, 10 chan, stereo, 10 echo pots, amps, \$475. G Nichols, Creative Prod, 200 Main, Orange NJ 07050. 201-676-4418.

Yamaha PM1000-32 in vgc w/road case & extra 16-chan mainframe, \$4000; Sunn SPL-2216 16-chan, solo, 4 band EQ, 3 buss/3 sends, vgc, \$875. S Hofmann, Cameron Univ Theater, 2800 W Gore, Lawton OK 73505. 405-248-2200 X428.

Collins 212F-2 like new, some amps not unpacked, w/book, \$950. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

Neotac Series I-Custom & EFX rack, incl 949, 160, etc. (package); \$18K/BO. T Trott, Little Caribou Str, 5477 Carter Rd, Lake May FL 32746. 305-323-0472.

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

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

Arrakis 158SC 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. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

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.

Gateway 8 chan tube type, \$400. J Gilchrist, 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.

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

Attec-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, 808, 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, WWRC, 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 1 108 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, WLTL, 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 Bartkowsky, WEDC, 4923 W 28th, Illinois 60650. 312-863-3090.

**Want to Buy**  
Consoles, 6 or 8 stereo board for ED FM station. B Gray, Gray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-7786.

BE 5S150 stereo audio console. M May, May School of Bdct, POB 127, Billings MT 59103. 406-248-4888.

Collins 12Z remote amp schematic. B Umberger, WLife, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Collins 212M mono audio console schematic and/or manual or copy. B Umberger, WLife, 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.

**DISCO & SOUND EQUIP.**

**Want to Sell**  
Ursa Major Space Station, mint, \$1200; dbx 180, \$325; dbx 208 8 chan, new, \$1900. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

Recg studio equip, 4 trk, like new cond, incl Teac, Tascam, Yamaha, dbx, Sony, Marantz, will sell for \$6500. T Stoller, 2320 Eade Ave, Ft Wayne IN 46805. 219-424-7390.

PA sad business close-out, speaker transformers 5 W, 10 W, 50 W, wall attenuators 5-100 W, wall controls & wall switches, items by Bogen, Triad, Stancor, Attec, McMartin, etc, call F Younker, 7 Old Farms Rd, Saddle River NJ 07458. 201-447-7100.

MXR 174 pitch shift doubler, \$250/BO. F Scheidt, Scheidt Audio, 67 Chestnut, Rochester NY 14604. 716-232-5210.

Aurstone 5L, \$50. P Gregory, Snd Concepts, 30 Hazel Terr, Woodbridge CT 06525. 203-397-1363.

Sound Workshop 242C stereo reverb, \$200. P Gregory, Snd Concepts, 30 Hazel Terr, Woodbridge CT 06525. 203-397-1363.

Tapes 4400 reverb, \$235; Fairchild 658-B, \$200. D Lundy, Lundy Recdg, POB 408, N 25E, Heidrick KY 40949. 606-546-6650.

dbx 501 dynamic range expander (2), new, \$175 ea; dbx 28X, new \$200. Call P. Colten, 212-473-0624.

SAE 5000 impulse NR unit, vgc, \$120. W Busetti, Lizard Electr, 114 N Robinson, Florence CO 81226. 303-784-3540.

Attec 456 compressors & rack mount in gd working cond, (3) \$50. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

JBL 4331 15" 2-way studio monitors (2), \$950/pr. L Schara, Pyramid Audio, 450 W Umberger, WLife, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Eceplate 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 Svcs, 1626 N Wilcox #105, Hollywood CA 90028. 818-944-5368.

Recording Pressing Plant, comp w/2 semi-auto Firebit 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 10016. 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-W Sentry 5 speakers in oak cabinets, vgc, \$325/pr. D Green, Waves Sound, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Attec 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.

