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Broadcast Equipment Exchange
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NRSC OKs Draft Standard

by Alex Zavistovich

New Orleans LA . . . The National Radio Systems Committee (NRSC) agreed on 10 September at a special meeting before the NAB's Radio '86 show to adopt a draft voluntary interim standard of a 75 μS AM broadcast transmission preemphasis and a complementary 75 μS AM receiver deemphasis, in a move which committee members anticipate will improve the quality of AM broadcasting.

NAB VP of Science and Technology Tom Keller was enthusiastic about the standard, saying, "This is a great milestone for putting AM back where it should be."

The standard, which also includes a 10 kHz AM transmission bandwidth provision and a five-year review provision, was the product of a year's study by the NRSC, a group of representatives of AM broadcast stations, AM receiver manufacturers and broadcast equipment manufacturers.

Public comment on the preemphasis proposal will be accepted by the NRSC until 15 December 1986.

According to NRSC Chairman and NAB Staff Engineer Michael Rau, 90 days are required for filing an interim standard after comments on the draft are received.

The earliest possible effective date for the interim standard is January 1987, Rau said. After one year, it would become a voluntary national standard.

A number of broadcast equipment and audio processor manufacturers, including Orban, CRL and Texar, said they support the preemphasis proposal and will introduce the preemphasis curve into their systems for retrofit, according to NRSC member John Marino, of New-City Communications.

At press time, Bob Orban, president of Orban Associates, speculated that his company may have a prototype preemphasis filter available by late September.

According to the standard, the recommended preemphasis curve is "a single zero curve with a break frequency at 2122 Hz," similar to the 75 μs curve used for FM broadcasting.

To reduce the peak boost at high frequencies, the standard includes a simple pole with a break frequency of 8700 Hz.

The recommended deemphasis curve for AM receivers is described in the standard as "the precise complement of the preemphasis standard"—a single pole at 2,122 Hz and a single zero at 8,700 Hz.

The voluntary standards, which apply only for audio frequencies below 10 kHz, produce in combination a "transmission/reception system that is flat to 10

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Daytimers Adding Night Power

by David Hughes

Washington DC . . . The long-awaited, final version of the broadcasting accord between the US and Mexico was signed 28 August, prompting many US daytimers on Mexican clear channels to immediately add nighttime operations.

"It's excellent. We're more than pleased," said Jim Wychor, president/GM of KWOA, Worthington, MN. The former president of the Daytime Broadcasters Association, which has become NAB's Daytimer's Committee, echoed the feelings of other daytimers contacted by **Radio World**.

Within hours after the accord was signed, Wychor added KWOA's new 159 W nighttime power, from local sunset to midnight, to its 1 kW daytimers operation. The station is also allowed to sign on at 5 AM instead of 6 AM, he said.

The new bilateral agreement, which went into affect immediately following the signing, allows about 300 US daytimers on Mexican clear channels—540, 730, 800, 900, 1050, 1220 and 1570 kHz—to operate at night. It also authorizes increased postsunset operations for about 2,000 daytimers on other channels.

Earlier this year, daytimers received show cause orders from the FCC which specified their night power levels. Stations were then required to notify the Commission of their post-agreement intentions.

A 500 W night power level cap has been placed on daytimer operations on Mexican clear channels. The FCC said that, following a five-year period, it will begin accepting applications for night power levels of up to 1 kW for the affected stations.

A similar agreement with Canada, affecting US daytimers on Canadian clear channels, was implemented last year.

"This agreement culminates an almost three-year process of cooperative efforts between US and Mexican officials which will lead to enhanced opportunities for US broadcasters to expand their service to the American public," FCC Chairman Mark Fowler said.

NAB President Eddie Fritts thanked the FCC, the US State Department and the Mexican government for their "tireless efforts to attain this historic agreement."

The preliminary agreement was penned in August 1985, with final signing originally predicted by fall of that year. However, a September 1985 earthquake destroyed many of the Mexican communications authority's offices, thereby delaying the pact.

Some in the broadcasting industry suggest strained international relations between the US and Mexico during the past year as a cause of further delay.

Good coverage

Wychor said that KWOA's 159 W signal is "interference free" for 45 miles, and "usable" for a full 60 miles radius.

"I've talked to other daytimers (on Mexican clears), especially in the north and east, and most are very happy," he

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RADIO '86 NEW ORLEANS

Report on Radio '86
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Regulatory News

NAB Seeking Upgrade Waivers

by David Hughes

Washington DC ... In a petition for rule making and emergency relief filed 26 August, the NAB has asked the FCC to reassess its decision to downgrade Class B and C FM stations that do not meet certain power and antenna height restrictions by 1 March 1987.

The broadcasters' association asked the Commission to "begin an expedited review of the matter" and issue "temporary waivers" to stations that make a "good faith effort" to upgrade before the end of a grace period that was implemented in 1984.

The issuance of temporary waivers to stations would give the FCC, acding to the NAB, "additional time to assess the need for reclassification while saving stations from making a huge investment to comply with a rule the Commission may determine is not necessary.

Diversity goal can be met

"Without a rule change, these stations will be reclassified to achieve station diversity goals that are already being met and, in the process, the FCC will have abandoned several of its own fundamental communications policies," the petition said.

The NAB maintained that, because almost 700 new FM allotments will be created in the Docket 80-90 proceedings, the FCC's diversity goal can be met even if existing stations are not reclassified.

The FCC's reclassification rule, the NAB added, "will create unprotected pockets of interference," thereby "destroy(ing) service currently enjoyed by many listeners."

The reclassification plan "ignores the fact that many stations face significant obstacles in their attempts to upgrade their facilities such as cost, FAA regulations, local zoning restrictions and land shortages," the NAB said.

Cost a factor

For example, the NAB pointed out that it would cost an average of $567,339 to upgrade a Class C station's HAAT (height above average terrain) to 300 meters in order to allow it to remain in its class. An average Class B facility would have to spend $126,912 to increase its ERP to at least 25 kW, the NAB added.

In a recent NAB survey of Class C stations, 63% of the more than 400 responding stations were not planning to upgrade, with almost 9 out of 10 of those indicating that there are obstacles preventing the upgrade, especially the "expense to upgrade."

Of the remainder, 20% of the surveyed stations said they have already filed for upgrade, while 17% plan to file by March 1987.

The association said that many stations are in a "Catch 22" situation: "They must upgrade their facilities to avoid reclassification ... but are presently unable to do so because of other regulations" such as FCC co-channel and adjacent channel mileage separation requirements.

For more information on the NAB's request, contact Margaret Davitt at 202-429-5350.

Update

Falls Church VA ... In the FCC files section of the 1 September RW, it was reported that public broadcast interest groups urged the FCC to adopt a policy statement restricting future TV-6 channel assignmnents.

An FCC official stated that the public broadcast petition was dismissed 20 May by the Mass Media Bureau, by delegated authority.

The FCC's response was in the form of a letter to the principals, and was not placed on public notice. For more information, contact Michael Lewis, staff engineer for the FCC's Engineering Policy Branch, at 202-632-9660.

Featured this issue

FCC Clips

FCC Confiscates Equipment

Officials from the FCC's Chicago office, joined by the US Marshal's Service, confiscated an estimated $10,000 worth of illegal electronic equipment, including 50 radio frequency amplifiers and transmitters, from retail distributor H&Y Electric Supply of Louisville, KY.

The Commission said the 29 August action followed an investigation that was "part of a continuing enforcement program to assure that the FCC ban on manufacturing and selling CB linear amplifiers and other non-type-accepted transmitters is observed."

Federal law prohibits the marketing and manufacture of such equipment, the FCC said. Violation of the law carries a maximum fine of $100,000 and one year's imprisonment.

The FCC maintained that it warned H&Y against marketing the illegal equipment, but the practice continued.

"Investigations of this nature are necessary in order to prevent the increased sale and use of illegal equipment that can cause harmful interference to authorized radio systems, such as police, fire and other safety services, as well as electronic home entertainment equipment," the Commission added.

For more information, contact Russell Monie at the FCC's Chicago office: 312-353-0195.

Radio Advisory Committee Meets

The Radio Advisory Committee (RAC), which includes representatives of the FCC and various broadcasting organizations, including the NAB, was scheduled to meet in Washington, DC on 24 September at the NAB Headquarters.

Items on the agenda included a status report on the industry's AM improvement campaign, information on preparations for the 1988 Second Session of the ITU Regional Administrative Radio Conference (RARC) on the expansion of the AM broadcast band to 1705 kHz, and details about the implementation of the recently signed Mexican agreement.

For more information on the meeting, call Committee Chairman Louis Stephens at the FCC: 202-254-3394.

New Procedures

New procedures are in effect at the Consumer Assistance Branch of the FCC Private Radio Bureau's Gettysburg (PA) Licensing Division.

Due to limited staff time and the large number of requests for research and/or retrieval of Commission documents for inspection, all requests will now be handled on a time-available basis.

For more information, contact Shirley Blickenstaff at 717-337-1212.

Regulatory News

FCC Reveals AM Stereo Data

by David Hughes

Washington DC ... The FCC has made available details about its recently completed tests on whether some AM stereo exciters create adjacent channel interference.

The data shows that two Washington, DC area stations—one using the Kahn/Hazeltine ISB system and the other using Motorola's C-QUAM system—slightly exceeded emissions limitations.

The details were contained in a memorandum dated 30 June from Robert Douchis, engineer-in-charge at the FCC Laurel, MD, facility, to the chief of the FCC's enforcement division.

The memo, which is accompanied by other intra-Commission communications and test results, summarizes the results of the AM stereo tests, which were conducted in May and June.

In complaints filed with the Commission in March and April, Leonard Kahn, president of Kahn Communications Inc., alleged that the FCC rules pertaining to occupied bandwidth specifications, which are contained in Rule Section 73.44, are exceeded when C-QUAM stereo exciters were tested with a single tone at 75% modulation levels.

However, the FCC performed field tests of C-QUAM, Kahn and monaural stations in May and June and found no significant violation of its rules. While the FCC informed Kahn of its decision to dismiss the complaint in July, it did not release details of the tests in its decision.

In August, Kahn reportedly filed a Freedom of Information Act request to obtain the test details, and has requested an oral hearing with the FCC commissioners.

Radio World was able to obtain the test documents in early September.

In the memorandum, Douchis indicated that the FCC's Office of Engineering and Technology (OET) has known that "using single tone (above 7.5 kHz) modulation at certain modulation levels, sidebands exceeding the emission limitations could be generated by some of the AM stereo systems."

However, operating with "normal program modulation, the occupied bandwidth criteria would not likely be exceeded," according to the memo.

Even though the tests concentrated on Kahn's allegations about C-QUAM equipment, the FCC also tested stations using Kahn exciters.

"For comparison purposes, measurements were also made on stations transmitting (with the) Kahn Independent Sideband Stereo (system)," the memo indicated. "Nine stations were measured ... and only one station was observed exceeding the bandwidth mask."

The document indicated that WMAL-AM, Washington, DC, "was observed to have occasional peaks (about 1 per minute) in excess of the −25 dB limit, on the spectrum analyzer in the swept mode."

"When viewed in fixed frequency (manual) sweep mode at +16 kHz above the carrier, approximately 5 peaks per minute were noted" at 2:13 PM on the day of the test, the memo continued, "while at −16 kHz, 2 peaks per minute were noted at 2:23 PM." The tests took place 18 June.

However, the FCC noted that "these excursions were not repetitive and (not) strong enough to, by themselves, warrant violative action."

In addition, the document noted that measurements made on two Kahn stations in Washington state indicated "a possible transmitter or exciter problem."

"On KKSN, Vancouver, WA, sidebands were ±35 kHz, about −54 dB below carrier level, while at KORD, Pasco, WA, sidebands were at ±40 kHz, −54 dB below carrier," the document continued.

The FCC, however said that the sidebands fell within the bandwidth limits of FCC Rule Section 73.44.

The other Kahn stations that were measured and found to be "in compliance with 73.44" included—KAAM, KFRC, KIQI, WATV, WZZK and WOOD.

The memo indicated that 23 C-QUAM stations were monitored. "Based on these observations, the allegations in the (Kahn) complaint cannot be substantiated," it indicated.

"Only one excursion outside the bandwidth limits specified in 73.44 (a)(1) and (2) was observed at a C-QUAM station," at WMZQ-AM, Arlington, VA, the document said.

"This was a single occurrence, while observing on a spectrum analyzer in the fixed frequency (manual) sweep mode, at +18 kHz above the carrier frequency."

The FCC said that the "excursion" was approximately 4 dB in excess of the −25 dB point specified in the rules. "One peak in approximately 40 minutes of monitoring would not constitute 'peaks of frequent recurrence,' and, hence, would not be considered a violation of the rules," the memo indicated.

"Of the monitoring conducted on all other C-QUAM stations, no excursions above the bandwidth limitations were noted," the memo continued.

However, the tests indicated that "one plot of WANN Annapolis, MD, shows

(continued on page 6)

NAB Favors FM Index Method

by Alex Zavistovich

Washington DC ... The NAB endorsed the use of an index method to determine the class of an FM station in recently filed comments on an FCC proposal to clarify and simplify FM technical allocation rules.

In addition to the index method, the proposal, issued by the Commission on 17 April, includes allowing higher classes of FM stations to operate on the 20 reserved Class A station channels.

Other items of the proposal include a 1 mV/m contour freeze for short-spaced stations, a modification of intermediate frequency (IF) distance separations for particular classes of stations and a modification of the method of predicting FM coverage.

The NAB said it supported the FCC's proposed index method for determining new station classes, but opposed intermediate frequency (IF) interference separation standard revisions.

Due to the "wide range of receiver susceptibility to IF interference," the association recommended that the FCC maintain its existing separation standards requirements.

Power, antenna height

The FCC proposed the replacement of minimum power and antenna height requirements with an index method which would employ a formula reflecting the expected distance to the 1 mV/m contour.

The NAB said such a formula would eliminate unnecessary operating restrictions and disparities in classifying facilities, and is simpler to use than calculating and matching equivalent coverage of 1 mV/m contours.

Clear Channel Communications, Inc. (CCC), licensee of KPEZ, Austin, TX, a Class A FM station, urged the FCC to permit Class A stations to increase their power to 4,000 W and antenna height to 125 m. CCC predicted this would increase the total coverage area for a typical Class A station by 40-42%.

But the Association for Broadcast Engineering Standards (ABES) said the FCC proposal regarding power and antenna height would lead to greater interference than found in the existing system by allowing stations to operate at existing power levels with antenna heights greater than at present.

ABES proposed that, rather than using a single index method, a different index and formula ought to be employed for each classification. This would ensure that interference levels would remain more or less the same, ABES said.

ABES further contended that additional study is required regarding IF separation. Citing that the NAB has determined that some amounts of increased interference would be present in short spacing, ABES urged the FCC to hold its decision until more research is done.

National Public Radio (NPR) said some broadcasters, particularly in the upper band, are concerned about reclassification, saying that funding problems make it difficult for the stations to meet the proposed deadline of 1 March 1987. NPR has urged the FCC to reconsider the deadline date.

Class A FM channel use

CCC opposed the Commission proposal that the 20 currently reserved Class A channels be opened for Class B and Class C use. It suggested that rather than helping stations with limited coverage provide greater service, the proposal would allow new broadcasters to move into communities without regard to coverage problems.

But the NAB endorsed the proposed use of higher FM station classes on the Class A channels.

"There no longer appears to be any reason to restrict the class of FM facility permitted on any particular FM channel," NAB officials noted.

NPR suggested the elimination of some Class A channels, particularly Channel 221A, for reasons of adjacency. Channel A, NPR stated, can be used for translator operations, where frequencies in the noncommercial educational band are unavailable.

Additional obstacles

NPR also indicated that some rule changes designed by the FCC to benefit commercial stations act as "additional obstacles" for public stations.

One such obstacle is the absence of a table of allotments for public stations.

NPR maintained that public stations are required to protect vacant allotted commercial stations as though those stations are operating at full power. The group contended that public stations are not receiving the same considerations.

NPR also pointed out that certain broadcasters in the "upper band" are experiencing a "squeezing" effect.

Although TV Channel 6 rules make the upper band desirable for public stations, NPR maintained, the stations then have to contend with additional channel adjacency rules.

Although the NAB stated that transmitter location should determine station class, it stressed that "maximum flexibility be afforded an applicant to select the class of station which will best serve its needs and those of the community to be served."

Beasley Broadcast Group, licensee of a number of FM stations, said that the 1 mV/m contour freeze for short-spaced stations is "ill-conceived." The current rule, Beasley stressed, is effective and should be retained.

If the freeze is adopted, Beasley urged, the Commission will need to "further refine" its implementation proposal. The FCC should "segregate the proposal into an independent proceeding and consider its impact more carefully," the group suggested.

The freeze is currently an "unworkable, oversimplified approach to a complex problem," Beasley contended.

FCC Docket number is MM 86-144. For additional information, contact Michael Lewis at the FCC, 202-632-9660.

Final Sale at Sound Genesis

San Francisco CA ... Sound Genesis, an established audio dealer, is reported to be selling its stock, liquidating its inventory, and closing its doors to the public.

The company, a general purpose pro-audio shop which sold equipment and contracted out for installations, was one of the largest such shops in northern California, according to Steve Hill of Otari, a Sound Genesis creditor.

Dave Angress, sales manager for Sound Genesis, confirmed that "the company is closed."

Angress said Sound Genesis' employees were informed of the company's intentions at 5 PM on 15 August.

The company opened its doors for the final time on 2 September for a liquidation sale which, at press time, was still underway.

Sound Genesis is working to ensure that its creditors and customers are "disadvantaged as little as possible" by the closing, according to Angress. He maintained that their creditors have been apprised of developments and that the company is "taking legal advice" to preclude any possibility of being placed into involuntary bankruptcy.

Angress would not provide reasons for the company's closing, but dispelled rumors of bankruptcy. John Delantoni, president of Orban Associates, another creditor, stressed that Sound Genesis is simply "closing its doors."

Angress revealed that a new audio company "will be emerging in the San Francisco area shortly."

He said the new company, which may also be named Sound Genesis, will be staffed by "a core of current Sound Genesis personnel."

For additional information, contact Dave Angress at Sound Genesis: 415-285-8900.

Opinion

Readers' Forum

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

Duly noted

Dear RW:

Referencing the 1 August issue, please accept my nomination for Mitsubishi International's Differential Pulse Code Modulation-Adaptive Quantification-Automatic Stabilization Recording Method as the longest bullshit line describing something that probably doesn't work yet found in your newspaper.

Arthur Constantine
VP, Mktg
Fidelipac Corp
Moorestown, NJ

Noninductive transformer

Dear RW:

My curiosity is killing me! In the 15 April issue of RW, you described your travails with a noninductive transformer. I've been waiting for the next chapter, but with no result.

Did you check to see if you had a large, permanent magnet instead of a modulation transformer? Since those critters have to work with DC, I believe they have a gap in the core to prevent magnetization (of the permanent variety).

Suppose something had plugged up that gap? Since inductance, hence transformer action, requires the domains in that core material to keep flipping around in response to the current, it seems that a permanently magnetized core would really fight you.

As to what might have shorted the gap, you might consider whether there should be a national ban on steel wool at radio stations. It normally only affects meter movements, but I wonder if it might have crept into your transformer?

In any case, I enjoy your column tremendously, and feel it provides a valuable perspective to the younger folks who haven't had someone around to bring 'em up right. I was very fortunate to have five years working under a bright and *well-experienced* man here at WTAG. That would be a rare situation these days. My best wishes to you.