**Want to Buy**  
Pittac 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.

**CATV-MATV EQUIP**

**Want to Sell**

Catal FM stereo modulator, used 6 mos, \$1000. J Sabella, KUTY, 38201 9th St East, Palmdale CA 93550. 805-947-3167

**CONSOLES**

**Want to Sell**

Audiotronics 110A Grandson, 24 chan, suitable for stereo prod, air, recdg sid, snd reinforce, etc, excel cond, \$12500. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

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

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**LIMITERS**  
**Want to Sell**  
Orban 8000 Optimod FM, just factory reworked, \$2300. S Tafuya, KLIR, Shady Lake Rd, Columbus NC. 402-564-0597.  
Volumax 410, \$175. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.  
CRL APP 300 (2) & CRL SEP 400 (2), just removed, \$350 ea. R Hill, WTPA, 107 E Main, Mechanicsburg PA 17055. 717-697-1141.  
CBS FM Volumax 4100 slim line, excel cond, \$300; CBS Audimax 4440A slim line, excel cond, \$500. B Harlan, WDJO, 393 Smyth ME, Alliance OH 44601. 216-821-1111.  
Orban 8000A in working order, \$2000. R Rocks, KOOK, POB 1276, Billings MT 59103. 406-248-7827.  
Orban 8100A-XT, like new, 6 band limiter chassis, \$1500. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.  
Gates LE-2 line EQ, like new, w/book, \$150. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.  
RCA BA-6A, mint, manual, new tubes, \$525. J Pines, Creative Audio, 705 W Western, Urbana IL 61801. 217-367-3530.  
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.  
Optimod studio chassis for 8100, excel cond, \$500. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.





# Broadcast Equipment Exchange

## LIMITERS . . . WTS

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.

Dorrough 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.

Callins 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.

Altec 436B compressor, gd cond, \$50. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Dorrough DAP-310 FM audio processor, missing IO 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.

## Want to Buy

Orban 8000A, will pay \$1500. B Ingram, WBLE, POB 73, Batesville MS 38608. 601-563-4664.

Dorrough 310-610 (2) 310's or one 610 in working order. B Early, 1340 Marshall #2, Lakewood CO 80214. 303-238-1292.

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

RCA 77 mics, sell of trade for RCA 44, \$300. R VanDyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

RCA 77DX in excel cond, \$225; RCA 77D in gd cond, \$200. B Harlan, WDJO, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

EV PL20, new, \$200 ea; Sony C500, mint, \$600 ea; EV RE15 & 90; AKG N66, new, \$150. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

EV 642 Cardline shotgun mic, gd cond, \$150. B Dickerson, WPXE, PO Box 520, Starke FL 32091. 904-964-5001.

Sennheiser D-421, Shure SM-81, AKG C460 & others w/stands, cables, etc. (package), \$4500/BO. T Trott, Little Caribou St, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Sennheiser MD421U mic, new, \$190. A Soroka, WIRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Astrolite sportscaster headset w/mic, like new, never used, BO. C Phillips, WOLA, 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, Pennington Studios, 1350 Ave of the Americas, NY NY 1A019. 212-687-4800.

WE-Altec 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.

Altec 218 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 Eventide Harmonizer. V Taft, RHG, 1326 Midland, Syracuse NY 13205. 315-475-2936.

EV 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.

## Want to Buy

Pre 1960 prof bdct & recdg mike stand, parts & lit/catalogs, any cond. R VanDyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

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

AM 1 kW daytimer 1580 kHz; FM 3 kW 105.5 mHz, completely automated, equip excel, Sunbelt, ideal for owner/operator, only station in market, \$250K, call or write. JP Robillard, 1803 N First East St, Haynesville LA 71038. 318-624-0105.

Panasonic & Quasar Service Manuals, over 1200 w/1985 supplements, bought out former Panasonic distributor, TV's, microwaves, rcvrs, from foot warmers to hair dryers, AM only keeping VCR & video camera manuals, some duplicates included & 15 binders valued at \$200, the lot for \$500 plus shipping. C Brennan, 661 Horseshoe Curve, Pike Rd AL 36064. 205-277-0139.

irectional Loop antennas, new (5). R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

AM bdct xmtr crystal, octal socket, metal case, 1320 kHz, avail immed, \$650. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

Lazy Susan cart rack, 1000 capacity, control & prod room console desk furniture w/sand filled TT box-stands, & other bdct type furniture, perfect for start-up or expansion, call. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

Radio Shack Md II Disk Expansion Units, (2) 1 drive unit, \$340; 2 drive unit, \$440, both units well maintained in great cond. R Pantaleo, WKPA, 810 5th Ave, New Kensington PA 15068. 412-337-3588.

Relay rack, 7', egod solid cond, \$50. B Gray, Gray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-7786.

Radio Station, WV Class IV, 1 kW, part ownership, \$5000 min. M Gottesman, 3377 Solano #312, Napa CA 94558. 415-550-8506.

Sony Computer 875, PC-compatible, portable, slightly used, excel cond, software & peripherals, \$3750. A Braun, Aluan Engineering, 2305 Florencia, Montrose CA 91020. 818-957-0618.

Class A FM station package, comp station equip w/Collins xmtr inc all from TTs to antenna, \$54,000 complete. D Silver, KSOS, 2050 Layton Hills Mall, Layton UT 84041. 801-973-7759.

Patch bay (2), tip-sleeve, unwired, also several patch cables, \$100. K Schipper, WMAD, Box 7727, Madison WI 53707. 608-249-9277.

Patch panels, 5 dbi row, w/T332A jax, \$35 ea; 2 single row patch panels, \$25 ea. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Patch panel, never used, new cond, \$75. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

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.

Ruslang S series dbi pedestal cabinet (2), new, \$350 ea. A Soroka, WIRO, 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 gear switch w/CT 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.

TT 144PP patchbay, BO. R Murphy, Darci Sound, 2736 N 11th, Beaumont TX 27703. 409-898-4556.

FM Search Software for Apple II computers, inc many databases, legitimate copy, \$50. S Wilson, KLIR, Columbus NE 68601. 402-534-2071.

Plate xformers, 230 V pri, 3600 V CT sec at 1 amp, \$75. J Hunter, KBRE, Box 858, Cedar City UT 84720. 801-586-5275.

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) 26-1/2", 2 29", D Strecker, WLTL, 100 S Brainerd, LaGrange IL 60525. 312-482-9585.

Microwave racks, 6' high, \$75. F Schutt, SGR Inc, 2330 Wengler, Overland MO 63114. 314-427-7584.

## Want to Buy

FM radio station equip, except xmtr & antenna, includes air studio, prod, & news, Marti units, mod monitors, etc, \$25,000 max. J Phillips, 414 Washington, Defiance OH 43512. 419-782-8591.

Station jingles, collector would like your station's jingles in library, willing to pay for dub. D Ferreira, POB 24, Manchester MA 01944. 617-620-9012.

## MONITORS

### Want to Sell

HP 335 B FM mod & freq mon, working when removed, BO. B Harlan, WDJO, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

Delta AAM-1, analog antenna monitor, set up for 2 tower DA-2, \$1000. B Jorgenson, KMAS, 210 Cota, Shelton WA 98504. 206-426-1030.

RCA WF-48A AM freq mon, working when removed, BO. B Harlan, WDJO, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

Yamaha-1000's, AB amps, Crown amp, Boze spkrs, (package), \$2500/BO. T Trott, Little Caribou St, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Gates MQ2639 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.

## Want to Buy

Weston-Daystrom 861-58 remote meter for Gates mod mon, 0-600 microamps, 0-110 linear scale. S Marshall, WDME, Box 357, Guilford Rd, Dover-Foxcroft MA 04426.

## MOVIE PRODUCTION EQUIP.

### Want to Sell

Bolox H16 reflex camera, \$300 plus frt. J Baltar, Reel Comm, 67 Green St, Augusta ME 24330. 207-623-1941.

Editing equip & supplies, leader, audio tape, reels, etc. S Friedman, B&B Ent, Box 625, Gaithersburg MD 20877. 301-977-1055.

MTM R101U 16-35 mag-stripe recorder, w/extra 3 trk pb head & amps, \$2000 plus freight. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Steinbeck 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.

# Employment

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## POSITIONS WANTED

Ops/Eng looking for FT position, exper in major mkt, will relocate, avail ASAP. R Weissman, 586 Center, Herndon VA 22070. 703-435-5973.

Prod/Traffic Asst, w/tech background seeking prod or news position, Urban, A/C or Chr. Write: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 2-2.

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.

PD/Eng, exper, knowledgeable, reliable. Write RW, POB 1214, Falls Church VA 22041. Attn: Box 12-2.

CE, hard working, looking for FT pos, will consider announcer, well qual, 9 yrs exp, worked w/ 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.