John K. Andrews, CE
WTAG, Worcester MA

RW *replies: Columnist Floyd Hall responded, "I'm afraid your theory of a permanently magnetized core in the 'noninductive' transformer I spoke of in the 15 April 'Old Timer' column shows something of a lack of knowledge of the action of the laminated core materials used in transformers.*

These core laminations are punched from silicon steel alloy sheet, then annealed at high temperature for the specific purpose of obtaining material with high permeability and low hysteresis.

In simple terms, 'permeability' is a measure of the material's ability to magnetize easily and carry high gauss without retaining magnetism when the coil current is stopped.

Hysteresis is the resistance of the material to be magnetized, and the polarity reversed.

The higher the permeability of a core material, the greater the inductance obtained with a given number of ampere turns and core cross section. Therefore, the permeability of the core of the transformers I had described had gone to zero, and the hysteresis had accordingly become unusably high. Contrary to your theory, the core would not *magnetize!"*

Fidelity wars

Dear RW:

When are the program directors going to wake up and not worry about the loudness battle on the AM band?

Recently I talked with a major market chief engineer who had recently heard the three AM stations in our market and how each had taken the care to process their audio with fidelity. We all use the same make processor, with two of us using C-QUAM stereo.

The point is that in most markets the PD wants the station to be the loudest on the dial. They also want the audio "rolled off" so it sounds great on a cheap radio.

They have to realize that an AM station's music competition is not another AM station, but a full-fidelity FM station.

My major market engineer friend told me that he had several battles with his "audio expert" PD over how his processing should be set, and the outcome was always loud and narrow response. The interesting part of this story is that this station is one of two AM stereo stations in their market. Listening to this station against the other narrow-response AM stereo station, the average listener would still choose FM because of a lack of fidelity.

Most AM stations use some sort of multi-band processing, so why not turn up the lows and highs and give your listeners some fidelity?

If you can go AM stereo, so much the better, because your listeners won't believe the sound difference. I'm happy to say that in our market the AM stations are competing in a fidelity war against the FMs instead of trying to blow the listener's radio out of his dashboard when he pushes the station selector button.

Listen to your station on a wideband radio and see if it needs some AM fidelity help. It probably does!

Bob Wittnebel, GM
KRIB-AM
Mason City, IA

New to the game

Dear RW:

I read with great interest the guest editorial written by Ed Montgomery in the 1 June issue of RW concerning the demise of his Broadcast Engineering department at Northern Virginia Community College. I found this particularly interesting because we are just starting such a program in our department.

We have operated a production/performance oriented degree program on this campus since 1970, but with the recent help of a state grant, we have hired a broadcast engineer and purchased equipment to instruct students in RTV engineering.

We have talked with the people at SBE and surveyed broadcast professionals around our state recently. We found a great need existed for educated specialists in engineering, and we are intent on building a nationally recognized degree within our department.

Our study showed that students have a higher probability for securing employment in engineering than in any other area of broadcasting, except sales.

Obviously we are new to this game so we would welcome input and advice from anyone about how we can produce a quality graduate in broadcast engineering. We hope our program does not meet the same fate as Mr. Montgomery's, and we trust we can do something positive to alleviate the shortage of quality, well-trained broadcast engineers.

Please feel free to share this with whoever might be able lend us some help.

Reed Smith, coordinator
AAS RTV Department
Ohio University—Zanesville
1425 Newark Rd.
Zanesville OH 43701

Plan for Radio '87

Radio '86, held 10-13 September in New Orleans, demonstrated that NAB not only successfully completed its merger with NRBA in order to produce an excellent fall radio show, but was also able to build on the NAB's inherent strengths in the process.

Radio '86 reflected the NAB's conscious effort to improve on past shows via the efforts of its Office of Science and Technology (OST), which—due to political rivalry between NRBA and NAB, along with simple oversight in the planning stages—was hampered in contributing its technical expertise to Radio '85.

Radio '86 included several events that marked major policy changes or advances in radio broadcasting.

The NRSC, meeting at the show, voted unanimously in favor of an interim draft preemphasis/deemphasis standard and distributed copies for comment at the OST booth. The NAB's AM Improvement Subcommittee reports were also distributed, including a much-anticipated report on AM modulation and overmodulation, the results of which may change standard engineering practices of measurement in those areas.

Radio '86 proved that engineering issues are of interest and consequence to the future of radio, not just to its engineers.

Unfortunately, NAB faces a marketing problem if it hopes to make its fall radio shows well-attended events. First, NAB should be prepared to face the fact that the industry's *perception* of the show may take a year or two to catch up with the reality.

Second, the OST may be faced with conflicts between the NAB's spring conference and the fall show. Limitations in manpower, speaker availability, budget, time, and perhaps audience could force NAB to choose between dividing radio resources between the two shows or placing its radio efforts into the fall show.

If Radio '86 is any indication, it's clear that radio has plenty of issues, events and exhibitors to successfully sustain a meaningful show that, with growth and effort, would clearly serve the radio industry far better than does the battle for attention it undergoes every spring.

—RW

Radio World

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Daytimers Adding Night Power

(continued from page 1)

said. However he has heard that some are not satisfied with their low night power levels.

"Many stations got pretty good nighttime power levels, while a handful got very low powers," according to NAB Counsel Barry Umansky. "Still most indicate that they can cover their core area. It's a big shot in the arm."

Mark Roberts, GM at WTSJ, Cincinnati, OH, said his 1 kW daytimer on 1050 kHz is authorized to run 275 W at night. "It gives us a good signal. We can cover the metro area with it."

The station expanded its operations to midnight immediately after receiving notification that the agreement was signed, but has since expanded to 24-hour operations. Roberts said the station receives some skywave interference after 9:30-10 PM.

"We would like to beef up our night power to 500 W," he added.

Norman Brooks, GM at Staunton, VA's WKDW, a 2.5 kW daytimer on 900 kHz, said his 150 W night power provides "fine reception in the immediate area." But the power covers only half the metro area, he said.

"Daytimers would like, and deserve, more power," Brooks said. "We would like 1 kW or 2.5 kW at night. We are so far away from Mexico."

Despite some of the low power levels reported, including some in the 20 W range, NAB Daytimers Committee President David Palmer said that many daytimers would be "pleasantly surprised at what these low power levels are capable of doing."

Some snags

Some daytimers, particularly those on 730 kHz, indicated that their nighttime powers were lower than what they expected, sometimes even lower than their previous postsunset and presunrise power levels.

This is because, Wychor said, a recent bilateral agreement between the US and Canada has allowed the upgrading of some Canadian stations. The recent upgrade of a Canadian station on 730 kHz from an equivalent I-B level to a I-A level has caused the FCC to require more protection from the new US nighttime operations.

FCC Policy and Rules Division Assistant Chief Wilson LaFollette said that the new "Class A" (formerly called Class I-A and I-B) Canadian stations required the US to change its night power level calculations for some US daytimers on Mexican clears.

For example, Wychor said KWOA's existing night power of 159 W is lower than the station's previous postsunset level (183 W), and its initial nighttime power level (165 W).

He maintained that, in KWOA's case, the difference between the power levels is "largely technical" and has "no actual effect" on the station's nighttime coverage.

John Bisset, CE for WCPT in suburban Washington, DC, a 5 kW daytimer on 730 kHz, said he expected a night power level of 90 W, but actually got about 20 W. The station still plans to utilize the lower level.

Michael Komichak, GM for WPIT, a 5 kW daytimer on 730 kHz in Pittsburgh, PA, said his station's night power is in also in the 20 W range. He said he had not decided whether to add night operations.

Umansky said some broadcasters have questions pertaining to the number of nighttime hours an authorized daytimer is required to operate in order to comply with the Commission's rules pertaining to minimum programming hours.

He pointed out that while a daytimer that has indicated to the FCC that it will use its night power may be only authorized to use a handful of watts, it is still considered a fulltime operation and must abide by Commission rules that require it to be on the air two-thirds of the time between 6 PM and midnight.

Umansky said a daytimer that is authorized to operate at night could sign off at 10 PM or 11 PM with no problem. But stations that try out their new night powers and then abandon them completely would have to get FCC permission, he added.

For more information, contact the FCC Attorney Jonathan David at 202-632-6955, or the NAB Legal Department at 202-429-5430.

FCC Releases Test Data

(continued from page 3)

the spectrum ±100 kHz from the carrier, to a level in excess of −90 dB below carrier (the carrier is filtered down by 34 dB using a notch filter)."

Other C-QUAM stations that were monitored in the tests included—WQSN, WITL, WCUZ, WJR, KMFY, WCCO, KFAB, KOIL, WOW, WSB, WPLO, WKFX, KHWY, KJOY, KKHI, KMPS, KTAC, KJR, KONA and WCPT. All were found, according to a chart of the findings, to be "in compliance with 73.44."

Thirteen monaural stations were also tested, and all were found to be in compliance, the FCC said. They were—WKZO, KDWB, WTCN, WMIN, WQXC, KKFX, KQIN, KRE, KABL, WOXR, WCKZ, KMMJ and KRGI.

The Commission's contact on this issue is OET Engineer Bruce Franca: 202-632-7060.

SBE National Convention Set

by David Hughes

St. Louis MO . . . Between 2,000 and 3,000 people are expected to attend the Society of Broadcast Engineers' (SBE) first national convention, to be held 14-16 October at the A.J. Cervantes Convention Center in St. Louis.

Unlike most other industry shows this fall—which are either highly specialized or geared for general broadcast interests—the SBE event will be specifically for broadcast engineers, according to SBE President Richard Rudman.

The exhibit floor will feature 225 booths occupied by more than 110 equipment manufacturers and distributors, SBE said. Floor hours are 9 AM-6 PM Wednesday, 15 October and 9 AM-3 PM Thursday, 16 October.

Entrance to the exhibit hall is free. Admission to the *Broadcast Engineering* magazine-sponsored engineering conference is $25.

The three-day engineering conference, arranged by former WOSU conference organizer John Battison, will open at 10 AM on 14 October, a day before the exhibit floor opens.

Technical papers scheduled include coverage of FCC RF radiation standards, FCC/FAA tower marking and lighting rules, audio specifications, Travelers Information Service (TIS) operations and digital audio.

Consulting engineer Lawrence Behr is scheduled to discuss "the care and feeding of folded monopole antennas," while Oscar Reed, also a consulting engineer, will talk about synchronizing AM transmitters.

Bill Sacks, president of Straight Wire Audio, will discuss his variable-speed CD player, while attorney Harry Martin will speak on FM allocations and application processing.

FCC Engineering Policy Branch Assistant Chief John Reiser will host a session titled "The FCC Answers Back." A "Consultant Round Table" discussion is also planned.

NAB VP/Engineer Tom Keller will address a Wednesday luncheon at the conference, while FCC Mass Media Bureau Chief James McKinney will be on hand to answer broadcasters' questions. The SBE said the luncheon, which costs $10, will be the "centerpiece" of the convention.

During the show, SBE President Rudman will present the first SBE Industry Award, the society's highest honor, to the widow of the late Harold Ennes, the author of many technical books for broadcast engineers.

The SBE will also hold meetings during the convention, including its annual membership meeting, scheduled for 5 PM Tuesday. A ham radio reception is planned immediately after, at 6 PM.

In related news, the AM subcommitte of the National Radio Systems Committee (NRSC) will meet at the SBE convention. On-air tests of the NRSC's interim draft standard on preemphasis/deemphasis will be conducted during the show.

80-90 Daytimer Credit Disputed

by David Hughes

Washington DC ... The NAB has asked the US Court of Appeals to uphold the FCC's 1985 decision to grant an upgraded enhancement credit to daytime broadcasters that apply for FM channel allotments in their communities.

In a petition for review filed 20 August, the NAB responded to a National Black Media Coalition (NBMC) petition filed in May that appealed the Commission's decision. The NBMC filed briefs in the case in late July; the NAB filed in August.

In the spring of 1985, in deciding the procedure it would use to award the 689 new FM stations in the "Docket 80-90" proceeding, the FCC said it would place an AM daytime station owner's previous broadcast experience (the so-called daytimer's credit) on par with other credits for local residence and minority ownership.

At the time, FCC Chairman Mark Fowler said that since only 40% of the communities which have Docket 80-90 allocations already have existing daytimers, minority applicants would stand "a good chance" of obtaining FM stations in the remaining 60% of the communities.

NBMC's case

However, NBMC Attorney David Honig disagrees with Fowler's assessment. He told RW that, of the 689 Docket 80-90 communities, only about 90 allocations have the potential of being financially successful or, as Honig put it, "money makers."

> *"The NBMC has maintained that the FCC should attempt to remedy marketplace imperfections."*

"Of those," he added, "all but 16 have existing daytimers."

In previous filings, the NBMC has maintained that the FCC should attempt to "remedy the marketplace imperfections which have resulted in nonexistent or inadequate service to minorities in many communities" by developing a plan that would determine which Docket 80-90 allocations would be able to reach the greatest numbers of minority listeners.

Honig said the FCC's Docket 80-90 procedure should "help daytime broadcasting in general," rather than aid "existing licensees."

The NBMC also has questioned whether the Commission provided adequate public notice that its FM preference scheme would also be applied to many other future FM proceedings, perhaps in as many as 2,000 or 3,000 cases, and not just to the 689 Docket 80-90 allocations.

Honig maintained that the FCC "did not make it clear" in the original notice of proposed rule making document that the procedures for Docket 80-90 preferences would apply to other FM proceedings. He said the FCC unlawfully expanded the scope of the rule making.

However, the NAB maintained in its August filing that the FCC, in line with the Administrative Procedure Act, did "adequately apprise" interested parties that it would apply the daytimer preference to all FM comparative proceedings and not just those created by Docket 80-90.

The NAB also said that the FCC's daytimer's credit action should be affirmed by the court as a "legitimate and rational determination within the statutory authority of the Commission to determine how best to assure that the public interest is served."

The special consideration for daytimers was granted "in recognition of both the plight of these licensees and of the public service contributions they have made to their communities," the NAB added.

The association states that the policy is fair because the minority ownership credit has the same value as the credit for previous broadcast experience. It added

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Basic Antenna System Checks

by Tom Osenkowsky

Brookfield CT . . . Many of today's AM broadcast antenna systems were designed in the early 1940s, and some even earlier. In a series of articles, we are going to explore the theory behind AM antenna systems and methods by which improvements to these systems can be made. We will also give some examples of BASIC

RF Readings

computer programs with which to analyze the operation of your antenna system.

Let us examine a typical antenna system. We'll use a nondirectional antenna for starters, as it is the building block of a directional system (see Table 1 and Figure 1).

Tom Osenkowsky is a radio engineering consultant headquartered in Brookfield, CT, and a new **RW** *columnist. He can be reached at 203-775-3060, or write to 5 Beechwood Grove, Brookfield CT 06804.*

The antenna has its conjugate (resistance R_A and reactance X_A) impedance plus a series loss resistance, R_L, along with a distributed capacity to ground. The FCC specifies that calculations for directional antennas employ a 1 ohm loss at the loop (point of current maxima on the radiator; usually 90° down from the top of the tower).

In our nondirectional radiator, assuming a theoretical loop impedance for a quarter wave radiator of 36.56 + j21.01, we find that, by Equation 1, $P_L = 27.4^W$ for an input power of 1 kW.

R_L appears in series with the radiator. R_L is made up of ground system losses and feeder losses. Our first step will be to examine ways to reduce R_L.

Start with the radiator itself. Cut down all weeds, trees, etc. within 100' of the tower. This is very important. Open all feeds and tower lighting apparatus.

Ground system/feeder losses

Second, construct the 'megger' in Figure 2 if you don't have one available.

What we are doing is creating a high voltage ohmmeter. We use a fast-blow fuse to protect the ammeter in case of a low resistance condition. We should see an open—that is, no current.

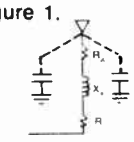
If there is current shown, the base insulator is most suspect. Be sure the insulator is free of water. If you have a self-supporting tower, each insulator must be checked.

Next, the guy insulators must be checked. Isocouplers in the line may have arced during a lightning hit and present a carbon trail to ground.

Table 1.

G	90°
R_A	36.56
X_A	j21.01
I_A	5.23
P_L	27.4W

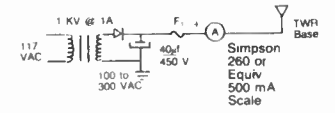
Figure 1.



Equation 1.

$P_L = I_A^2 \times R_L$

Figure 2.



F_1 = 1/8 A 3AG Fuse

⏚ = Ground Strap Connector

Checking ground system

Our next step is the ground system. Be certain all radials are connected solidly to the ground ring strap about the base. Be certain at least a 3" strap runs from the base to the ATU, and that all ATU connections are 100% solid.

Ensure that the transmission line shield, shunt element and lighting choke have a good ground.

One of the often overlooked but essential details in the antenna system is the copper strap, which should run from the ground base ring strap back to the transmitter. A connecting strap should exist between the ground rings of each tower and be bonded to the transverse strap.

If you have a DA system, repeat the testing procedure for each tower. If you have one or more self-supporting towers, you can "spider-feed" them; that is, run a copper pipe from one leg to its diametric opposite and repeat for the other. Then feed the center of the criss-cross. This process equalizes current flow in each leg, and thus lowers losses within the tower.

In next month's column, we will examine some of the math behind loss resistance, how to calculate loop currents and how to improve DA parameters.

RADIO '86 NEW ORLEANS

Radio '86 Report

New Orleans, LA 10-13 September

NAB's Fall Show a Success

by Pamela A. White

New Orleans LA ... The NAB produced a well-planned and well-rounded radio convention 10-13 September at the New Orleans Convention Center.

Participants seemed pleased both with the show and with the location, which provided the practicality and ambience missing from NAB/NRBA jointly sponsored shows in the last several years.

The city offered a chance to combine business with pleasure without posing problems in room availability or transportation.

Though the NAB supplied buses linking hotels with the convention center, many attendees preferred walking through sections of the downtown waterfront.

These things all helped to make Radio '86 a success, lacing the atmosphere like French wrought iron.

But specifically, the addition of 13 "hard-core" engineering sessions and a much heavier emphasis on engineering, as promised by the NAB immediately following the technically barren Radio '85, helped to give Radio '86 a significance that Radio '85 could never have had.

All the fine speeches usually delivered at these things notwithstanding, participants had a sense that they were participating in something historical of their own.

Undeniably, the most significant of these was the National Radio Systems Committee's (NRSC) unanimous approval of a new preemphasis/deemphasis draft standard 10 September at a meeting of the full committee.

FCC Mass Media Bureau Chief Jim McKinney during the AM Improvement Report session; FM Upgrades/FMX™ System Panel with FMX co-developer Emil Torick, CBS Technology Center, Bob duTreil, duTreil & Rackley, Joseph Costello III, Gulf South Broadcasters, John Allen, airspace consultant, Richard Edwards, Guy Gannett Broadcasting; NAB Science & Technology booth.

Included in the draft of the interim voluntary national standard, worked out by the NRSC, a committee composed of both broadcasters and receiver manufacturers, is a "modified" 75 μs AM broadcast transmission preemphasis and a complementary 75 μs AM receiver deemphasis, using a 10 kHz AM transmission bandwidth.

The draft standard includes a comment period through 15 December 1986, with adoption expected in early January (before the CES show). A full definition of the shape of the output filter has not been worked out yet, but committee member Stanley Salek, engineering manager at CRL, and Greg Buchwald of Motorola, felt that working out the final details would be fairly straightforward.

On-air tests will begin "the Tuesday or Wednesday" before the SBE show in St. Louis, said Salek. The yet-to-be-identified station "proposed the tests," he added. When asked how long the station would transmit with the new standard, he said, "Oh, they'll probably leave it on."