Studio Mgr at Original Sound Studios seeking extra work or FT/PT position in recording, mixing or production, 15 yrs exper. C Egnoian, Original Sound Stds, 7120 Sunset Blvd, Hollywood CA 90046. 213-851-1147.

Program Dir avail immed, willing to relocate, tape on request. B Zolnowski Jr, 865 Seneca Creek Rd, W Seneca NY 14224. 716-825-6042.

## HELP WANTED

Station Eng for AM/FM, exper in xmtrs, audio & digital. Call John King, KBIM, 505-623-9100.

Asst Eng for Ohio medium market quality AM/FM operation. Two yrs radio eng exper required, SBE Certification desirable. Send resume, salary history. EOE. Write: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 2-1.

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# Broadcast Equipment Exchange

## RECEIVERS & TRANSCEIVERS

### Want to Sell

Yeasu FRG-7 SWL rcvr, gd cond w/manual. \$165. M Hoffman, Hoffman Telecomm, 4976 Dick, San Diego CA 92115. 619-287-4961.

U.S.N. WRR-2 digital readout, triple conversion, 15B SSB-AM-CW-2-32 MHz, \$695. J Strayer, Advanced Tape Products, 13000 Bel Red Rd No. 103, Bellevue WA 98005. 206-641-5044.

Lampkin 107C comm monitor & manual, \$1850. J Giacometti, Nady Systems, 1145 65th St, Oakland CA 94608. 415-652-2411.

GE 100 MHz, 5 chan auto telephone, \$200. A Braun, Aluan Engineering, 2305 Florenca, Montrose CA 91020. 818-957-0618.

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.

### Request for Bids - B878-2.

Subcarrier Receivers for Radio Reading Service: 238 each. Bids will be received until April 1, 1986. For Bid Documents contact: Maricopa County Community College District Attn: Purchasing Department PO Box 13349 Phoenix AZ 85002 Phone 602-267-4454

### Want to Buy

WLF 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 recs, table models for household use. R Malone, Christian Radio Network, POB 6336, E Rochester NH 03867. 603-335-2005.

## REMOTE & MICROWAVE EQUIP.

### Want to Sell

SA 7325 15 kHz dual audio decoder, module for DPU. J Cantrill, 1910 E Kimberley Rd, Davenport IA 52807. 319-355-5331.

Moseley sub carrier generator & demodulator, never used. R Baker, Bcct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Moseley 505-C STL system, new, awaiting freq assignment, \$5200. B Haynes, WZZX, POB 597, Lineville AL 36266.

Moseley PBR15 for wireline, fair cond, BO. D Fields, KBYG, Box 1713, Big Spring TX 79720. 915-263-7326.

Ma/Com MA-4001 satellite rcvr & Wegener Mdl 1601 main frame, excel cond, 2 yrs old, \$1600/both. D Soapes, KTOL, Olympia WA. 206-438-1280.

S-A Series 9000 2.8 meter satellite receive antenna. J Cantrill, 1910 E Kimberley Rd, Davenport IA 52807. 319-355-5331.

Micro Controls, 9 chan wireless, new cond, BO. D Fields, KBYG, Box 1713, Big Spring TX 79720. 915-263-7326.

Comtech/Fairchild dual 15 kHz chan card, \$725. R Rocks, KOOK, POB 1276, Billings MT 59103. 406-248-7827.

Cetus RDC-10 remote control wire system, \$100. J Gilchrist, WTBF, POB 747, Troy AL 36081. 205-566-0300.

Motrola 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 ASD-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, WLAQ, Ste 9020 Sears Tower, Chicago IL 60606. 312-329-8844.

QEI 77751 ATS interface, \$200. J Robillard, KLVU, 1803 N First East St, Haynesville LA 71038. 318-624-0105.

### Want to Buy

Marti STL8 or STL10 xmtr & rcvr in gd cond, pref w/antennas. G McClintock, WITA, 7212 Kingston Pk, Knoxville TN 37919. 615-588-2974

Marti RPU system in 160 MHz band. B Walters, WEKY, POB 747, Richmond KY 40475. 606-623-1340.

Need remote control in excel cond. B Walters, WEKY, POB 747, Richmond KY 40475. 606-623-1340.