CRL had a sign up in its booth eliciting comments from attendees about the NRSC's standard. Shortly before the exhibit floor closed on the last day, Salek said they had heard no negative comments.

Buchwald said the comments heard in the Motorola booth were 90% favorable, with the other 10% quibbling the standard was either proposing too little or too much preemphasis. None of those commenting disapproved of having any standard whatsoever.

The NAB/EIA-sponsored NRSC efforts were on display at the NAB Science and Technology booth. Attendees could hear the effect of the proposed standard on an AM radio receiver and pick up detailed literature on the standard.

SBE President Richard Rudman said he would encourage the board of directors of the SBE to endorse the NRSC report, and that "the society should do everything possible to support" the standard.

Another event giving convention attendees a sense that they were participating in something historical was a report given by the NAB's AM Improvement Subcommittee at the AM Improvement Report session, given in two parts on 11 September, the first full day of the convention.

Prepared by Harrison Klein, PE, Hammet & Edison Consulting Engineers, it is the most detailed study to date on AM modulation and overmodulation ever done, with some unexpected results.

The report was prepared from a computer program that analyzed the results of out-of-band emissions from overmodulation, improper processing and RF networks in transmitters and antennas.

The report examines effects of antenna bandwidth, and suggests the best ways to measure modulation and occupied bandwidth.

The report found that splatter interference is more likely to be caused by an excessive amount of high-frequency au-

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Sikes Says NTIA to Enter AM Stereo Arena

Excerpts from speech on AM stereo by The Honorable Al Sikes, NTIA, at the Radio '86 "AM Improvement Report" session:

It seems to me that we should be driven to act because ... there's a real public interest. It seems to me that we've got to ask about jobs. We've got to ask about choice. We've got to ask about quality programming. We've got to ask about opportunities for new entrants. I especially feel strongly about opportunities for new entrants.

It's undeniable that, to the extent that part of the radio service falls on hard times, it's much more difficult for new entrants.

I tend to reflect, having just left broadcasting, on situations like machines replacing jocks. I'm concerned about that and I've watched that happen.

I tend to reflect about owners who are unwilling to buy equipment because of doubt as to whether that equipment will be a good investment or not, and what that means to the equipment manufacturers, and what that means to the resulting jobs in equipment manufacturing.

I worry about the narrowing opportunities for new interests and I worry about the potential of a longterm decline in quality programming.

In short, I think that it's important that we begin to do something, and that we begin to do something right now. ...

The long-run AM problem is sound, and the quality of what people hear.

The central question is what step or steps will create market incentives that will result in dramatic increases in the distribution of what I call "high tech" AM radios?

I very simply believe step #1 is that, somehow, some way, broadcasters have got to decide to go stereo. ... That's the only way that we're going to get the kind of marketing hook (and if there's anything we understand it should be marketing), to bring high-tech AM radios on the market.

Step #2: there has to be a strong marketing effort by the industry to double and double again and then double again the number of broadcasters who go stereo. ...

Thirdly, I believe that it's going to take a strong and dramatic move. Gradualism—glacial movement—in this area is not going to work. Somehow there have to be the positive signals that tell the radio entrepreneurs, that tell the capital markets ... there's light at the end of the tunnel. There's got-

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Radio '86

Wide Range of Wares Displayed

by Marlene Petska Lane

New Orleans LA ... Radio '86, held 10-13 September, provided broadcast manufacturers, consultants, and software specialists the opportunity to show their wares. Several even took the opportunity to display new products.

Manufacturers and attendees alike commented that the time is ripe for a breakthrough in technology, and suggested that a true digital cart machine is on the way. But rumors that anything was imminent could not be confirmed.

Some cart machine companies are awaiting a digital format standard before developing a new product, and say that their cart machines provide a satisfactory bridge between the technology of today and tomorrow. Rumors may turn into reality by the spring NAB show in Dallas.

Digitalk

In its booth, Broadcast Electronics showed its digital solid state record/playback machine, the Model DV-2 Digitalk. Actually, the last prototype was on display, but orders for the final product were being accepted.

All recordings are stored digitally in random access memory. The memory capacity of the DV-2 allows more than 6 minutes and 15 seconds of total recording time. The DV-2's frequency response is 50 to 6500 Hz, ±1 dB, and distortion is less than 1% at 400 Hz, +8 dBm output level into 600 ohms resistive load, record to playback.

The DV-2 can take up to 99 cuts, and provides direct starts from 1-8. It will lock into any selected cut.

The DV-2 has a 7-minute battery backup to ensure continuous operation during a power failure. Retail cost is $2,695.

In the area of automation, Systemation featured its cassette-driven computerized digital music and communications storage and retrieval system. The system uses Sony digital audio cassette recorders rather than CDs. Each 8mm tape can hold 300 songs.

Touchstone audio controller

Media Touch Systems introduced its new computerized touchscreen controller for all audio sources, Touchstone. The touch screen displays scheduled events, their length and scheduled air time, and allows the announcer to quickly reorder, cancel or cue events prior to actual airing just by touching the screen.

From the simplest system to control multi-CD players to the largest fault tolerant system to control multiple operations from multiple sites, Touchstone can be the central point for all broadcast functions. The system connects to the audio switcher for remote sources, Instacarts, digital audio, reel-to-reel, and broadcast delay.

Howe Audio featured its Phase Chaser 2300, designed specifically for stereo radio and television. Its designer, Bill Latetin, says it is remarkable because it has the ability, without any pilot tones, to distinguish between stereo phase fluctuations and intentional fluctuations. It has mono compatibility with stereo and works on-line.

The Model 2300 features 150 μs differential time base compensation; channel polarity inversion detection and correction; missing channel detection and correction; integral relay bypass mode (automatic with loss of power); user programmable input terminating resistors and electronically balanced I/O and XLR connectors.

The heart of the Phase Chaser is a bandwidth limited, phase sensitive cross-correlator followed by a dual time constant phase error integrator. This circuit detects time delay errors between the left and right audio signals, and introduces compensating time base correction via the two time delay networks to restore the original time relationships between the output signals.

Eventide broadcast delay

Eventide displayed its BD980 Advanced Broadcast Delay, which features a patented automatic catch-up that solves the problem of getting back into delay after a segment is "dumped." The unit will imperceptibly add delay back into the program audio without program interruption.

The BD980 also features a "ramp to zero" mode to initiate a "catch-down" process, new delay entry/exit modes, two channel stereo operation, full 10 second maximum delay and multifunction alphanumeric display. It can also be used to shorten or lengthen an audio segment by up to 10 seconds, without a variable speed tape recorder.

The BD980's distortion is less than 0.02% at 1 kHz, and dynamic range is 90 dB from clipping to noise floor. Input is balanced, with impedance a nominal 10K ohms, a maximum level of +24 dBm, and a full dynamic range from −4 to +24 dBm levels. Output is electronically balanced, with maximum level at +20 dBm into 600 ohms.

The BD980 sells for $5,495.

Auditronics' 400 series consoles

Auditronics showed its new 400 series audio consoles, which will be available 1 January 1987. The consoles can be configured for either production or on-air use, with either 4 or 8 output sub-master groups, plus stereo and mono.

Any 4 output group mainframe may be field upgraded by the user to an 8 output system at minimum cost.

Standard sizes are offered for 12, 18 and 24 input positions. The mainframes are designed for drop-in flush mount into a desk top cutout. Each model has a recessed trough with a removable plate so the user may install custom switching.

Directly above the input module positions is a sloped "dash board" section, providing space for special 5" accessory modules. In this section, located above the master, foldback and monitor modules, is a card cage housing the plug-in dual line output amplifiers.

Standard output metering will be LED bar graph having VU and peak ballistics. Analog VU meters will be offered as an option on some models.

Satellite testing gear

Avcom introduced its battery-operated portable spectrum analyzer, the PSA-35, designed for rapid testing and alignment of satellite equipment. The large screen is designed for outdoor and indoor use, and it is scale calibrated in 10 dB steps for accurate, repeatable measurements.

The reference level controls the sensitivity of the display to allow signals as weak as −85 dBm, as well as strong signals, to be displayed. The center frequency control tunes the spectrum analyzer through each band and centers signals of interest on the display.

New FM transmitters

Continental Electronics featured two new FM transmitters, its Type 814B 4.3 kW and its Type 816R-5 35 kW. Both

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Clockwise, From top: Radio '86 exhibit floor; Auditronics' 400 Series console; Harris FM transmitter; on the floor again; Holaday Industries' RFR metering equipment; Systemation Corp.'s cassette-driven computerized digital storage and retrieval system; Eventide's BD980 Advanced Broadcast Delay.

FCC RFR Standard Examined

by Alex Zavistovich

New Orleans LA ... FCC RF radiation limit requirements, measurements of RF fields, and corrective action were among the topics addressed at the NAB's RF Radiation Regulation Compliance Seminar, held 10 September at the Radio '86 convention.

NAB staff engineer and seminar moderator Ralph Justus stressed that the theme of the seminar was station compliance with FCC regulations; biological effects of RF energy were not addressed.

Justus introduced attendees to the American National Standards Institute (ANSI) RF Exposure Guideline C95.1-1982, explained its development as a voluntary standard, and focused on a 28 January 1986 FCC public notice, which provided further guidance for broadcasters regarding RFR.

The notice, Justus maintained, provided measures which stations must follow to ensure that people are not exposed to fields in excess of the ANSI standard. Included in the measures is a requirement that signs be posted in certain areas.

The signs warn that a site is a "high radio-frequency energy area," as described by the NAB. Justus noted the phrasing of the NAB warning sign purposely avoided the term "radiation."

In extreme cases, Justus cautioned, warning signs and fencing may not be a sufficiently corrective measure; a site change may be required.

Richard Tell, chief of the EPA's Office of Radiation Programs, discussed the EPA's measurements of RF field strengths around FM antennas. Tell said the measurements were made to ensure compliance with FCC guidelines and to ascertain the occupational safety of the environment.

Tell maintained that a number of factors influenced measurements, including signal frequency and the presence of multiple frequencies. He added that exposure level measurements were dependent on the ANSI standard's time-averaging factor.

Time averaging, Tell said, is a product of power density measured in mW/cm², with exposure based on a 6-minute standard.

In six minutes' time, Tell said, workers may be exposed to a maximum power density of 1 mW/cm², but this scale will slide depending on duration of exposure. At 3 minutes, for example, the power density limit is 2 mW/cm², and a limit of 6 mW/cm² is set for exposure of a single minute's duration.

Tell commented that, in his measurements, higher power densities were read at corners of buildings in proximity to antennas, as well as at the tops of fences surrounding towers. Tell recounted an example of a building near a broadcast tower in Hawaii which was acting as a "parasitic radiator" for the tower.

In discussing compliance with FCC RF guidelines, Jules Cohen, a consulting engineer and president of Jules Cohen and Associates, stressed that the FCC's OST Bulletin 65 could be used to determine compliance "without the need for special education."

Cohen noted that exposures likely to approach the FCC's guidelines would, for certain AM stations, be in evidence in the near field, rather than in the far field.

Cohen said that tables provided in OST Bulletin 65 would enable both AM and FM stations to determine the distance in meters at which stations fields would fall below various electric field strengths.

He also called attention to charts in the bulletin which provided the numerical electromagnetic code for 1 kW, quarter- and half-wavelength towers. Cohen added, however, that a power correction formula should be employed for certain AM curves, in which field strength is equal to the reading from the curve multiplied by the square root of the power, measured in kilowatts.

Cohen also warned that, in the case of FM towers, antenna height alone does not guarantee compliance with FCC guidelines. Actual power density in the near field still may exceed the standards set in the guidelines, Cohen added.

In the case of multiple-use sites, Cohen maintained that total power density is important, saying that according to the FCC, all licensees have a joint responsibility to comply with the radiation guideline.

In some instances, the last broadcaster on the tower may have to back off from a multiple-use tower, if its compliance is in question.

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Wide Range of Wares Shown

(continued from page 11)
provide SCR power control, automatic RF power output control, automatic SWR circuit protection, SWR output power foldback, remote control interface, AC power failure recycle, two/four shot automatic overload recycle and internal diagnostics.

The 4.3 kW transmitter is all solid state, including a 100 W intermediate power amplifier, except for a single tube in the final amplifier. The 35 kW transmitter is solid state except for three tubes: a pair of 4CX250B drivers, and one YC130/9019 tetrode power amplifier operating at Class C.

Digital time/weather system

Audichron introduced Chrono, its digital telephone time and temperature announcement system. The system works over public or private telephone networks, and features membrane-switch entry keys with audible tones to ensure complete and easy information entry and retrieval. An LCD provides all system information and continous display of current time and temperature.

Other companies exhibiting their products included ATI, IGM, Johnson Electronics, Dielectric, Broadcast Automation, Capitol Magnetic Products, Vector Technology, Broadcast Audio, Cablewave, Delta, NEC, Comark, LeBlanc & Dick, Tennaplex Systems, Harris, Broadcast Supply West, Philips, SWR, CSI, Shively, Harrison, Holaday, and many more.

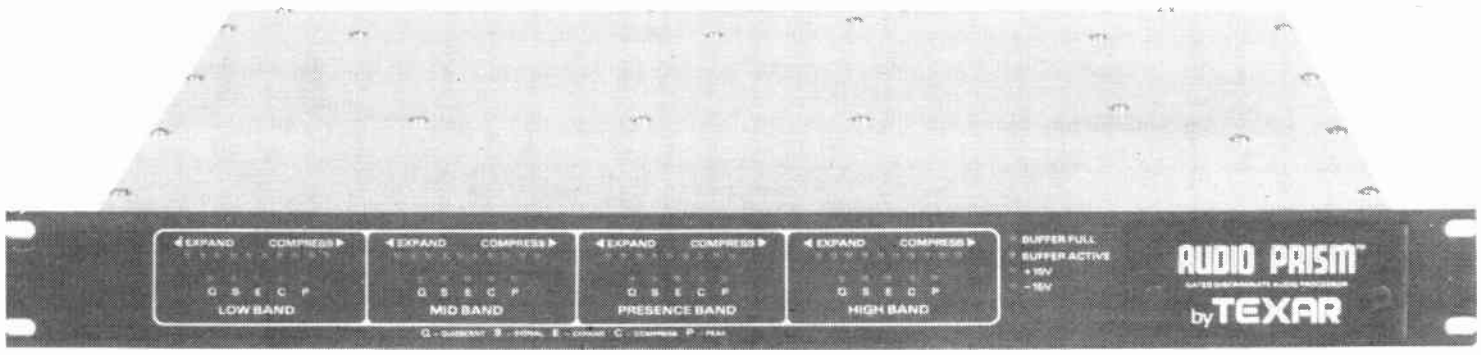
Some products were displayed at several hospitality suites rather than on the exhibit floor. Shown at the suite of Allied Broadcast Equipment were the Telnox L-O, an on-air computerized telephone system for broadcasters; the SMC Audiometrics CD Jukebox automation system; Gentner remote control equipment, and a prototype of the Otari CTM-10 broadcast cartridge recorder/reproducer.

The Radio '86 Computer Fair, held 13 September, provided attendees a chance to visit the displays and see demonstrations of the latest computer software products on the broadcast market.

Traffic/billing and newsroom computer systems were shown, along with programming data information systems. Exhibitors included Strata Marketing, Systemation, Sunspot Broadcast, Tapscan, Industry Programs, Sperry, Rockcom, Inc., Jefferson-Pilot, Media Computing, Register Data Systems, Decision Data Systems, Dataworld, Datacount, Data Communication Corporation and CBSI.

In all, more than 100 companies exhibited at Radio '86.

Four! ~~THREE~~ ARBITRONS IN A ROW.*
THE #1 MARKET...
THE TOP THREE STATIONS.



Climbing to number one is tough. Staying there is tougher. Any defending Super Bowl team can tell you that. Suddenly, you're the team to beat. Other teams are studying your game films more than any one else's. They watch all your moves, they learn all your tricks. When the game comes, you better have new moves, because they know all your old ones. Very few Super Bowl winners have returned to win again the next year.

The same goes for being number one in the Arbitron. You are the guy to beat. You are the one with a bullseye drawn on your back. The competition monitors your playlist, mimics your promotions, and steals you best ideas. Suddenly it's no longer a game of one-on-one. It's five-on-one! It's everybody else out there versus you. Returning as number one the next Arbitron is harder than getting there in the first place.

It is with considerable pride then that TEXAR was the audio processor of choice for the #1, #2, and #3 rated stations in the Super Bowl of radio, New York City...for four Arbitrons in a row!

What's the secret? DIGITAL CONTROL. Just as digital Compact Discs are replacing vinyl LPs as the medium of choice, the future of program audio processing also belongs to the digital world. The digitally-controlled TEXAR AUDIO PRISM™ is the beginning of the future. The AUDIO PRISM delivers the modulation power for monstrous cumes, but with a clarity that keeps listeners quarter-hour after quarter-hour. An audio processor that makes you jump out of the dial at the expense of cutting your quarter-hours in half is NO bargain.

Step into the future. Put the power and clarity of digital control to work for *you*. Call Barry Honel at (412) 85-MICRO to arrange for a ten-day demo in your station. Considering a demo of another make of audio processor? Let us know! We'll make sure our delivery date coincides with theirs so you can hear the difference yourself!

TEXAR

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616 Beatty Road
Monroeville, PA 15146-1502
(412) 856-4276
(412) 85-MICRO

*Summer & Fall '85 and Winter & Spring '86 ARBITRON Ratings. Total Persons 12+ Share. Mon-Sun, 6A-12M. (Used with permission.)

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Modular Vector Panel Aids WZZD

by Melvyn Lieberman

Philadelphia PA ... WZZD in Philadelphia, PA operates on 990 kHz with a power of 50 kW days and 10 kW nights with separate day-night patterns. In early Spring of 1986, Stuart Engleke, director of engineering for Communicom Corporation of America, licensee of WZZD, decided that the age and condition of the existing WZZD phaser and antenna tuning units warranted their replacement. The equipment was originally installed in the 1950s, and was modified on a number of occasions along the way.

The recent changes in protection requirements to Canada also warranted looking into. Ted Schober, Communicom's consulting engineer, took all this into consideration when he redesigned the array and phaser. The result allowed WZZD to drop one tower to 4.

Operational constraints dictated that, not only would the phaser have to switch day and night patterns, but would also have to be able to switch between towers 3 and 4, which would be their nondirectional tower, when necessary, for RF radiation regulations.

Building constraints required that the phaser go into an existing phaser room under the WZZD building. To make matters worse, there appeared no way to bring an anticipated 12' long phaser cabinet into the building.

Melvyn Lieberman is secretary/treasurer of Vector Technology, Inc. He can be reached at 215-348-4100.

Modular panel design

Enter Vector Technology. Upon presenting the problems to Vector, Kurt Gorman, Vector's CE, devised a plan to construct the phaser on a single panel, placing the day networks on one side and the night networks on the other.

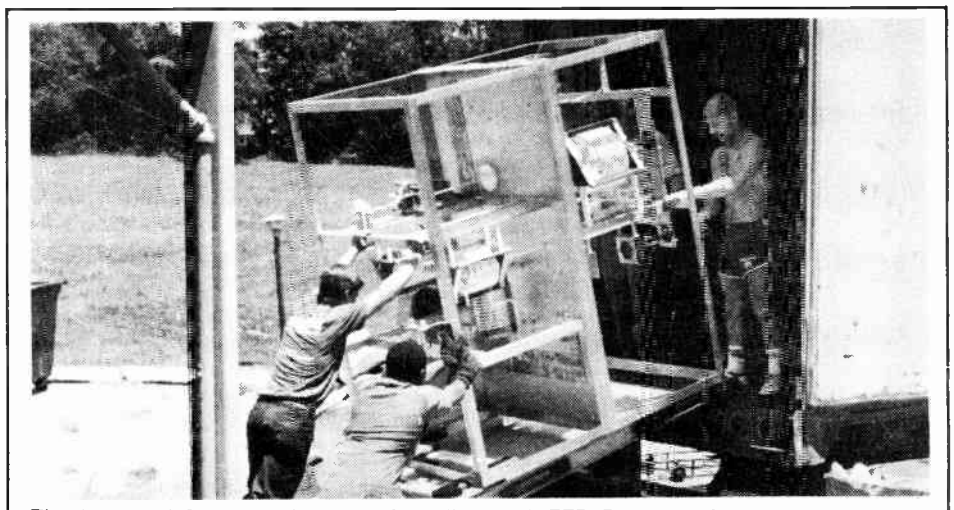
The entire panel, which could be 6½' high by 11' long, would be cut into three equal sections and supported by a frame on both sides of the panel. The frame would also serve to support the various shelves that were necessary in order to mount the myriad of electro-mechanical switching contactors, coils and capacitors that would be required.

The result was a three-part frame assembly that, when bolted together, would form a complete phaser, yet could be separated for easy entrance into the WZZD phaser room.

The ground strap for this assembly was mounted over the top of the panel on a flat plate. Eash assembly had its own ground strap which terminated directly to the main ground strap, much like the branches of a tree.

Night CP net/OIB link

Another problem Vector faced was how to be able to tune the night array common point when the operating impedance bridge was to be located on the day side of the phaser.



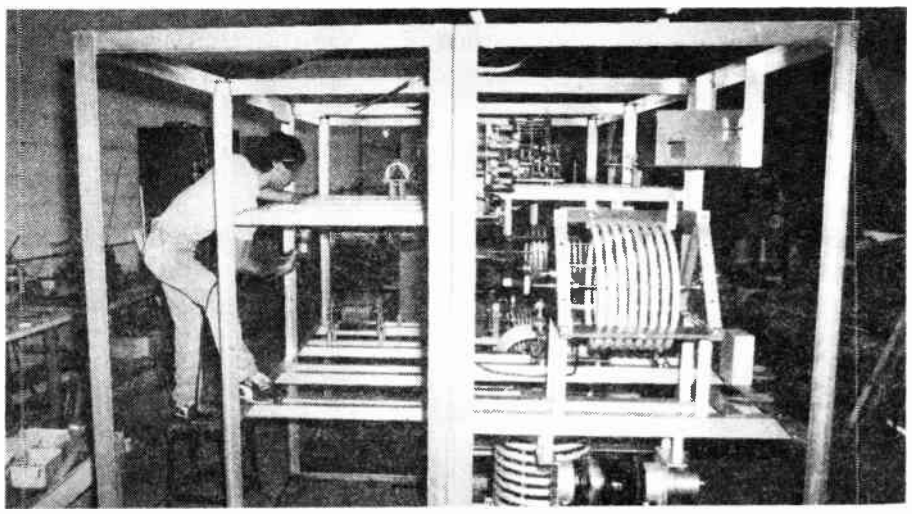
The three modules were taken apart for delivery to WZZD. This is the first of three separated modules rolling off the moving van at the WZZD transmitter site. The modules were later bolted together to form one complete unit.

Vector solved that problem by fitting a set of long shaft-controls from the day side of the phaser to the back of the input and shunt coil of the night time common point network. The shafts are carefully located to fit in an area where they would not interfere with the daytime array.

Thus, instead of tuning the night common point from the front, as one would normally do, the night common point coils are tuned from the rear.

After the three modules were positioned in place, they were rebolted together. Then the seven pieces of silver-plated tubing removed for shipping were replaced, and two copper jumpers were soldered to the main ground strap trunk at each joint to form an electrically complete ground system.

While this form of phaser cabinet construction does cost more, it offers an alternate method of installation when existing building configurations prohibit direct or easy entry, and building alteration is too costly.



This end view of the WZZD phasor shows the single panel construction for supporting the day phasor on one side and the night phasor on the other. Here, Vector assembly technician Richard Brown works on the night side while the day side appears complete.

NRSC Approves Draft Standard

(continued from page 1)

kHz," the proposal stated.

The draft interim proposal has no finalized specification for 10 kHz audio system performance prior to modulation and transmission.

In general, however, it recommends that each AM broadcast station should use an audio bandwidth "no greater than 10 kHz to modulate the station's transmitter."

The proposal also maintains that audio frequencies above 10 kHz should be "attenuated to the maximum extent feasible and consistent with ... the capabilities of the station's audio processing equipment and the characteristics of the station's transmitter and antenna."

It further suggests that "appropriate audio low-pass filters prior to modulation can be used to implement this recommendation."

During the NRSC meeting, the committee discussed the relative merits of so-called "brick wall" versus "gentle rolloff" filters, with an aim toward producing the maximum rejection possible after 10 kHz.

Although no 10 kHz filter was specified during the meeting, the committee entertained several suggestions, including one proposed by Bob Orban for an interim two-filter system incorporating a pre-processor filter and a "gaussian" or similar after-processor.

Orban said a prototype 10 kHz filter may be available by January 1987.

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

Daytimers Use Power

(continued from page 8)

that the NBMC's plan would provide "no special consideration to daytime-only licensees."

At press time, oral arguments were scheduled in the case in late September in New York City.

Related case

In a related, but separate case, the US Court of Appeals in early June overturned the FCC's May 1985 order (Mass Media Docket 84-281), which set an applications policy for AM clear channel operations.

The court responded to a complaint filed by the NBMC that the Commission failed to give proper notice that it had decided not to include a minority preference policy in its final report and order.

However, the FCC argued that since it saw little or no opportunity for new clear channel stations, minority or otherwise, it decided not to adopt any "non-technical" criteria in the order. FCC General Counsel David Silberman said the Commission did not drop the minority provision per se.

For more information on either case, contact the NAB's legal affairs office at 202-429-5430, or the NMBC at 202-387-8155.

Troubleshoot Xmtr Inefficiency

by Thomas L. Vernon

Harrisburg PA ... It's been a long, hot summer, and many of my recent calls and letters have been from engineers troubled by overheated and/or arcing AM transmitters, and/or transmitters getting exceptionally short tube life from expensive power tubes.

Often there's a common denominator to these problems, and that's a transmitter not operating with efficiency. Efficiency is important for good fidelity, power consumption and long tube life.

Station Sketches

During this month's get-together we'll discuss transmitter efficiency, what it is, how to calculate it, and how to troubleshoot an inefficient transmitter.

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

Table 1.

Power (Watts)	Efficiency (Percent)
250	65-75
500	65-75
1000	68-77
5000	72-82
10000	72-82

Typical efficiency ranges for high level plate modulated transmitters. Variations may be due to design differences, slight meter error, and overall final tuning accuracy.

Efficiency is expressed as a percentage, and in this case represents the ratio of RF power to to DC power input of the PA amplifier. Don't confuse this with "overall efficiency," which is the ratio of RF power out to AC power in.

To determine PA efficiency, first multiply plate voltage by plate current. Let's assume we're checking a 1 kW transmitter with a plate voltage of 3,000 V and plate current of 470 mA:

$$3{,}000 \times 470 = 1{,}410.000$$

Therefore, the input to the power amplifier is 1,410 W. Assume we've determined that the operating power is exactly 1,000 W. To get a figure for efficiency, we divide power out by power in:

$$1{,}000 \div 1{,}410 = 70.9\%$$

The other 410 W are used up as heat.

OK, so you've figured out the efficiency. What's normal for your transmitter? Start by checking in the instruction manual and the final test sheet for your rig. Failing this, call the factory.

Table 1 presents typical ranges for every power level. Please note that these values are for conventional, high-level, plate-modulated transmitters only. Ampliphase, PDM, or screen-grid modulated transmitters, or those employing harmonic resonator circuits will have PA efficiency factors noticeably different from these figures.

If you came up with an overly high efficiency factor, say over 85%, this usually does not mean that you have defied the laws of physics. High figures usually result from metering errors, or from erroneous antenna resistance measurements from which power output was computed.

Figure 1. Increasing grid drive can improve efficiency and distortion figures. Overdriving however, does not yield improvements. Source: 1949 Radio Amateur's Handbook

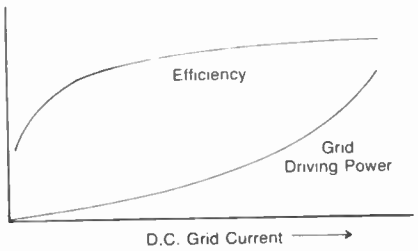
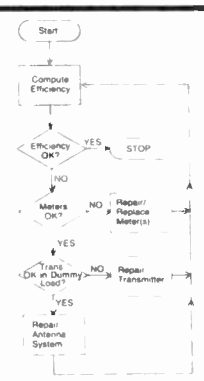


Figure 2. Troubleshooting efficiency problems requires a methodical approach. This flow chart illustrates one plan of attack.



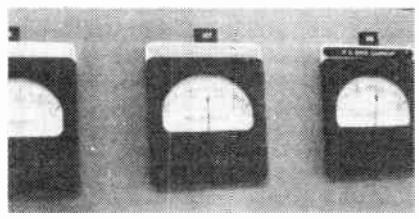


Photo 1. Transmitter meters are occasionally prone to failure, and should be checked before any conclusions are drawn about efficiency.

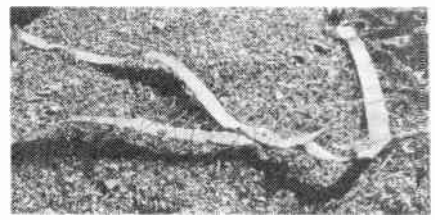


Photo 2. A poor ground system such as this one can cause unstable antenna resistance readings, making accurate power calculations difficult at best.

Problems with low efficiency usually fall into three general categories: errors in metering, problems in the transmitter, or problems in the transmission line/antenna system. Here I'll outline a methodical approach to isolate the problem to one area.

Like all electromechanical devices, meters are prone to problems now and then. If the plate voltage, plate current and/or line current meters were inaccurate, it would cause false high- or low-efficiency numbers.

The plate voltage meter is easily checked with a HV probe and DVM. A

(continued on page 18)

Troubleshooting Transmitter

(continued from page 17)

good point to do this is at the dropping resistor(s) for plate voltage metering. Plate current meters can be checked by substituting a DVM for the meter in question. Another method is by measuring the voltage drop in the plate current metering resistor and using Ohm's law.

Line current meters can be checked by inserting a known good meter in series with the one being checked. If your antenna tuning unit is in the same building with the transmitter, the meter jack on the input is a convenient place to do this.

It goes without saying that proper precautions should be observed when working around high voltage. All high voltage points should be tapped down with a shorting stick before working inside the transmitter.

If your meters have all proven themselves, your efficiency problem is genuine, and lies in either the transmitter or antenna system. Again, a methodical plan of attack is necessary to isolate the problem.

At this point, a good dummy load becomes an essential piece of test equipment. This rules out strings of 100 light bulbs mounted on a sheet of plywood. These may be OK for making PSA power, but their reactive component makes them invalid for testing. A proper dummy load will show 50 ohms pure resistance at your operating frequency.

Now, check the transmitter into the dummy load. The meter readings should be identical to those you got on the antenna. A shift in plate current, improved efficiency, or the need to retune for resonance all mean that something's wrong with the antenna system. On the other hand, if you get the same bad efficiency with the dummy load that you did with the antenna, the problem lies in the transmitter.

Most transmitter efficiency problems boil down to insufficient drive, mistuning, and components changing value.

Sufficient grid drive to the PA is necessary both for good efficiency and low distortion. If PA grid current is low, it may be time to change the driver. If a new driver tube yields poor results, there could be problems with the driver coupling network. Some engineers think that if adequate drive gives good results, excessive drive will give even better results. Not true. Overdriving the PA stage shortens driver tube life, generates more heat, and will impair positive peak capability of the transmitter. See Figure 1.

A quick way to check for bad or mistuned components in the transmitter is by running at full power with 100% modulation for about 15-20 minutes. Then shut down, and discharge all HV points with a grounding stick. Feel all of the components in the output network. Look for hot spots as well as loose connections. If you find either, you've probably found the trouble.

Occasionally, neutralization controls can go out of adjustment. Again, this will manifest itself by poor efficiency and frequently will be accompanied by arcing. Follow the procedure in the transmitter's instruction manual and recheck the neutralization adjustments.

If the meters and transmitter are operating properly, the problem has to be somewhere in the antenna system or transmission line.

A ground system in poor condition will be unstable and yield erratic antenna resistance measurements. This makes calculating power output (and thus efficiency) difficult at best. A classic symptom here is a signal that gets out well when it rains, but which gradually fades as the ground dries out.

An antenna coupler not tuned to the transmitter or not tuned to the antenna will waste power. Again, feeling around for overheated components after shutdown will help locate the trouble.

If the antenna coupler is located some distance from the transmitter, you may well wonder if the transmission line is OK, especially if it is underground. Take the dummy load and insert it in place of the coupler. Recheck efficiency. Good efficiency means you should look at the transmission line more closely.

Efficiency is a good indication of overall transmitter health. With patience and a logical approach, most problems will surrender to your scrutiny. Figure 2 flowcharts one methodical way to attack efficiency problems.

RFR Standard Explored

(continued from page 12)

"The burden falls on the newcomer," Cohen said, "to prove he wasn't causing problems with compliance."

In addition to providing information of FCC regulations, some spoke about guarding against claims of radiation hazards, and working with zoning commissions.

Tom Fitch, VP of Engineering for Broadcast Services, Inc., an antenna site management company, stressed that radiation hazard management for a new antenna site is dependent on "fundamental site design and good engineering."

Fitch maintained that "a detailed record and accurate knowledge of the radiation field that surrounds a station's antenna array is the best insurance a station can have to cope with radiation hazard injury claims."

Ruth Rosenberg, of the law firm Nixon, Hargrave, Devans & Doyle, pointed out the problems typically encountered by stations establishing an antenna site.

Federal regulations do not preempt local land use ordinances or environmental laws, Rosenberg said. Stations may have to prepare for possible encounters with zoning boards and planning boards.

Rosenberg suggested that careful preparations be made regarding a site plan, real estate appraisals, radiation calculations, and professional medical appraisals on effects of emissions on humans, birds and fauna.

"The battle is won by the best-prepared army, and may require several dry runs," Rosenberg said about interaction with local commissions.

For additional information on RF radiation guideline compliance, contact Ralph Justus of the NAB, 202-429-5341.

First Month on New Job Critical

by John "Q" Shepler

Rockford IL . . . Just before you reach the top of the hill, you catch sight of the tower about a mile away. That tingling in your stomach starts up again. Will they like you? Will you be able to solve all the problems that have been piling up in the last few months? Will you even like living in this area?

Q-Tips

It's too late to worry about those things now. In a few seconds, you'll pull into the parking lot and head nervously toward the front door. The new job will begin.

You're smiling. You remember this scene well. Chances are pretty good that you'll make a few more moves in your career. Certainly, you'll want to get the most out of those moves that you possibly can. You will, too, if you just remember to do a few critical things right at first.

Every job should be a step up in one way or another. It's money, glory or freedom. You are starting your first job as chief engineer. You are getting a big break in Chicago or New York. You are retiring to a small town in Michigan where the fishing is great!

Whatever the reason, you accepted the job because you expected life to be better. Now, it's your job to make sure that happens.

First impressions

Before you get out of the car, take a quick look in the mirror. Hair combed? Shirt buttoned? Appearance is critical.

No, you don't need to be wearing the suit you put on for the interview—not unless you just made group chief and will be wearing suits every day. But, if all you own are denim shirts and jeans, at least wear your best denim shirt and jeans today.

Save the ones with oil stains for transmitter clean-out night. Appearance is critical because, as soon as you step through that station door, everybody inside will be taking mental snapshots that they will keep for a long time.

"First impressions last forever." You've probably heard that expression before. Do you believe it? You'd better. The instant you touch station property, your management and peers will start sizing you up. It doesn't matter that you haven't had a chance to really do anything yet.

People need to have some opinion of you and they will form one based on even the flimsiest reasons. That's why you must make darn sure that you show your best side first.

Hopefully, the station manager has thumb-tacked a memo to the bulletin board announcing your impending arrival and what a smart decision he made in hiring you. Make him proud.

Start right at the front desk with a pleasant smile for the secretary and a polite self-introduction. Then ask to see the manager and wait patiently until he gets out of that big sales meeting.

The key is to keep smiling and go out of your way to be friendly and accommodating.

Once you've pressed-the-flesh with Mr. Manager, resist that compulsive urge

(continued on page 20)

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

First Month on New Job Critical

(continued from page 19)
to make a bee-line for the shop in order to claim your kingdom. The shop is not going anywhere, but those other inquisitive faces are still forming their first and lasting impressions.

The first priority is to meet everybody. Make an effort to remember their names. At least focus on each first name and use it a couple of times, if possible.

Also be sure to associate faces and functions. The program director, sales manager, news director, and accountant are very important people in your life. Know who is whom.

By the end of the first day, you should have had a chance to chat a bit with just about everybody—that's if everything is working OK. On many jobs, I've never had that luxury.

Complaints begin

After a quick round of handshakes, the complaints start pouring in. Few are immediate crises, but the people complaining think they are.

Be nice to them and make a note of their problem. Their biggest fear is that they're going to get ignored for another year. In fact, take every problem seriously. Those loose knobs on the control board are a matter of life and death to somebody.

After eight hours of assault, you probably feel beat into the ground. Who were all those people? What was that guy's name? Hope he wasn't the owner. Which board had the bent meter? Who knows?

If you can possibly muster the strength, it would be good to solve a few minor problems right away. Things like cleaning pots, replacing indicator lights, a new cord for a reporter's crackling microphone.

Yeah, those things could wait 'til next week. But, if you do them today, you'll immediately establish a reputation as a go-getter.

The others will stop worrying about their problems because they see you in action and know their turn will come soon. Just get a couple minor victories before you head off for supper.

The honeymoon

One reason that being new is so difficult is that you have a lot of personal details to attend to in addition to the job. Getting an apartment, buying a house, moving the family, and even establishing a new checking account take lots of time. Everybody expects this and is willing to give you some slack for a while.

This is called the "honeymoon" period and may last for a couple of days up to a couple of weeks. People aren't too demanding during the honeymoon. You won't be asked to start building a new studio or even to keep regular hours. Only real emergencies, like a transmitter off the air, will demand instant action.

Don't make the mistake of confusing the honeymoon atmosphere with the real demands of the job.

If you start believing that you've found the easiest job in the world and begin taking advantage of the situation, the atmosphere will get nasty in a matter of only a few weeks.

In fact, the best way to handle the honeymoon period is to get your personal affairs in order as quickly as possible and give the job 120% of what you normally would.

Why work that hard if nobody cares? Ah, but they do care. They're just afraid of overloading you too soon. If you take the initiative by staying late or spending patient hours listening to the morning jock's tantrums, you'll have gotten the jump on them.

You'll also have the advantage of surprise. Later, while they're trying to figure out how they got so lucky, you'll be able to take a breather in the shop or maybe hang out at the parts distributor.

Where to be in a month

The first month is when those first impressions begin to turn to stone.

The first month will make or break your career at this station. If you do well, people will smile and the hassles will diminish.