Wegener 1606-10 satellite rcvr. R Meyers, Benchmark Comm Corp, 4700 SW 75th Ave, Miami FL 33155. 305-264-5957.

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.

## STEREO GENERATOR

### Want to Sell

Moseley SCG-4 SCA, like new, w/book, \$250. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

Moseley stereo generator, latest model, never used. R Baker, Bcct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Moseley SC3-T stereo gen, \$200. R Simonson, HDM Comm, Box 99, Mears MI 49436. 616-873-3817.

## SWITCHERS (VIDEO)

### Want to Sell

NCA 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 Hvey St, McKeesport PA 15132. 412-673-7130.

Echelon SE-4 & other equip, send for list, BO. S Delahoyde, ITT Tech Inst, 4837 E McDowell, Phoenix AZ 85008. 602-231-0871 X174.

## TAPES, CARTS & REELS

### Want to Sell

Empty reels, 10", new cond, 1/2", \$2 ea; 1", \$2.50 ea; 2", \$3 ea, min order 25. I Kaufman, Natl Recdg Co, 460 W 42nd, NY NY 10036. 212-279-2000.

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, 1-800-331-3191 or 516-678-4414.

Fidelipac 300 carts (243), gd cond, assrtd lengths, \$1.50 ea. C Sheibenberger, WFTW, POB 10, Ft Walton Bch FL 32549. 904-243-7676.

Ampex 456 2" tape, 10" reels, gd cond, minimum order 5 reels, \$25 plus freight. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Fidelipac 300 cart shells, \$30/100. D Robinson, WISV, Rt 4, Viroqua WI 54665. 608-637-7200.

Audio Pak dbi 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.

NAB 1/4" hubs, black, yellow, blue, 250 plus at \$1.15 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 1/2" 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.

Tapes in boxes, perf for auto music tapes, \$3 ea. J Geedy, Plough Bdcg, POB 1467, Wilmington NC 28402. 919-395-6157.

Bases, 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.

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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): \_\_\_\_\_

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 Company/Station \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
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Rw

## Broadcast Equipment Exchange

## TAX DEDUCTION EQUIP.

AM mod mon & 2 servicable TTs for Christian station. J Counter, YSVE, 5484 San Patricio, Santa Barbara CA 93111. 805-967-6410.

Low pwr AM/FM xmtr, 8-10 chan console, compressor/limiter & tower w/antenna. M Butterfield, 4H Camp Howe, Goshen MA 01032. 802-775-3731.

onation, 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.

Non-profit, tax-exempt Christian radio station needs 150' Utility tower, 5 kW AM xmtr, various phaser parts, transmission line. P Fakoury, WPRZ, POB 3220, Warrenton VA 22186. 703-349-1250.

## TEST EQUIPMENT

## Want to Sell

Tek 140 NTSC test signal gen, like new, \$1500; Tek RM 529 video waveform mon, excel cond, \$250. G Boldenow, 1301 Allison, Newton KS 67114. 316-284-2535.

Potomac Instruments Mol SD-31/RX-31 synthesizer gen/detector, brand new, \$2600. Call F Colligan, 301-229-5577.

HP 330A, audio dist analyzer in gd cond, \$175. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

HP 410B VTVM, gd cond, \$75. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Delta OMB-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.

O1B-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.

Sens Research Mod RFV, 1-300 V RF, needs thermocouple, \$35; Gertsch FM-6 freq meter, 20-1000 MHz, no book, 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.

## 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.

## TRANSMITTERS

## Want to Sell

Collins FM 5B, 5000 W FM xmtr, excel cond, avail immed, \$7500. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

U.S.N.-WRT-2, 2-32 MHz, 15B-55B-AM-FAX-CW, 2.5 kW pep, \$1995. J Strayer, Advanced Tape Products, 13000 Bel Red Rd No. 103, Bellevue WA 98005. 206-641-5044.

CCA FM 3000D, R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

AM & AM dummy loads, 15 W, 80 kW. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

## OVER 80 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FMs: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

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R.E. (Dick) Witkovski  
Owner, 214-630-3600

McMartin B910 exciter. R Baker, Bdct Parts & Svcs, POB 426, Fairburn GA 30213. 404-964-3764.