If you botch it, the people who decide they don't like you will start getting revenge by making major crises of every trivial problem. You won't get another chance to reverse the situation until the personnel turns over or memories start to fade after a year or so.

At the end of the first month, you must be in control of the situation. You won't have solved all of the problems. You probably won't even have made a major dent in the big ones.

But, people must perceive that the situation has stabilized and is actually getting better. They want to believe that no matter what disaster befalls them, you will able to quickly step in and get things under control.

How do you accomplish this? There are three key tactics: visibility, organization and prioritizing.

You must be visible. The jocks want to see you in the studio. The newscasters want to see you in the newsroom. Everybody expects to see you in the transmitter room. Nobody wants to page you 20 times with no response.

There's a way to give the appearance of working 20 hours a day without killing yourself; when you're out shopping in the evening or just riding around, stop in the station for a few minutes.

If somebody's headphones are broken, fix them. It only takes 15 minutes or so and makes them feel that you are always there.

Organizing

Organization means smoothing the waters, making things flow, creating order out of chaos. To be organized you need systems, schemes, plans, instructions. Organization requires lots of quiet thinking.

The best times to organize are before or after the 9-to-5 madness. During the day, somebody will be pulling your chain every 10 minutes. You need to be responsive.

However, it's hard to even get your instruction manuals filed when your biggest block of uninterrupted time is 20 minutes. That's why it may be better to skew your hours so that you get some time before or after the normal workday.

Prioritizing means first things first. When you make a priority list of projects, you are simply acknowledging the common-sense notion that only one thing gets done at a time.

Obviously, with 10 problems and 1 you, 9 things have to wait. This can be tough to administer because everybody thinks their problem should be #1.

But rank has its privileges, so anything the owner or manager wants done is really #1. The program director can decide what's #2. If the FCC shows up, that's immediately #1.

If you really get into a squeeze between two stubborn people of equal rank who demand instant results, it's time to bring out the mirrors and magic.

Remember those three mirrors in the clothing store that give you three views of a jacket? That's how you multiply yourself. You can get a similar effect by slicing up your time on several projects at once.

In other words, work an hour on job #1, an hour on job #2, an hour on job #3, and then back to job #1. If you're a good dancer, they won't suspect that you aren't fulltime on all three projects.

At the end of 30 days, you should begin to become ignored. That's a good sign. It means the big problems are under control and the little ones don't seem all that bad anymore.

In the beginning, you'll never get from the front door to the shop without being jumped by a half-dozen desperate individuals.

At the end of a month, you should be able to make it all the way through the station with only one whiner dragging from your belt.

For a new chief engineer, that spells *S-U-C-C-E-S-S.*

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★ **Full Automatic Transmission System (ATS) Capability.** All 32 command outputs can be set to automatically be activated from any of three sources. The four tolerance levels on each metering channel can be set to cause an automatic output, such as power control. Changes in status channels can cause a command to be activated. Twenty time of day functions are also possible. In total there are **(116) Automatic Command possibilities!**

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Broadcast Computing

Design T, PI ATUs

by Clive Warner

Solihull, West Midlands, England ... Antenna tuning units (ATU) are almost invariably necessary when matching AM transmitters to their antennas. There are exceptions, however; types of antenna exist which may be adjusted so that their impedance matches the feeder line without an additional network (e.g., the shunt-fed "umbrella" antenna).

However, ATUs are most commonly encountered, and may represent a significant financial part of a complete system, especially at higher powers.

When the impedance of the antenna is quite different from that of the feeder, it is quite common to use a simple L-type network, which will perform adequately in many cases.

However, if the impedances are similar, or it is desirable to provide a large range of adjustment, then it is necessary to employ a more complex network, and the PI or T networks may then be used.

The PI and T networks also have another advantage, in that they provide added filtering, and therefore a useful degree of harmonic reduction. Careful design is necessary, however, in order to minimize losses while remaining cost-effective.

In order to achieve these aims and simplify design, I wrote the program "ATU" (see Figure 1), which allows fast, cost-effective design of both T and PI antenna tuning units.

The program is, in fact, a subprogram of a module entitled "AM EXPERT," which is an expert system for the lowest-cost design of LF and MF broadcast facilities, expected to be released in December 1986. However, the "ATU" program is complete in itself, and I hope that it may assist broadcast engineers in their work.

The program is written for users of the IBM PC (or compatibles), in BASICA. Since this dialect of BASIC is fairly portable, it will no doubt translate fairly easily for users of other machines.

Clive Warner is a broadcast engineer and consultant with Typing and Translation Services (T&TS), 75 Willow Rd., Solihull, W. Midlands, B91 1UF, England. He can be reached by calling 021-704-1399. "Time-poor" readers can obtain a disk copy of the program by sending $15 (US) to the above address.

T versus PI networks

The T and PI networks can each be broken down into two, simple L-type sections (see Figure 1). In each case, one of the components represents a critical choice, as far as the designer is concerned.

For the T network, the critical component is the center capacitor, in that the operating voltage of this component effectively determines the design and performance. For the PI network, the inductor is the crucial item, and its operating current must be carefully considered.

Let us first consider the T network.

As shown, the network transforms the impedance of the antenna to a higher value than either the antenna or feeder (source) impedance, and then back down to the wanted value. This intermediate value is known as the "mid-shunt" impedance.

Since suitable capacitors come in a restricted range of voltage ratings, the designer must choose one which has a sufficiently high rating while simultaneously not choosing too high a working voltage. This is not only for reasons of expense, but also because too high a value of mid-shunt impedance will result in high values of Q for the half-sections, and in turn restrict the effective bandwidth of the antenna system, as seen by the transmitter.

The program allows the designer to start with a low value which, if insufficient, can be altered until a suitable value is found.

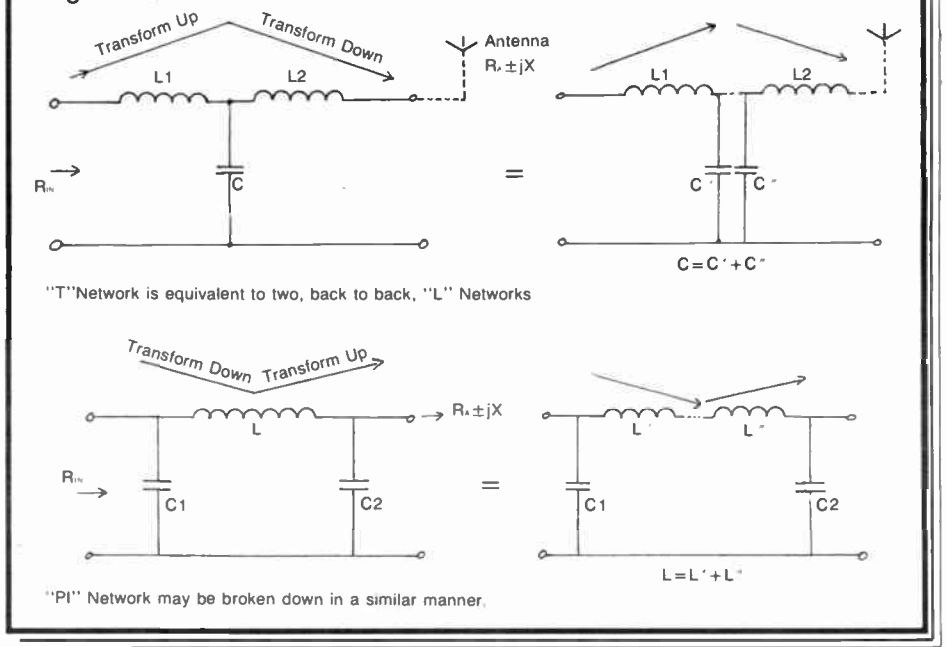
Mid-series impedance

For the PI network, much the same applies; here, the antenna impedance is transformed downward, to a value which is lower than either the antenna or source impedance. This intermediate value is known as the "mid-series" impedance, and similar constraints apply, except that here, the current-carrying capacity of the inductor is the key value.

Again, the program will allow the designer to start with low values, increasing as necessary until a suitable value is found.

How do you decide whether to use a PI or a T network? This is not an easy choice, and generally depends on the types of components most easily available to the designer.

Figure 1.



However, providing that low-loss capacitors are chosen, it is generally true to say that the PI network usually introduces less loss than does the T network, since inductors are usually more lossy than good capacitors. If you make your own coils, however, the T will often be cheaper!

It is interesting to run the same requirement through the program for both types, and examine the values of Q for the networks, since these have an important influence on bandwidth.

Program flow

The program first requests the user to enter the primary information, which includes:

- Transmitter Carrier Power
- Whether modulation to 100% is to be allowed for
- Transmitter carrier frequency
- Highest modulating frequency
- Antenna impedance, as R ± jX
- Source resistance

The modulation bandwidth and transformation ratio are then calculated and printed.

Then, the user is asked to select either a PI or T network.

In the case of a PI network, the program continues by requesting a preliminary value of coil working current. A calculation follows, to determine if the value given is too low, in which case the user is prompted for higher values, until the program is satisfied that a network can be created. Following this, the program proceeds to:

- Convert the antenna impedance to its parallel equivalent;
- Calculate the first-half network "Q";
- Calculate the first-half component values;
- Calculate the second-half network "Q";
- Calculate the second-half component values;
- Compensate for the antenna's parallel reactance;
- Add the two coil "half values" to get the total; and
- Convert the components into "real" values of L and C.

The network values are then printed, together with their calculated working voltages (capacitors) and current (the coil).

Note that these are theoretical; it would be prudent, to say the least, to add a suitable safety margin, especially considering overmodulation, lightning strokes, etc.!

The sequence then terminates, and returns to the menu options. Since this is but a small module, these are simply:

- RUN the program again.
- EXIT from BASIC to the PC or MS-DOS.

If the user chose a T network option, then the program will branch to the subroutine commencing at line 1820. The user is first requested to supply an arbitrary working voltage for the capacitor (usually as low as you think you might get away with), and a calculation routine then checks whether the value is workable, as in the case with the coil in the PI network.

Once a suitable value is chosen, the program then continues to:

- Calculate the first-half "Q";
- Calculate the first-half component values;
- Calculate the second-half "Q";
- Calculate the second-half component values, automatically compensating for the antenna reactance.

(continued on next page)

Broadcast Computing

T, PI Nets Efficient

(continued from previous page)

• Convert the values into "real" L and C values, adding the two "halves" of the network together.

Provision is made for the detection of an insufficient working voltage selection for the second half as well as for the first, and also to detect the case where a "negative" inductance value could occur (e.g., due to a truly outrageous antenna impedance).

As before, all component values and working currents or voltages are then printed before returning to the menu.

```
1000 CLS:PRINT SPC(23) "ANTENNA TUNING UNIT DESIGN"
1010 PRINT SPC(23) "--------------------------":PRINT
1020 PRINT SPC(23) "Copyright  C. Warner  1986":PRINT :PRINT
1030 PRINT "If you want to print your results, then first make sure your printer
 is ready,  and then press `P' ":PRINT:PF=0:REM Print flag set 0 = off.
1040 Q$=INKEY$:IF Q$="" THEN 1040
1050 IF Q$<>"P" AND Q$<>"p" THEN 1120
1060 PF=1
1070 ON ERROR GOTO 1110
1080 LPRINT SPC(23) "ANTENNA TUNING UNIT DESIGN"
1090 LPRINT SPC(23) "--------------------------":LPRINT:LPRINT
1100 GOTO 1120
1110 IF ERR=27 THEN PRINT "PLEASE CHECK YOUR PRINTER - IT DOES NOT SEEM TO BE RE
ADY!":RESUME
1120 GOSUB 2150:REM Get Tx. carrier power (PT)
1130 CLS
1140 GOSUB 2190:REM Get Modulation, y/n? (PIN)
1150 IF PF=1 THEN LPRINT "MODULATION TO 100% ALLOWED FOR":LPRINT
1160 CLS
1170 GOSUB 2240:REM Get carrier frequency (FC)
1180 GOSUB 2270:REM Get highest audio frequency (FMM)
1190 GOSUB 2330:REM Get antenna impedance, R+-jX
1200 IF PF=1 THEN LPRINT "ANTENNA IMPEDANCE SPECIFIED AS:    ";RA;
1210 IF PF=1 AND S=1 THEN LPRINT "+J";ABS(XA);" ohms."
1220 IF PF=1 AND S=-1 THEN LPRINT "-J";ABS(XA);" ohms."
1230 GOSUB 2420:REM Get source resistance (RS)
1240 IF PF=1 THEN LPRINT "SOURCE   RESISTANCE                =";RS;CHR$(23*):LPRIN
T
1250 TR=RA/RS:REM Calc. transform ratio (TR)
1260 IF PF=1 THEN LPRINT "TRANSFORMATION RATIO               = 1/";TR:LPRINT
1270 PRINT "TRANSFORMATION RATIO =       1:";TR
1280 IF PF=1 THEN LPRINT "TRANSMITTER  CARRIER  POWER        =";PT;"watts":LPRINT
1290 IF PF=1 THEN LPRINT "TRANSMITTER  CARRIER  FREQUENCY    =";FC;" MHz":LPRINT
1300 IF PF=1 THEN LPRINT "HIGHEST   AUDIO   FREQUENCY        =";FMM;" KHz":LPRINT
1310 INPUT "You can try either a  PI  or a T network. Enter `P' or `T'";Q$
1320 IF Q$<>"P" AND Q$<>"p" AND Q$<>"T" AND Q$<>"t" THEN 1310
1330 IF Q$="P" OR Q$="p" THEN PRINT CHR$(227);" NETWORK SELECTED.":PRINT:NFL=1:I
F PF=1 THEN LPRINT CHR$(227);" NETWORK SELECTED.":LPRINT:GOTO 1350
1340 PRINT "T NETWORK SELECTED.":PRINT:NFL=2:IF PF=1 THEN LPRINT "T NETWORK SELE
CTED.":LPRINT
1350 S=SGN(XA)
1360 IF Q$="P" OR Q$="p" THEN GOSUB 1380:GOTO 1370:ELSE GOSUB 1820
1370 GOTO 2510: REM ****************** MENU **********************
1380 GOSUB 2480:REM Get Coil working current, amps (IL)
1390 REM Mid-Series Current
1400 RMS=PIN/(IL*IL)
1410 IF RMS>RA THEN BEEP:PRINT "COIL WORKING CURRENT TOO LOW - SELECT A HIGHER V
ALUE, PLEASE!":GOTO 1380
1420 REM Series to Parallel Conversion
1430 Q=ABS(XA)/RA
1440 RAP=RA*(1+(Q*Q))
1450 IF ABS(XA)=0 THEN XAP=0:GOTO 1470
1460 XAP=XA*(1+(1/(Q*Q)))
1470 RMS=PIN/(IL*IL)
1480 REM First half of network.
1490 IF RS/RMS<=1 THEN BEEP:PRINT "SORRY, COIL CURRENT STILL TOO LOW TO ENABLE C
ORRECT OPERATION - INCREASE!":GOTO 1380
1500 Q=SQR((RS/RMS)-1)
1510 XL1=Q*RMS
1520 XC1=RS/Q
1530 PRINT "`Q' FOR FIRST HALF OF NETWORK=";INT(Q+.5)
1540 IF PF=1 THEN LPRINT "`Q' FOR FIRST HALF OF N/W          =";INT(Q+.5)
1550 REM Second half of network.
1560 Q=SQR((RAP/RMS)-1)
1570 XC2=RAP/Q
1580 XL2=RMS*Q
1590 PRINT "`Q' FOR 2nd. HALF OF NETWORK= ";INT(Q+.5)
1600 IF PF=1 THEN LPRINT "`Q' FOR SECOND HALF OF N/W         =";INT(Q+.5)
1610 REM Compensate for XAP
1620 XP=XC2
1630 XAP=ABS(XAP)
1640 IF XAP=0 THEN 1670
1650 IF SGN(XA)=-1 THEN XC2=(XP*XAP)/(XAP-XP) ELSE XC2=1/(1/XAP+1/XP)
1660 REM Above conversion.
1670 PRINT "CONVERTING COMPONENTS TO REAL VALUES:- ":PRINT
1680 REM Converting to real...
1690 LPI=XL2+XL1
1700 C1=1/(XC1*2*3.1417*FC):C1=C1*1000000!
1710 C2=1/(XC2*2*3.1417*FC):C2=INT(C2*1000000!)
1720 PRINT"-------------------------------------------------------------------------
---------"
1730 PRINT "C1 =    ";INT(C1);" pF,  at ";INT(SQR(PIN*RS));"volts + mod."
1740 PRINT "C2 =    ";INT(C2);" pF,  at ";INT(SQR(PIN*(SQR((RA*RA)+(XA*XA))))));"v
olts + mod."
1750 IF PF=1 THEN LPRINT
1760 IF PF=1 THEN LPRINT "C1 = ";INT(C1);" pF,  at ";INT(SQR(PIN*RS));"volts + m
od."
1770 IF PF=1 THEN LPRINT:LPRINT "C2 = ";INT(C2);"pF,  at ";INT(SQR(PIN*(SQR((RA*
RA)+(XA*XA))))));"volts + mod."
1780 LPI=LPI/(2*3.1417*FC):LPI=INT(LPI+.5)
1790 IF PF=1 THEN LPRINT "INDUCTANCE OF COIL = (nominal) ";LPI;" uH,  at ";IL;"a
mps.":LPRINT:LPRINT
1800 PRINT "L =  ";LPI;" uH":PRINT
1810 RETURN
1820 GOSUB 2450:REM Get working voltage for capacitor (VC)
1830 RMS=VC*VC/PIN
1840 IF RMS<RA THEN BEEP:PRINT "MID-SHUNT (CAPACITOR) WORKING VOLTAGE TOO LOW TO
 ACHIEVE A MATCH - TRY A HIGHER VOLTAGE RATING, PLEASE!":PRINT:GOTO 1820
1850 Q=SQR((RMS/RA)-1)
1860 PRINT "FIRST HALF: Q =  ";INT(Q+.5):IF PF=1 THEN LPRINT "FIRST HALF OF NETW
ORK:          Q =";INT(Q+.5):LPRINT
1870 XL2=(Q*RA)-XA
1880 XC2=RMS/Q
1890 REM 2nd. Half of network.
1900 IF RMS/RS<1.1 THEN BEEP:PRINT "MID-SHUNT (CAPACITOR) WORKING VOLTAGE TOO LO
W FOR SECOND HALF OF NETWORK.       I RECOMMEND YOU EITHER TRY A `PI' NETWORK, O
R INCREASE THE CAPACITOR WORKING    VOLTAGE...":PRINT
1910 IF RMS/RS<1.1 THEN PRINT "1) PI NETWORK? PRESS `P'":PRINT:PRINT "CONTINUE:
HIT <RETURN> " :ELSE GOTO 1950
1920 Q$=INKEY$:IF Q$="" THEN 1920
1930 IF Q$="P" OR Q$="p" THEN CLS:GOTO 1310
1940 GOTO 1820
1950 Q=SQR((RMS/RS)-1)
1960 PRINT:PRINT "SECOND HALF:Q =  ";INT(Q+.5):IF PF=1 THEN LPRINT "SECOND HALF
OF NETWORK:         Q =";INT(Q+.5):LPRINT
1970 XL1=Q*RS
1980 XC1=RMS/Q
1990 C1=1/(XC1*2*3.1417*FC):C1=C1*1000000!:REM Convert to real.
2000 C2=1/(XC2*2*3.1417*FC):C2=C2*1000000!:REM Convert to real.
2010 C=C1+C2:REM Total of two capacities = value of centre capacitor.
2020 PRINT :PRINT
2030 PRINT "VALUE OF CENTRE CAPACITOR   = ";INT(C+.5);" pF"
2040 IF PF=1 THEN LPRINT:LPRINT "VALUE  OF  CENTRE  CAPACITOR     =";INT(C+.5);"
 pF,  at ";VC;" volts + mod."
2050 L2=XL2/(2*3.1417*FC)
2060 PRINT "VALUE FOR COIL L2  =          ";INT(L2+.5);" uH"
2070 PRINT "L2 WORKING CURRENT =          ";INT(SQR(PIN/RA))
2080 IF PF=1 THEN LPRINT "VALUE  FOR  COIL  L2              =";INT(L2+.5);" uH, a
t ";INT(SQR(PIN/RA));"amps."
2090 L1=XL1/(2*3.1417*FC)
2100 PRINT "VALUE FOR COIL L1  =          ";INT(L1+.5);" uH"
2110 PRINT "L1 WORKING CURRENT =          ";INT(SQR(PIN/RS))
2120 IF SGN(L2)=-1 OR SGN(L1)=-1 THEN BEEP:PRINT "SORRY, BUT ONE OF THE COILS HA
S A NEGATIVE INDUCTANCE! YOU NEED TO TRY AGAIN..":WAIT:GOTO 1310
2130 IF PF=1 THEN LPRINT "VALUE  FOR  COIL  L1              =";INT(L1+.5);" uH, a
t ";INT(SQR(PIN/RS));"amps.":LPRINT
2140 RETURN
2150 INPUT "WHAT IS THE TRANSMITTER CARRIER POWER (Kw) ";PT:IF PT<.01 THEN 2150
2160 PRINT "TRANSMITTER CARRIER POWER  =  ";PT;" Kw"
2170 PT=PT*1000
2180 RETURN
2190 PRINT:PRINT "ALLOW FOR MODULATION (to 100%)      y/n    "
2200 PIN=PT
2210 Q$=INKEY$:IF Q$="" THEN 2210
2220 IF Q$="Y" OR Q$="y" THEN PIN=PT*1.5
2230 RETURN
2240 INPUT "WHAT IS THE CARRIER FREQUENCY, IN MHz      ";FC
2250 PRINT "CARRIER FREQUENCY:            ";FC;" MHz"
2260 RETURN
2270 INPUT "WHAT IS YOUR HIGHEST AUDIO (INPUT) FREQUENCY (KHz) ";FMM
2280 PRINT "MODULATION FREQUENCIES TO:    ";FMM;" KHz"
2290 F1=FC-FMM/1000:F2=FC+FMM/1000:BW=(.2*FMM)/FC
2300 PRINT "MODULATION BANDWIDTH:         ";BW;"% OF CARRIER."
2310 IF PF=1 THEN LPRINT "MODULATION   BANDWIDTH             =";INT(BW+.5);"% OF C
ARRIER."
2320 RETURN
2330 INPUT "WHAT IS THE VALUE OF THE RESISTIVE COMPONENT OF ANTENNA IMPEDANCE (O
HMS) ";RA
2340 PRINT "RESISTIVE ANTENNA COMPONENT:  ";RA;" ohms."
2350 INPUT "PLEASE ENTER THE ANTENNA REACTANCE, PLUS or MINUS `J' (e.g. 37, .. -
37, ..-54,  to give a few examples)  ";XA
2360 PRINT
2370 PRINT "ANTENNA IMPEDANCE:            ";RA;:IF SGN(XA)=-1 THEN PRINT " - j";
:S=-1
2380 IF SGN(XA)=1 THEN PRINT "+ J";:S=1
2390 PRINT ABS(XA)
2400 IF XA=0 THEN S=1
2410 RETURN
2420 INPUT "SOURCE RESISTANCE (ohms)  ";RS
2430 PRINT "SOURCE RESISTANCE:            ";RS;" ohms"
2440 RETURN
2450 INPUT "ENTER WORKING VOLTAGE FOR MID-SHUNT CAPACITOR: (volts)  ";VC
2460 PRINT "CAPACITOR WORKING VOLTAGE:    ";VC;" volts."
2470 RETURN
2480 INPUT "ENTER COIL WORKING CURRENT: (amps)  ";IL
2490 PRINT "COIL WORKING CURRENT:         ";IL;" amps"
2500 RETURN
2510 REM ********************** MENU ***********************************
2520 PRINT "PRESS A KEY TO CONTINUE"
2530 Q$=INKEY$:IF Q$="" THEN 2530
2540 CLS
2550 PRINT SPC(38) "MENU"
2560 PRINT SPC(38) "----"
2570 PRINT:PRINT:PRINT
2580 PRINT "1.    RUN THE PROGRAM AGAIN."
2590 PRINT
2600 PRINT "0.    QUIT BASIC AND RETURN TO DISK OPERATING SYSTEM."
2610 PRINT:PRINT:PRINT
2620 PRINT "PRESS EITHER 0 or 1, please."
2630 Q$=INKEY$:IF Q$="" THEN 2630
2640 IF Q$<>"1" AND Q$<>"0" THEN 2630
2650 CLS
2660 IF Q$="1" THEN RUN
2670 IF Q$="0" THEN SYSTEM:ELSE 2510
```

NAB's Radio '86 Show a Success

(continued from page 10)

dio than the disappearance of the carrier during overmodulation.

Splatter can be minimized by using low-pass filters on audio prior to modulation, using final protective clippers either in processors or at transmitter inputs, and by eliminating DC level shift in AM transmitters.

Klein found that modulation percentage observed in the field is often inaccurate, and differs from the percentage found at the transmitter. This is due to the effect of RF networks in both the antenna and the transmitter.

The committee recommends development of a high-quality synchronous detector AM demodulator for a more accurate measurement of modulation characteristics in the field.

A copy of the 50-page report is available free to NAB members. Those interested can call NAB Science and Technology for a copy at: 202-429-5346.

The presence of both Al Sikes, NTIA, and Jim McKinney, FCC, lent the AM Improvement Committee sessions an air of official sanction.

Sikes' comments in particular raised a lot of eyebrows and not a few broadcasters' hopes. Starting out by saying that, "in the long run, AM's problem is sound," and discussing the need to create a climate for "radio entrepreneurs and the capital market," Sikes indicated that the government, in the form of the NTIA (part of the Department of Commerce) would step into the AM stereo arena (see sidebar).

The NTIA's plans, said Sikes, include a study on the state of AM stereo, both domestically and internationally. From that report, the NTIA will tailor its efforts in coordination with the industry and the marketplace to create a better capital market for AM radio.

Sessions in general were much better attended than last year in Dallas, especially the more technical sessions.

Other technically oriented sessions offered over the course of the convention included New Studio Technology; Satellite Opportunities for Radio; More Stations, More Power, More Hours, which dealt with the effects of Docket 80-90 and the recent effect on daytimers of the final signing of the international agreement with Mexico; How to Use a Smith Chart; FM Antennas; FM Upgrades/FMX System; Audio Circuit Grounding; AM Stereo Broadcasting; Directional Antenna Maintenance; Preventing Lightning Interference; and Design for Tomorrow's Studio.

In addition, three Engineering Equipment Workshops were given adjacent to the exhibit hall entrance on 12 September. ITC presented mechanical setup and disassembly of one of its tape carts. Harrison Systems gave a demonstration of its on-air console, and Tennaplex gave a slide show on antennas.

An Engineers and Exhibitors reception on Friday night, 12 September, was also well attended, with many of the engineering session panelists and NRSC members present.

Exhibitors were largely pleased with Radio '86. Most reported that business was good, with many remarking on the quality of their contacts with attendees.

"We've had a few engineers come by, some station owners," reported Welton Jetton, president of Auditronics. "We've been well pleased with the quality of the leads we've attained at this show." Auditronics did not attend Radio '85.

"This has proven to be a worthwhile show for us," he said. "We will definitely be there (at Radio '87)."

Jetton's only complaint, echoed by other exhibitors, was that "there are too many fall shows. We're very busy with fall shows."

Shively's Charles Peabody reported that "The show was good. There were a lot of people who stopped by who were doing new things or considering changes at their stations. We also saw some older customers who were considering making some changes. I call that opportunity."

Chris Kidd, Kidd Communications, said the show had "much better attendance than last year at Dallas. There were more customers that were ready to buy at this show, or who were interested in the products in the very near future."

Tim Bealor, manager of audio products at Broadcast Electronics, reported good response from attendees. "We had good customers, but not enough," he said.

Bob Bousman, sales manager, Delta Electronics, had a similar response: "It was a nice show, but not a barnburner." He said Delta would definitely return next year.

NAB ensured plenty of floor traffic by scheduling a number of events on the exhibit floor during the convention, including two luncheons on the floor itself and the 1986 Radio Awards Luncheon in exhibit hall C, which was immediately adjacent to the exhibit floor. NAB also sponsored a "Coffee Hour with Prizes" on 12 September, and a "$100 Giveaway," from 9:30 AM to 2 PM, with $100 given away every half hour.

Final attendance figures were 5,500, up 500 from last year.

NTIA to Study AM Stereo

(continued from page 10)

ta be light at the end of the tunnel or it won't work.

NTIA is going to take the responsibility to revisit the AMstereo question. Specifically, what we intend to do is to try to begin to answer questions that are being asked daily, and that you pick up in trade publications and read about so frequently. There are claims; there are charges; there are counterclaims; there are countercharges.

How many receivers are out there? Which systems are those receivers capable of receiving? Is there a de facto standard or not?

What we intend to do and intend to release before year's end is a study on the state of the AM stereo market, and we intend to answer questions like those just asked.

We intend to look at this in the domestic sense, but we also intend secondarily to look at this in the international sense—because we no longer live in a simply domestic market. We live in an international marketplace.

I'm convinced that if we begin to provide positive signals from an industry standpoint, from a government standpoint, and from a marketplace standpoint, that AM is going to work.

. . . I'm here to tell you that we're going to do everything we can to make sure it's done.

RadioWorld

Broadcast Equipment Exchange

AMPLIFIERS

Want to Sell

Biamp TC60 power amp. $295. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Ampex monitor amp & speaker. $100. B Hunter, KIXE, Box 9, Redding CA 96099. 916-221-5800.

Scott tube-type Stereomaster 299-D preamp & amp. $20; matching Scott Stereomaster 333-B. AM/FM tuner. $15; Scott tube-type stereo lab amp, from a kit. $20. C Brennan, 661 Horseshoe Curve, Pike Road AL 36064. 205-277-0139.

Langevin tube & solid state & preamps, large quantities. BO. R Van Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

Sansui CA-F1 straight-line preamp, black, rack mt, like new. $200. W Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Bogen MTA 60 PA amp. $50; McMartin MA20 PA amp. $25. J Reichard. POB 557, Mechanicsville MD 20659. 301-373-3339.

University 100W basic amp, rack mount, excel cond. $100. W Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Tapecaster 3 chan remote amp, AC or battery ops. VU meter, compact metal case, like new cond. $150 plus ship. M Gollub, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

McIntosh M50, perfect cond. $250; McIntosh M100, perfect cond. $350. G Guarino, Acoustilog Inc, 19 Mercer, NY NY 10013. 212-925-1365.

Belar FM RF amp, 107.3 MHz, new 1981. $200; Belar AM RF amp 810 kHz, new 1979. $200. Dutch, WDDD, Marion IL. 618-997-8123.

Crown D-150, excel cond. $425. P Costa, Eastern Snd/Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

Sigma ADA-210 dist amp. 2 stereo 1×10's or single 1×20, ins & outs, bal or unbal or any combo, new. $300. J Bruzzese, Pampa Stds, 31925 Van Dyke, Warren MI 48093. 313-264-8888.

University 100T solid-state 100 W PA line amp, gd cond. $95. W Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Want to Buy

Marantz/McIntosh MC2300 MC2500, C29 tube & solid state equip. C Dripps, Kurloff Ent, 4331 Maxson Rd, El Monte CA 91732. 818-444-7079.

McIntosh, Marantz, Dynaco Quad, Audio Research, etc, amps; WE, Tannoy, Altec, EV, JBL, Hartsfield, Olympus, Harness, Laguna speakers; Thorens, Fairchild turntables; WE tubes & microphones. Lapine, 3920 August Dr, Lake Worth FL 33461. 305-588-8195.

Solid state 100 W RF amp or IPA for FM bdct band. J McCann, NTV Networks, 35 Adams Ave, Smithtown NY 11746. 516-423-2464.

ANTENNAS & TOWERS

Want to Sell

Cetec JSLP-2R 2 bay antenna at 96.7 w/radomes, less than 6 mos old. $3000. D George, WSEY FM, 6313 Odana Rd, Madison WI 53719. 608-274-1441.

AM tower, self-supporting, 150', w/4 legs approx 10' sq base w/insulators, tapered w/obstruction lights, avail immed. BO. C Thornton, WAGE, Box 1290, Leesburg VA 22075. 703-777-1200.

Flanged EIA 90° elbows (3), new, 3-1/8", $200 ea PPD; flanged EIA reducer, new, 3-1/8" to 1-5/8", will fit either sex. $125 PPD. D Gilliam, KJZZ, 1435 S Dobson, Mesa AZ 85202. 602-969-9099.

Bullets (12), new, 3", 50 ohm. $10 ea PPD. D Gilliam, KJZZ, 1435 S Dobson, Mesa AZ 85202. 602-969-9099.

Bird 3-1/8" flanged EIA wattmeter section. (2). P/N4600-000, gd cond w/new bullets. $75 PPD. D Gilliam, KJZZ, 1435 S Dobson, Mesa AZ 85202. 602-969-9099.

Micro Comm diplexer, avail soon, will retune, will handle 2 class C stations. J Sands, KMZQ, 1555 E Flamingo Rd, Ste 335, Las Vegas NV 89119. 702-731-5100.

Andrew 87-2 splice kit for 1-5/8" heliax. $100 PPD. D Gilliam, KJZZ, 1435 S Dobson, Mesa AZ 85202. 602-969-9099.

RF xmission line hardware for rigid line & heliax, 7/8 to 6-1/8", 500', new HJ5-50 7/8" heliax w/75AR connectors attached. H Husbands, 6626 Talmadge Ln, Dallas TX 75230. 214-233-6351.

Gates FMCP 124A 8 bay class A FM antenna, tuned to 105.1 MHz. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Bulkhead fitting for 3-1/8" transmission line. $25. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Harris CP, 2 bay on 100.1 MHz. $750. V Argo, KYLT, Box 2277, Missoula MT 59806. 406-728-5000.

Phelps Dodge CFHP5, 96.9 MHz w/deicers, includes 75' of 3" coax w/connectors. $4000 (if we remove). J Miner, KFMJ, 1215 NE 7th St, Grants Pass OR 97526. 503-479-5365.

Andrews self-supporting, 150' AM tower w/approx 10' square base w/insulators, obstruction lights, gd cond. BO. C Thornton, WAGE, Box 1290, Leesburg VA 22075. 703-777-1200.

Andrew PL8-65D antennas (2) w/radomes & mounts; (2) 250' EW63 waveguide w/connectors & hangers. $9000. C Bryson, Comserv, 93 Robinhood Dr, Velienople PA 16063. 412-776-3793.

Cetec 1 bay w/de-icer, tuned to 93.7, never used. Gil Garcia, KTQN, POB 240, Belton TX 76513. 512-398-3079.

Andrew 1-5/8 line, never used, 375' on roll. $3000. Gil Garcia, KTQN, POB 240, Belton TX 76513. 512-398-3079.

Phelps Dodge, 3-1/8" coaxial switches (4), new. $100 ea. G Torres, GT Intl, 48 W 46th St, NY NY 10036. 212-730-7114.

Want to Buy

FM antenna, 1 to 2 bay, 98.3 MHz. A Bowab, WDLT, 2402 Wolfridge, Mobile AL 36618. 205-344-3698.

FM antenna, 3-6 bay, on or near 96.9 MHz. R Calhoun, Calhoun Assoc, 2412 Larsen Rd, Yakima WA 98908. 509-783-6605.

AUDIO PRODUCTION (OTHER)

Want to Sell

Comp 8 th studio w/Tascam 80-8 w/dbx, 15 ch mixer, mic, much equip & tape, call for separate pricing & details. $5000. B Johnson, Rejoice Recording, POB 45, Rainier OR 97048 503-556-4052.

Ampex mixer, 6 inputs, stereo. $200; (2) bulk tape erasers, $50 ea; (3) Magnefax tape duplicators, BO. B Hunter, KIXE, Box 9, Redding CA 96099. 916-221-5800.

Yamaha R1000, reverb, new cond. $750. T Stoller, 2320 Eade Ave, Ft Wayne IN 46805. 219-484-7390.

Shure Audio Masters EQ, $100 ea; Shure feedback controller, $100; dbx 155 4-chan, $325; Linn drum, $1400, all mint cond. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Altec 9062A 7 band passive EQ's, one pair w/doc. $40. B Skye, Skyelabs Inc, 58 W Tidbury Dr, Dover DE 19901. 302-697-6226.

Lexicon M97 Super Prime Time digital delay, excel cond. $1200; UREI 546 2 chan parametric EQ, gd cond. $250. T Stein, New River Studios, 408 S Andrews, Ft Lauderdale FL 33301. 305-524-4000.

dbx 162 perfect working order. $350. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46204. 317-266-9700.

Eventide BD955 digital delay, mono, 7-1/2 kHz, 7 sec. $1400. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-1590.

Teac 15 w/floor stand, 24 chan cap board w/8 out, excel cond. $3500. H Saunders, Music Shop Recdg, 1114 Riveria Dr, Greensboro NC 27406. 919-273-9892.

Technics SH-9010 EQ, 5 band stereo. BO. J Sulik, WGBA, 1145 Pine St, Green Bay WI 54305. 414-437-2624.

Burwen TNE-7000 phono NR, black, rack mt, mint cond. $300. W Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Sundholm 2100, stereo octave graphic EQ, one rack space. $240. BO. N Lederman, Oval Window Audio, 306 Congress St, Portland ME 04101. 207-775-7292.

dbx 166 dynamics processor, $400; dbx 160 compressor/limiter, $400; (2) Scully 280, $125 ea; Electro Sound ES-505 R-R in console type mount, $500; Sennheiser binaural mics w/head, $400; Rainbow Prod travel case 32×24×24 w/in-case rack mount, $500/BO. R Sanchez, KUCV, 3800 S 48th, Lincoln NE 68506. 402-488-0996.

Burwen 1201A dynamic noise filter, new in sealed box. $200. W Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Ramko DA amps, stereo, 1 in 8 out. $150 ea/BO; Garron phase enhancer, works. $200/BO; Ramko mic preamp/dist amp, works. $150/BO. H Landsberg, Henry Eng, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

UREI 532 10 band graphic EQ, mono. $150. B Umberger, WNLT, 51 S Main Ave #957, Clearwater FL 33575. 813-446-0957.

Burwen dynamic noise filter. $25. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Radio equip: items to numerous to list for sale, inc amps, speakers, EQ's, encoder-decoder's, noise meter, audio gen, etc. write for details & prices. G Barnett, KWXY, Broadcast Centre, Palm Springs CA 92263.

Eventide H910 Harmonizer, excel cond. $1000. J Roman, KQIP, 1011 Texas Commerce Bank Bldg, Odessa TX 79761. 915-337-6262.

Elcom 300 gd cond. $300; Lauderdale Electr Labs SF-101, $95; Ramko Research ACL-25/E, $250; TFT 760 generator fine, decoder needs work, $300; Lang Electr PEQ-2A, $200 ea; Gates Dynamote 70 remote mixing board. $175. Steve Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Want to Buy

R-R, 6-8 chan console, 2 R/P cart machines all in stereo. E Lewis, Sound Audio, POB 1161, Globe AZ 85502. 602-425-3930.