Gates FM10B, 10 kW xmtr, removed from air in working cond, \$6000/BO. L Haines, Quincy Prod, 816 S 11th, Quincy IL 62301. 217-222-5267.

Gates BC1F AM xmtr, 1 kW, cut back to 250, excel cond, call. B Schneider, KQTY, 806-273-7533.

Collins 550 A-1, AM xmtr, 500 W, used as backup, excel cond, avail immed, \$2500. D Workman, 8151 Anchor Dr, Longmont CO 80501. 319-785-6069.

Pwr transformer for Gates 1 kW, Pt No. AP-10459E, like new, \$250; modulation transformer for Gates 20V2, Pt No. 8496, like new, \$200. P Schneider, KPMJ, 1280 S Oxnard, Oxnard CA 93034. 805-486-2337.

McMartin BA-1k, 1 kW AM xmtr, tuned & test to your freq; McMartin B910 exciter (FM) tuned & tested to your freq. C Goodrich, Goodrich Ent, 11435 Manderson, Omaha NE 68165. 402-493-1886.

RCA BTE-10B direct F14 exciter, completely operational when removed, BO. B Harlan, WDJQ, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

RCA BTA 5, blower motor, 3 phase, never used, \$150. D Hastings, WKYB, POB 1000, Hemming SC. 803-558-2558.

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.

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 xmtrs from 2 to 25 W (16), tube & transistor mdl 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, WTBF, 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, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

Collins FM 2.5 xmtr, 1974 mdl 831 D-1, w/exciter, SCA & tubes, gd cond, \$11,500. J Blake, WMQT, POB 467, Ishpeming MI 49849. 906-485-5523.

## Want to Buy

FM xmtr, 5 or 10 kW, w/exciter & stereo gen, C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-981-4245.

RCA BRF-20E1 or BTF-40E1, need side panels in any cond, R Withers, WZXL, POB 310, Gastonia NC 28053. 704-865-8501.

FM xmtr, 3000 W, stereo gen, related equip in gd to excel cond, call collect Tues-Sat, 9-5 CST, C Stover, Stover Bdcg, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

FM xmtr, 3 or 3.5 kW, prefer nearby. B Taylor, KQSS, Box 292, Miami AZ 85539. 602-425-4378.

AM xmtr, 5 kW near 1200 kHz, must be in excel cond, need within 6-9 mos. B Walters, WEKY, POB 747, Richmond KY 40475. 606-623-1340.

Harris FM10H/FM10K 10 kW xmtr, must be in gd cond, J Bahr, WVIS, Box 487, Frederiksted, St Croix VI 00840. 809-772-1652.

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 & retunable, T Taggart, WSPD, 125 S Superior, Toledo OH 43602. 419-244-8321.

Harris or RCA 5 kW FM xmtr 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 xmtr, 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 Stucki, 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 xmtr, Standard Elect, GE or RCA, will disassemble & remove. B Fornoff, KKEI, 402-534-2071.

Collins 21E/M or other 5 kW AM xmtr, 1-30 kW FM xmtr 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.

## TURNTABLES

## Want to Sell

RCA BQ-1A 12" TT w/Gray tone arm in gd cond, BO. B Harlan, WDJQ, 393 Smyth NE, Alliance OH 44601. 216-821-1111.

Russco Cue Master, broken 303 arm but TT in excel cond, will inc stereo preamp, \$325. M Butterfield, Butterfield DJ Svcs, RR 3 Box 4969, Rutland, VT 05701. 802-775-5883.

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.

Rek-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.

Presto 6N disc cutter, hot stylus, Gotham/Grampian head & amp, microscope, feedscrews, working cond, \$950. G Nichols, Creative Prod, 200 Main, Orange NJ 07050. 201-676-4418.

BE Spotmaster Studio Pro TTs (2) w/Gray tonearms & Shure cartridges, low hrs, excel cond, \$200 ea. L Wagner, Ardnigva Radio Net, POB 1788, Orlando FL 32802. 305-299-1299.

Technics SP-15 w/base & Audio Technica ATP 12T arm, new, \$750. A Soroka, WJRO, POB 159, Glen Burnie, MD 21061. 301-761-1590.

Rek-O-Kut B16H 16" TTs (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 6N, Grampian head, Gotham amp, great cond, \$500/trade, T Roller, Hollywood Demo Svcs, 1626 N Wilcox #105, Hollywood CA 90028. 818-994-5368.