Reverb units, $1-200. P Douglas, KKAY, Box 759, Plaquemine LA 70765. 504-473-3806.

Harris SSA-3 silence sensor. D Williams, KTNY, Cedar & S Main, Libby MT 59923. 406-293-6234.

AUTOMATION EQUIP.

Want to Sell

SMC tima announce unit w/2 carts. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Schafer 903 automation systems, remanufactured, warranty, installation, & training. Broadcast Automation, 4125 Keller Springs, #122, Dallas TX 75244. 214-380-6800.

IGM Instacart, 48 tray mono, 5 yrs old. $3000. J Mason, KJMB, 2222 Kansas Ave Ste L, Riverside CA 92507. 714-682-2222.

IGM Brain, BM format tape sequencer. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Harris 9000-1 inc (5) ARS1000DC, (3) Sonomag Carousels, all w/control, CTR & printer. BO. S McDaniel, WZFX, Ste 700 Wachovia Blvd, Fayetteville NC 28303. 919-486-4991.

Autogram 250 (4) stereo Carousel, excel cond, recently refurb. BO. P Douglas, KKAY, Box 759, Plaquemine LA 70765. 504-473-3806.

IGM Instacart, stereo, like new cond. $8000. J Neilson, KVNU, POB 267, Logan UT 84321. 801-752-9764.

DAP 5000 automation system, 2000 random access events, audio panel, 10 source cards, Instacart interface, complete, 6 yrs old, excel cond. $2200. Dutch, WDDD, Marion IL. 618-997-8123.

ABC network command decoder for talk radio (2); ABC network pulse decoder. J Stanford, WQUE, 1440 Canal Ste 800, New Orleans LA 70112. 504-581-1280.

Automation system, inc SMC DS-20 digital switcher, DP-1 digital programmer, DP-1C brains, CC1 interface, PSB pwr supply, (5) 350 RSB 24-cart Carousels, (6) Otari ARS-100s, brains rebuilt, R-R's need work, w/rack mounts, $7500/BO. H Scanlon, KFMI, POD 1139, Arcata CA 95521. 707-822-7223.

SMC DP1 (2) memories, 6 Carousels, 4 dual carts, time announce, etc, will function as 1 or 2 systems, call for specifics. $12000. D Grant, KEZV, 1115 3rd St, Spearfish SD 57783. 605-642-5747.

SMC 350-RSB/ME1 1188 Satmaster controller, 2 Carousels & controller in 6' rack cabinet, $4000/BO. E Nearman, KUMU, 2005 Kalia Rd, Honolulu HI 96817. 808-941-1566.

Cetec 7000, (4) Otari ARS1000, (3) 42-tray Go-Carts, interfaces, memory dump load, real time clock, in use, avail immed, 4 yrs old, $15000. J Miner, KFMJ, 1215 NE 7th St, Grants Pass OR 97526. 503-479-5365.

Stereo PB head for RSC 100 Carousel, new. $50. J Gabrouy, KEZC, 699 Ave B, Yuma AZ 85364. 602-782-4321.

ATC FA-S 25 Hz filter assy. T Devine, WMGE, Box 8 Burgin Rd, Danville KY 40422. 606-236-2711.

Harris SC-90 automation system, installed in racks, call for details & price. K Freeman, WBBQ, 1305 Georgia Ave, N Augusta SC 29841. 803-279-6610.

Harris 995-7867-001 R-R source interface (2) for System 90 or 9000, $150 ea. C Bryson, Comserv, 93 Robinhood Dr, Velienople PA 16063. 412-776-3793.

SMC ESP1 controller, PDC5 clock, DS20 switcher, RAC30 remote control, Extel AHP11R printer, 4 SMC 350RS Carousels, 3 Audicord A31SR cart machines, 3 Otari ARS1000 DC & more, call for details. W Howe, WQNY, 122 S Cayuga, Ithaca NY 14850. 607-277-1528.

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Circle Reader Service 43 on Page 24

RW Broadcast Equipment Exchange

AUTO EQUIP ... WTS

IGM 48 tray stereo Instacart, works good, $5000. M Meyer, KLQP, POB 70, Madison MN 56256. 612-598-7301.

Want to Buy

Network delay cart machine, must be compatible w/SMC automation. J Clark, WWIZ, Box 1120, Hermitage PA 16148. 412-981-4586.

CAMERAS (VIDEO)

Want to Sell

GBC CTC5X camera, color, no lens, w/BFM5X view finder & 15' ext cable, $75. F McCall, Performance Srvs, 1521 W St Mary's Rd, Tucson AZ 85745. 602-323-0901.

RCA TK76B (2), plumbs, Angenieux 15x1 w/studio hand control adaptors. S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

Sony DXCM3, 126mm Tamron automatic lens, interconnect cables to 1/2 or 3/4 video recorder, tripod mount, $5500. P Carlson, PKC Ent, POB 568, West Linn OR 97060. 503-656-6998.

Panasonic WV3990B color camera w/3 50' cables, remote control, battery charger, less than 200 hrs use, $2600. M Hamilton, WSVL, POB 338, Shelbyville IN 46176. 317-398-9757.

JVC BY-110U, w/newer mdl updated 10:1 zoom lens, 3 tube, power supply/charger, (2) batteries, other access, $3000. B Dombrowski, WhirlWind Prod, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

JVC KY1900, like new w/case, battery, AC adaptor, $2195. D Brennan, Custom Video Lab, POB 26126, Birmingham AL 35226. 205-823-0088.

JVC KY 1900 color cameras (3), two 10x1, one 6x1, w/case, battery pack charger & AC, $2750 for 10x1 & $2500 for 6x1. P Costa, Eastern Snd & Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

JVC BYU-110 3 tube color, pwr supply, 10:1 lens, battery charger, 1 battery, 14-10 pin VCR cable, tripod base, chest rest, carrying case, LN, $3000. J Bruzzese, Pampa Stds, 31925 Van Dyke, Warren MI 48093. 313-264-8888.

Want to Buy

RCA TKP-46 Minimax adapter. H Henson, Henson Prod, 4569 Havencrest, Winston-Salem NC 27106. 919-924-8717.

RCA TK760 camera cable, 1500'. B Seaman, WTVN, 1261 Dublin Rd, Columbus OH 43215. 614-481-6663.

JVC CCU f/u/w JVC KY1900 camera. D Brennan, Custom Video Lab, POB 26126, Birmingham AL 35226. 205-823-0088.

CART MACHINES

Want to Sell

SMC record cart machine, mono. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

BE 3200RPS (3); BE 3100P (2) play only immaculate. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-9751.

ITC 3D mono w/3 tones, works fine, w/manual, $1700/BO. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46204. 317-266-9700.

Gates Criterion R/P stereo w/150 Hz aux cue, rack mt, very low hrs, $200; Gates Criterion 80, stereo play, 150 Hz aux cue, cabinet, $250. J Boehm, WFYR, 3000 Olive Rd, Homewood IL 60430. 312-861-8100.

Spotmaster 2000 mono RP, mint cond, BO. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Viking (Telex) 35 cart, $100; 3M Contata 293AG tape player, needs repair, $60. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Rapid Cue PB mono cart machines (2) w/spare motor, in 19" rack; Spot-o-matic deck w/PB preamp, $75; $250 for both. F McCall, Performance Srvs, 1521 W St Mary's Rd, Tucson AZ 85745. 602-323-0901.

Tapecaster 700 R/P, gd cond, just realigned, $475; Tapecaster 700 P, gd cond, just realigned, $300; UMC Beaucart 100 series, one R/P & one play, gd cond, includes rack mount for both if purchased together, w/manual, $1600/R/P & $900/play. M Lewis, Africa News Service, 720 9th St, Durham NC 27705. 919-286-0747.

BE 2100RPS, like new, hardly used, $1750. B Gutherie, Stage 4 Prod, 7352 Newburgh, Westland MI 48185. 313-421-5330.

Cue det card & control card for Ampro cart, $85/both. J Stanford, WQUE, 1440 Canal S-800, New Orleans LA 70112. 504-581-1280.

Gates Criterion 80 w/record amp, $400. C Springer, KSEC, Box 890, Lamar CO 81052. 303-336-2206.

Spotmaster 505 rack mount, R/P w/solid state electr, $450 +ship. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

ITC SP for trade w/Tomcat PB cart machines. S Brown, WLTE, 215 S 11th, Mpls MN 55403. 612-339-1029.

ITC 3D cart decks, mono (2), $500 ea. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

BE Spotmaster 2000 mono PB, gd cond, $225 plus ship; Contel 101P-B mono PB, gd cond, $150 plus ship. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

Nortronics QK-114 cart head mounting kits, new, BO. N Lederman, Oval Window Audio, 306 Congress St, Portland ME 04101. 207-775-7292.

Nortronics QK-114 cart head mounting kits, BO. N Lederman, Oval Window Audio, 306 Congress St, Portland ME 04101. 207-775-7292.

ITC WRA-1874 stereo record units (2) for use w/3-D decks, excel cond, $650 ea. D Fisher, 4185 Arch Dr, #202, Studio City CA 91604. 818-505-9490.

Spotmaster cart winder w/timer, $200. M Phillips, Phillips & Co, POB 985, Laurinburg NC 28352. 919-276-1306.

Cart 2000, mono R/P cart machines. J Phillips, WDCW, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

IGM 48S stereo Instacart, clean, low miles, $6000. T McGinley, First Media, POB 10239, Wash DC 20018. 301-441-3500.

Audicord 526, gd cond, $1000. J Howell, Howells Audio, 521 Park St, Kingman AZ 86401. 602-753-3054.

Want to Buy

Gates 150 Hz cue amp & QC-150 for Gates Criterion. P Wayne, 4915 Heatherdowns #6, Toledo OH 43614.

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.

Harris Criterion 80, or ITC mono R/P w/150 Hz sec tone record capability. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

ITC RP mono w/3 cue tones. J Hunter, KBRE, 450 W 4th S, Cedar City UT 84720. 801-586-5273.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Ampex AG440B 8 trk, mint cond, comp w/remote, $5500. Elsmere Music, Box 185, Bedford Hills NY 10506. 914-234-9201.

Ruslang RL600 (2) consoles for MX5050BII, $150. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-1590.

Technics SV-P100 digital audio cassette rec. BO. J Sulik, WGBA, 1145 Pine St, Green Bay WI 54305. 414-437-2624.

Ampex ATR102 1/2" 2 trk w/pedestal & remote, $4500; MCI JH110A (2) 1/4" 2 trk w/Lang cabinet, $1800 ea. B Nathan, Unique Recg Std, 701 7th, NY NY 10036. 212-921-1711.

Ampex AG440 recorders (2), mono, FT, $1000 ea. B Hunter, KIXE, Box 9, Redding CA 96099. 916-221-5800.

Tascam 32 (6) just removed from service, very clean. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-9751.

Concord MK III 7" 1/4 trk, 3 spds, ferrite hds, gd cond, $85; Sony TC-366 7" 1/4 trk, 3 spds, gd cond, $89; Ampex AG-355 serv manual, BO. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Crown SP722 tape deck, play only, w/manuals & some spares, stereo 2 trk, works well, $300. J Boehm, WFYR, 3000 Olive Rd, Homewood IL 60430.

Nagra 4.2L sync recorder w/7" reel cover, $3500; 4S stereo sync w/7" recorder, $3800. S Smith, Chicago Audio, 1005 W Webster, Chicago IL 60614. 312-327-5533.

Dolby 330 2 chan stereo tape dup unit w/B-type (consumer) NR char, excel cond, $950. G Lewis, Lewis Recdg, 216 S Pershing, Arlington VA 22204. 703-521-1871.

Studer A810, (2) 2-2 R-R decks, $5000 ea. M Hieb, KLTQ, 329 E 200 S, Salt Lake City UT 84111. 801-533-9305.

Teac 80-8 w/DX8, patch cords, align tape manual & console, excel cond, $2500. H Saunders, Music Shop Recdg, 1114 Riveria Dr, Greensboro NC 27406. 919-273-9892.

Ampex 351-2 (10), all guar within specs, buyer pick up, 2 trk, $200 & 2 trk play only, $150; Scully 280 (2), 8 trk w/cabinet in gd cond; also 2 trk w/o cabinet in working cond, $1750 for both. I Kaufman, Natl Recrd, 460 W 42nd, NY NY 10036. 212-279-2000.

Scully 284 2TS in console, new heads, $1500; Ampex 351 FT, needs heads, BO; Tascam 48, new, $3000. W Priest, Classic Snd & Recd, 1249 Bayshore Blvd, Dunedin FL. 813-736-4474.

Scully 280-4 in console, align tape, service manual, trade for Nagra stereo, write only. J Neuman, Industrial Announcer, POB 7703, Atlanta GA 30357.

Tascam 80-8 w/dbx & roadcase plus 20 reels 1/2" tape, used, $3000. B Johnson, Rejoice Recording, POB 45, Rainier OR 97048. 503-556-4052.

Ampex PR10 FT, CL-10 deck, spare motor, 2 sets elec, $100. B Dudley, Location Snd, 6919 19th St, Tampa FL 33610. 813-237-6516.

Ampex 350 FT mono w/Inovonics 375 elec, $750; Scully 284-8 1" 8 trk w/remote & rolling cabinet, $2500. A Grunwell, Calf Audio, 157 Gray Rd, Ithica NY 14850. 607-272-8964.

24 trk machine, converts to 16 trks, 15 or 30 ips, $12,500. R Robinson, TNA, 10 George St, Wallingford CT 06492. 203-269-4465.

Ampex 351 reel machine R/P stereo. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Tape-A-Thon librarian tape player system, (2) 702-10 bi-directional decks, interspercer, pwr amp, in rack cabinet, call for details. D Beatty, Beatty Televisual, 1287 Wabash, Springfield IL 62704. 217-787-4855.

Ampex 601 w/port case, working gd, heads fair, $250; Tape-A-Thon 702-10 R-R, works gd, $200; other Tape-A-Thon parts & chassis avail. E Davison, Multiplex Music, 125 N Illinois, Springfield IL 62702. 217-787-0800.

Ampex AG-440, 4 trk in Ampex roll-around console w/comp extra AG-440 transport w/two 2 trk head stacks, all heads in vgc, EQ card components matched, w/orig manuals & some spares, $2200; Ampex 351/440 2 trk, Accurate Sound 351 upgraded transport w/AG-440 electr, matched EQ components, no case, heads in vgc, $800. B Skye, Skyelabs Inc, 58 W Tidbury Dr, Dover DE 19901. 302-697-6226.

Revox A700 remote cont w/LEDS, $100; A700 parts/serv man, $10; A700 dust cover, $10; hubs & various parts & PR99 serv man, $10; B710 cass deck full doc remote cont & carton; Studer A810 w/wood panels & full doc, $4200; Teac 3440 dust cover, $10. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Sony 777-4 portable R-R w/remote control, excel cond, $250 plus ship or trade for gd quality 10-1/2" reel, stereo or mono, 7-1/2 & 3-3/4 ips, 1/2 trk portable recorder. S Barkett, WPQR, RD2 Box 91, Hopwood PA 15445. 412-438-2336.

Teac DX-8 8 chan NR, excel cond, $580. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Revox A77, 2 trk, 15 ips w/new heads, excel cond, $550/BO. H Landsberg, Henry Eng, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Scully 100, 16 & 24 trk deck w/audio upgrades. R Robinson, TNA Stds, 10 George St, Wallingford CT 06492. 203-269-4465.

Otari Mark III, 8 trk, $3500. R Robinson, TNA Stds, 10 George St, Wallingford CT 06492. 203-269-4465.

Teac V-350C (2), $89; Teac V-300, $79. P Costa, Eastern Snd/Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

Scully 100 8 & 16 trk, w/Auditronics 501 console, $10,000/both. J Nave, Pickin Post, POB 982, Watertown Hwy, Lebanon TN 37087. 615-449-1770.

Revox A-77 (2), gd cond, just aligned, 3.75/7.5 ips, w/manuals, both in wood cabinets, $500 ea; Tascam 122B (2), gd cond, w/manuals, $500 ea. M Lewis, Africa News Service, 720 9th St, Durham NC 27705. 919-286-0747.

Ampex 351 mono in metal rack, $400. G Guarino, Acoustilog Inc, 19 Mercer, NY NY 10013. 212-925-1365.

Ampex AG-440B 2 trk in roll-around console, w/new heads & sapphire guides, excel cond (2), $1000 ea, must pick up in LA area. H Landsberg, Henry Eng, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

MCI JH-110-4 4 trk, 30/15/7.5 ips w/1/2" & 1/4" heads & remote control low profile console, $3000. T Jones, KNXR, 220 S Broadway, Rochester MN 55904. 507-288-7700.

Ampex 350, 351, 300 hard to get elect parts, record relays, coils, xformers, switchers, etc, limited numbers. R Meyers, Sound Masters, 4700 SW 75 Ave, Miami FL 33155. 305-372-5594.

Magnecord PT6, 3 mono 2 stereo, some disassembly but complete, BO. R Meyers, Sound Masters, 4700 SW 75 Ave, Miami FL 33155. 305-372-5594.

Ampex 300, (3) transports, & (3) elect, $300/lot. R Meyers, Sound Masters, 4700 SW 75 Ave, Miami FL 33155. 305-372-5594.

Ampex 300-8, 1" 8 trk restored, new tubes w/remote, $3000. T Papa, Santa Monica Snd, 2114 Pico Blvd, LA CA. 213-450-2119.

Magnecorder PT6 (2), BO. J Curtis, KFRO, POB 792, Longview TX 75606. 214-663-3700.

Ampex 440A w/roll around, needs work, $800. B Makson, WSBH, 56 Jagger Ln, Southampton NY 11968. 516-283-9500.

Ampex 602 stereo, gd cond, $150; Sony audio cassette Carousel RD 6000, $250. J Reichard, POB 557, Mechanicsville MD 20659. 301-373-3339.

Grundig stereo deck w/NR, $40; Pioneer F2121 stereo w/wooden cabinet, $125; Technics M205 stereo, $100; Technics M227X stereo, $100, +ship on all. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

AMI record only high speed open reel duplicators (12), w/8 trk cartridge heads, fits any format w/bias traps in wood console, $150 ea/BO. Natalie, Studio 2, 9733 Culver Blvd, Culver City CA 90230. 213-558-8832.

Ampex 500 2 trk 1/4", 7.5-15 ips, play only w/console, gd cond (2), $450/both or BO. Natalie, Studio 2, 9733 Culver Blvd, Culver City CA 90230. 213-558-8832.

Broadcast Equipment Exchange

CASSETTES . . . WTS

Scully 16 16 trk 15/30ips xformerless, w/sync master remote. $5000. G Guarino, Acoustilog Inc, 19 Mercer, NY NY 10013. 212-925-1365.

Ampex 350-351 (3) w/Innovonics or 440 elect, mono, in use. $400 ea or $950 all; Teac 501, $200; Technics M224 cassette decks. $75. David, Waves Snd Rec, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Ampex 440 PB stereo, $200; Ampex 351 PB mono, $100; Ampex 350 PB mono & guts of another, $100. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

ITC 850 R/PB, mono (2), $300 ea; Ampex 600A (2), $60/both. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Otari MX5050MKII-4 4 trk 1/2", like new cond, BO. R Kaufman, POB 29804, Atlanta GA 30955. 404-646-9911.

Ampex AG-355 service manual. BO. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Scully 270-2 play only machines (2) w/o heads; elect & transport fully operational when removed from automation system, $600 ea. E Walters, WTCR. 606-739-8427.