## Want to Buy

Russco Studio Pro's needed. B Gray, Gray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-7786.

Rek-O-Kut leadscrews for M5, 16" overhead lathe, 120-180 lpi pitch, J Wood, In-ovonics, 1305 Fair Ave, Santa Cruz CA 95060. 408-458-0552.

## TV FILM EQUIPMENT

## Want to Sell

Shintron Mol 636 time code reader/window gen, 6 mos old, used 3 hrs, list \$1500, BO, as new. J Anthony, TV Stars, 914-271-3969.

## Want to Buy

Dumont camera chain, B&W for video museum, A Weiner, WOZI, 4 Second St, Presque Isle ME 04769. 207-764-6022.

## VIDEO PROD. EQUIP.

## Want to Sell

EECO BE-520 time code gen in gd working cond, \$350. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Dynascience prof hor & vert image enhancer, gd cond, \$495. D Brennan, Custom Video Labs, POB 26126, Birmingham AL 35226. 205-823-0088.

**Shintron Model 636**  
Time Code Reader/Window Gen., 6 mos old, used 3 hours, list \$1500, BO, as new. TV Stars, 914-271-3969.

RCA TP66 16mm projectors, brand new, factory warranty including lens & remote controls; addtl A/V equip avail. F Bovino, SB Video Co., 125 Prospect Ave, Hackensack NJ 07601. 201-343-6944.

Harris 516 TBC, hetrodyne, excel cond, \$3495. D Brennan, Custom Video Labs, POB 26126, Birmingham AL 35226. 205-823-0088.

Sony VO 4800 w/4 DP60's, battery charger, AC supply, shipping case, \$1600. K Cable, Cable Film, 1060 Ryeland Ct, Bridgeville PA 15017. 412-257-1596.

Palmer SW-3 16mm video recdg camera, comp w/Modulite variable density T209 amp & A/B reverse lens, made to shoot film from video monitor w/frame correction, \$12,000/BO. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Faroudja Record-Ex record image processor, excel cond, \$395. D Brennan, Custom Video Labs, POB 26126, Birmingham AL 35226. 205-823-0088.

Tek 1420 vectorscope, mint cond, trade for Tek 528 WFM or sell, \$1450. M Paradiso, 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 Paradiso, 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 Paradiso, Ultimate Image, 7200 Dunfield Ave, LA CA 90045. 213-410-1009.

## Want to Buy

Service manual for Conrac CNA8 B/W monitor. S Shumate, WVIR, POB 769, Charlottesville VA 22901. 804-977-7082.

## VIDEO TAPE RECORDERS

## Want to Sell

Ampex VR 7500 VTR, color or BW, as is, \$150. D Lundy, Lundy Recdg, POB 408, N 25E, Heidrick KY 40949. 606-546-6650.

JVC CR6060U 3/4" R/P VCR, excel cond, w/l spare new video head assembly & approx 200 KCA 60 & 30 tapes, most new or single pass. H Ruh, 300 N State, Chicago IL 60610. 312-670-2009.

Sony VP1000 3/4" deck, play only, \$350 plus frt. J Baltar, Reel Comm, 67 Green St, Augusta ME 24330. 207-623-1941.

Recortec R-Mod, reel servo mod RCA TR600 VTR, brand new, still in box, \$300. D Hastings, WKYB, POB 1000, Hemming SC. 803-558-2558.

Sony SL-2000 w/access, new in box, \$395. S Hofmann, Cameron Univ Theater, 2800 W Gore, Lawton OK 73505. 405-248-2200 X428.

Sony VO3800 3/4" portable, color, w/new heads, \$725. C Potorti, Potorti Video, 10005 Lacey, Morrisville PA 19067. 215-945-3990.

DAVR 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.

## Want to Buy

Sony BVU-100 parts, boards, color CCU, etc, early model. C Asplund, WATR, 79 Baldwin, Waterbury CT 06706. 203-755-1121.

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General Manager  
Radio Station WVAF

**V100**

October 6, 1983

**WVAF**  
P. O. Box 4318  
Charleston,  
West Virginia  
25304  
(304) 925-4947

Mr. Eric Small  
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