Tascam 58-OB 8 trk 1/2" prod recorder, new in box, w/rack mount adapters, $4500. B Dombrowski, WhirlWind Prod, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

Scully 100 16/8 trk, needs work, $3500. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Teac 1/4 trk 7" reel capacity, $250; Magnecord 728 rack mount, needs some mechanical work, 10" reel capacity, $100. T Papa, Santa Monica Snd, 2114 Pico Bl, Santa Monica CA. 213-450-2119.

Revox A-77 1/2 trk w/spk & amp, gd shape, $695; 1/4 trk Teac 2300, $295. P Costa, Eastern Snd/Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

Uher 4000 Report-L 2 trk, w/battery charger, main operated power unit & Siemens mic, like new, BO over $450. A Bassing, 7303 Holly Ave, Takoma Pk MD 20912. 301-587-9020.

Akai GX-6000D, 10½" reels, 7.5 & 3.75" speeds, 4 trk stereo, gd cond, w/manual, $100 plus ship. M Gollub, WMJS, Box 547, Prince Frederick, MD 20678. 301-535-2201.

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

Ampex 300 mono decks, $100/both. R Robinson, Trod Nossel Recdg, 10 George St, Wallingford CT 06492. 203-265-0010.

Wollensak 2780 A/V high speed cassette duplicator, slave unit (3 slaves) for use w/the 2770 A/V, $700. D Flynn, Continental Recdgs, 210 South St, Boston MA 02111. 617-426-3131.

Want to Buy

Ampex MM1000 capstan servo motor, tape lock access, sync lock access. Auditec system. H Henson, Henson Prod, 4569 Havencrest Rd, Winston Salem NC 27106. 919-924-8717.

Ampex 600, 601, 602, AG600, 620, 621, 622 etc, amp/speakers, fair prices, depending on cond. G Harris, Theatre Works USA, 131 W 86th, NY NY 10024. 212-595-7500.

Ampex AG 440 1/2" 4 trk head stacks, head block & parts. R Riccio, ETS Record, Box 932 Honolulu HI 96808. 808-533-6095.

Ampex MX10 or MX35. P Chance, Imperial Analog, 1809 Capers, Nashville TN 37212. 615-322-7601.

Revox A77. D Van Zandt, WGNV, POB 88, Millador WI 54454. 715-457-2988.

Ampex 351-2 pref w/portable case. P Chance, Imperial Analog, 1809 Capers, Nashville TN 37212. 615-322-7601.

CATV-MATV EQUIP.

Want to Sell

Jerrold Commander modulator, chan 2, $250; Dynair Dynamod TX4A chan 11, $150; Dynair Dynatune demod RX4B, chan 11, $250; Dynair Dynamod TX4B chan 4, $300. J Reichard, POB 557, Mechanicsville MD 20659. 301-373-3339.

Sony demods, chan 4, 5, 7, 9, 11, 13, $100. R Peterson, Pacific Comm, POB 7668, Olympia WA 98507. 206-754-7081.

CONSOLES

Want to Sell

Sound Workshop 1280B, excel cond w/Anvil case. $1350. w/o case, $1000. B Skye, Skyelabs Inc, 58 W Tidbury Dr, Dover DE 19901. 302-697-6226.

Autogram, BE, UREI studio consoles, new. Let BAI bid on your needs. Broadcast Automation, 4125 Keller Springs, #122, Dallas TX 75422. 214-380-6800.

Harris Stereo Statesman, 5 pot, gd cond, $850; Gates Studioette, BO. D Charles, WHOO, 1 Radio WHOO Rd, Orlando FL 32808. 305-295-3990.

Gates Studioette 80, 4 pot 12 in, not in service, BO. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Howe 9000 Series, 30 input slide pot, gd cond, BO. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Altec 250A tube type console w/table, 9 in 2 out w/cue, gd cond, $750. B Woolf, Fidelity Sound, 3986 Edidin Dr, Jacksonville FL 32211. 904-744-1661.

Cherokee 300 8 pot mono console w/2 spare modules. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Tascam 5 16 chan stereo. $1200. B Johnson, Rejoice Recording, POB 45, Rainier OR 97408. 503-556-4052.

Gates 10 chan stereo, gd cond, w/spares & manual, $900. G Stevens, KFXY, 409 Duke St, Morgan City LA 70380. 504-384-1430.

Tascam 5 23 input, 8 chan, vgc, nc T/B module, $900. J Boehm, WFYR, 3000 Olive Rd, Homewood IL 60430. 312-861-8100.

Tascam 30 4 chan, like new, $1000. T Stoller, 2320 Eade Ave, Ft Wayne IN 46805. 219-484-7390.

Sound Workshop series 30 wired to XLR panel 18×3×2; one wired to panel 20×8×2 w/10 stereo modules, perfect cond; Hill B Series 15×8×2 w/snake to XLR panel, factory mod for bdct. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-9751.

Altec 250 SU, excel cond, tube type, $700. B Woolf, Audio & Recdg Systems, 2986 Edidin Dr, Jacksonville FL 32211. 904-744-1661.

Electrodyne console parts, (6) 710 modules, (20) SM-9 switch modules, oscillator, limiters line amps, R Robinson, TNA Stds, 10 George St, Wallingford CT 06492, 203-269-4465.

Ramko DC8MS 8 chan, 21 input stereo, excel cond, $1550. B Van Prooyen, Van Prooyen Bdctg, 628 Mulford Dr SE, Grand Rapids MI 49507. 616-452-0133.

Russco Studio Master 505, 5 pot mono, gd shape, $700. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

RCA BC3, dissassembled, case, guts, front panel, PC boards new, $100. R Meyers, Sound Masters, 4700 SW 75 Ave, Miami FL 33155. 305-372-5594.

Studer console for B67, $200; Neve pots, wide assortment at gd prices. G Guarino, Acoustilog Inc, 19 Mercer, NY NY 10013. 212-925-1365.

RCA BC17 3 chan mono, $100. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Collins 212S, stereo 6 chan, w/complete spare parts, $500 plus frt. F Spinetta, KCEA, POB 2585, Atherton CA 94026. 415-321-6049.

IC-10 stereo, new, BO. R Kaufman, Ricky the K's, POB 29804, Atlanta GA 30359. 404-636-9911.

Ramko DC8MS 8 mixer stereo w/LC-2 remote control & 2 SP-8/E stereo TT preamps. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

MCI 2001 opamps (116), real cheap. M Feidler, Mahoney Feidler Prod, 5346 Dupont Ave S, Mpls MN 55419. 612-822-0013.

Gates Statesman, excel cond w/extra modules, $1200. J Stitzinger, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-7538.

Teac AX-20 mixdown panels (2), $20 ea. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Gates Studioette solid state 4 chan. J Phillips, WDCW, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Teac AX20 mixdown panels (2), $20 ea. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Arrakis SC 2000 12 chan, 4 yrs old, $950. C Gray, Kiny & Assoc, 1107 W 8th St, Juneau AK 99801. 907-586-6037.

Gatesway dual chan 10 pot TV board, old but clean & in gd cond, inst book, pwr supply & amps included, $350, you ship. H Espravnik, WHHV, Box 648, Hillsville VA 24343. 703-728-9114.

Console, 16 in 16 out, all transistorized, 5 EQ sliders, $2500. W Burchett, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

Want to Buy

Collins IC-6. R Kramer, KSOR, 1250 Siskiyou Blvd, Ashland OR 97520. 503-482-6301.

Ross SMC803, need service manual only. JW Shepard, 539 Westminister Ln, Salem VA 24153. 703-389-1670.

RCA BC7A or B, or comparable stereo console, also need spare parts, for school district purchase. M Kosack, C&G Assoc, 516-489-1071.

Gates stereo Executive, gd cond & reasonable price. M Kosack, C&G Assoc, 516-489-1071.

RCA BC3 parts & spares. L Scott Jr, WMJS, PO Drawer 1729, Bartow FL 33830. 813-533-4654.

DISCO & SOUND EQUIP.

Want to Sell

Altec Lansing Voice of Theatre speakers & studio monitors, BO. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Eventide HM-80 Harmonizer, special effects, reverb & pitch change, never used, $500. T Brazil, WRUP, 832 W Washington, Marquette MI 49855. 906-228-6800.

Lexicon Prime Time II dual tape digital delay, mint cond, $800. W Whitney, Sub Sound, 2232 Wengler, Overland MO 63114. 314-429-2858.

Altec W horn cabinets (4), $750 ea. A Grunwell, Calf Audio, 157 Gray Rd, Ithica NY 14850. 607-272-8964.

Yamaha 6×2 echo & reverb, bal & unbal inputs, $350 incl ship & handling. J Staley, WSCG, 609A Palmer, Corinth NY 12822. 518-654-9058.

BTX 4500 (2) synchronizers, excel cond, $1000 or $1750/both. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

AKG BX-10-II reverb, used, gd cond, $400. G Lewis, Lewis Rec, 216 S Pershing, Arlington VA 22204. 703-521-1871.

MicMix XL-305 room reverb, stereo send & return w/3 bands of EQ, vgc, $350. B Skye, Skyelabs Inc, 58 W Tidbury Dr, Dover DE 19901. 302-697-6226.

JBL 4301, 1 pair, gd cond, $300/pair. H Underwood, Underwood Audio, 34 Aviation Way, Atlanta GA 30341. 404-457-1268.

Delta Lab DL-2 stereo delay, $850; MXR digital delay, $275; Ursa Major digital reverb, $900, all in mint cond. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Comp 8 trk set up, inc Teac 80-8 w/dbx, Tascam 35-2 w/dbx, mdl 10 mixer MicMix reverb, patchbay, etc., will sell separately, $3400. B McPeek, Mirror Image, 619 S Main, Gainesville FL 32601. 904-376-1688

Burwen 1201A dynamic NR, new, $150. I Kaufman, Natl Recdg, 460 W 42nd, NY NY 10036. 212-279-2000.

Delta-Lab DL-4, $375; Loft DDL 440, $275; Eventide phaser, $350; Omni-Craft 4 chan noise gate, $250; UREI 550 9 band stereo graphic EQ, $425; Alesis XT digital reverb, $425, all in gd to excel cond. P Costa, Eastern Snd/Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

Publison, effects processor, does everything. BO. R Kaufman, POB 29804, Atlanta GA 30955. 404-646-9911.

Tapco 2200 graphic EQ, $95; Bogne MXM, 5 input, road mixer, XLR, $50. T Papa, Santa Monica Snd, 2114 Pico Bl, Santa Monica CA. 213-450-2119.

Realistic 10-band stereo EQ w/mixing dubbing facilities, $75 +ship. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

Sundholm 2100, stereo octave graphic EQ, one rack space, mint, $240/BO. N Lederman, Oval Window Audio, 306 Congress St, Portland ME 04101. 207-775-7292.

EV MC8A 8" speaker, new in box, $25. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Radio Shack Nova-5 speakers (2), $40 ea/$70 pair +ship. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

dbx 224 Type II NR system for tape & disc stereo unit, prof series, $90 plus ship. M Gollub, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

AKG BX10 stereo reverb, just rebuilt by AKG, $950. R Tiegen, Plum Studios, 2 Washington St, Haverhill MA 01830. 617-372-4236.

Want to Buy

Janzen electro stats & DuKune Ionovac tweeters, J Anthony, Stancor Audio, 8 Passaic St, Hackensack NJ 07601. 201-265-5200.

LIMITERS

Want to Sell

Universal audio limiter, $200. B Hunter, KIXE, Box 9, Redding CA 96099. 916-221-5800.

CRL audio processing equipment, great prices on the full line. FM4G in stock for immediate delivery. Broadcast Automation, 4125 Keller Springs, #122, Dallas TX 75244. 214-380-6800.

Distributor Directory

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Broadcast Equipment Exchange

LIMITERS . . . WTS

CRL AM system SPP800, SEP400A, PMC300A, used 1.5 yrs, $3000. C Prim, KURL, 636 Haugen, Billings MT 59101. 406-245-3121.

Altec A332C limiter amp w/P511 power supply, serial #53, $30. B Skye, Skyelabs Inc, 58 W Tidbury Dr, Dover DE 19901. 302-697-6226.

Aphex Compellor limiter, excel cond, boxed w/manual, $900. J Alan, WMMS, 517 W Giles Rd, Muskegon MI 49445.

Dorrough 610, w/all latest factory mods, $2700. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-1590.

CRL AM4 mono, excel cond, factory refurbished, 2 yrs old, BO. J Saunders, WLIM, 45 Pennslyvania Ave, Medford NY 11763. 516-475-1580.

Inovonics 215 audio processors, includes gated AGC, compressor & FM peak controller modules (2), excel cond, $800 ea. T Hemingway, WGAJ, Box 248, Deerfield MA 01342. 413-773-9649.

Gates Solid Statesman FM limiters (2). J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

UREI LA4's, stereo blackface w/rackmount & manual, work fine, $550. B Hawkins, WENS, 1099 N Meridian, Indianapolis IN 46204. 317-266-9700.

Orban 422A current mod comp gated lim, BO; UREI BL-40 Mod-u-Limiter, $250/BO. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Inovonics MAPII •No397, 7 yrs old, gd cond w/manual, $600/BO. J Mason, KJMB, 2222 Kansas Ave Ste L, Riverside CA 92507. 714-682-2222.

CBS Audimax III. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Harris MSP-90 tri-band audio processor, mint cond, $1500 or trade for Optimod 8000A. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

RCA 86-A1 tube limiters, same as BA-6A w/warm punchy sound, $700 ea/BO. Natalie, Studio 2, 9733 Culver Blvd, Culver City CA 90230. 213-558-8832.

UREI LA-4 compressor/limiters, pair rack mounted, new cond w/instr, $550. I Kaufman, Natl Recd, 460 W 42nd, NY NY 10036. 212-279-2000.

Inovonics 230 multiband audio processor in gd working order, $500; Orban Optimod 8000A in gd working order, $1700. C Springer, KSEC, Box 890, Lamar CO 81052. 303-336-2206.

DAP 310 w/manuals, recently aligned, $750. S Wilson, KLSF, 803 S Rusk, Amarillo TX 79106. 806-371-9797.

RCA BA6A tube limiter, $350. T Papa, Santa Monica Snd, 2114 Pico Bl, Santa Monica CA. 213-450-2119.

CRL AM4 APP400, PMC300, SEP400, BO; Limpander LE35B, BO. J Curtis, KFRO, POB 792, Longview TX 75606. 214-663-3700.

UREI 1176 peak limiters, 5 yrs old, work well, $200 ea/BO. H Landsberg, Henry Eng, 503 Key Vista Dr, Sierra Madre CA 91024. 818-355-3656.

Kahn Symetra-peak SP58-1A, $100. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Dolby 334 NR unit, $50. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Orban 9100A2 set up for C-QUAM, excel cond, superb sound, $4200. C Hemming, KBOR, POB 3407, Brownsville TX 78523. 512-544-1600.

Elcom WBL 11 composite clipper, $200. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Urei 1178 stereo, mint, w/srvs manual, $500. M Paradiso, Ultimate Image, 7200 Dunfield, LA CA 90045. 213-410-1009.

Want to Buy

Orban 8100A or 8000 FM Optimod. J Paffenbarger, WUOM, 5000 LSA Bldg, Ann Arbor MI 48109. 313-763-1551.

Orban 8000A. D Van Zandt, WGNV, POB 88, Millador WI 54454. 715-457-2988.

MICROPHONES

Want to Sell

Sennheiser MKH 405 & 404 mics w/power supplies & cables, both need work, offer or trades. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

AKG 224E, $200 ea; RE20, $225, mint cond. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Shure SM-81 condenser mics (2) to trade, have AC PS for 1 Neumann U-87. Shure's in mint cond. J Neuman, Sound Results, POB 7903, Atlanta GA 30357.

WE 633 historic mics from UN, will trade for other old mics, $50; 24A table stand, $50. R Van Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

AKG 224E, dynamic mics (3), $285 ea, excel cond. G Lewis, Lewis Recdg, 216 S Pershing, Arlington VA 22204. 703-521-1871.

RCA 77-D, excel; RCA MI 4048-D, gd cond, both $275. D Kocher, 1901 Hanover, Allentown PA 18103. 215-776-1455.

AKG NR-4288 w/CK-9 condenser mic, PS, handle & case; HMR WM-152A wireless mic in Anvil case. S Dodson, Desert West, 1870 W Prince Rd #48, Tucson AZ 85705.

Sennheiser MKH-416 P48 w/Rycote windscreen, $500. S Smith, Chicago Audio, 1005 W Webster, Chicago IL 60614. 312-327-5533.

Sony ECM56FP condenser, like new, $125 ea or $200 for two; Edcor wireless mike system w/EV C090 lavalier mike & xtal controlled rcvr, $250; AKG D110 lavalier mike, $50; Shure Voice Gates (4) on rack panel, $50 ea or all for $125. E Davison, Multiplex Music, 125 N Illinois, Springfield IL 62702. 217-787-0800.

Turner 2302 dynamic new in box $30; Turner 450D paging mic, new $10. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

RCA 74B, new ribbons, excel cond, $60. B Woolf, Audio & Recdg Systems, 2986 Edidin Dr, Jacksonville FL 32211. 904-744-1661.

Turner 2302 dynamic, new in box, $30; Turner 450D lo-Z paging mic(s) have several, new in boxes, $10 ea. W Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

EV RE-15 & RE-16 w/metal cases, vg, $125 ea. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

RCA BK5B mics w/yokes, no shock mounts, factory recond, $140 ea. M Phillips, Phillips & Co, POB 985, Laurinburg NC 28352. 919-276-1306.

Canon UA-3-31; P3CG-12S; UA3-12, both male & female connectors, new, several of ea, BO; EV 664, BO. M Kosack, C&G Assoc, 516-489-1071.

Sennheiser 441U, excel cond, w/hard case, $300. M Lewis, Africa News Service, 720 9th St, Durham NC 27705. 919-286-0747.

Want to Buy

Old bdct & rec mics, parts, station name plates, stands. R Van Dyke, Squires Ave, E Quogue NY 11942. 516-728-1327.

Mic w/sound similar to EV RE-20, will pay up to $100. P Wayne, 4915 Heatherdowns #6, Toledo OH 43614.

RCA boom mfg by Mole-Richardson 40's. L Scott Jr, WMJS, PO Drawer 1729, Bartow FL 33830. 813-533-4654.

MISCELLANEOUS

Want to Sell

RCA 19" equip rack. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

AT&T desk phones (3) 5 lines & hold for 1A2 system, $75 ea.; T159 w/printer, dozens of programs, w/carry case & ext printer paper, $85; shipping crate for Harris Executive console, $25. L Snyder, Box 182, Floral Park NY 11001. 718-347-2940.

Micro-Trak M72 lazy susan cart rack, $29. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-1590.

Wood cart rack, 100 slot, pecan finish, new, $80; 40 slot pecan finish, new, $35. J Boehm, WFYR, 3000 Olive Rd, Homewood IL 60430. 312-861-8100.

Parts, large box inc tubes, IC's, caps, resistors, hardware, multimeter, tools, RF & AF connectors. $25 plus $5 ship. C Daniel, KNCB, Box 1072, Vivian LA 71082. 318-375-3279.

Tellabs 248RF housings (4) w/4008 cards, power supplies & repeat coils, $250/set PPD. D Gilliam, KJZZ, 1435 S Dobson, Mesa AZ 85202. 602-969-9099.

Okidata U82A printer, like new, dot matrix, $200. J Cunningham, YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Electro Sound 1800 cassette loader, 300 DPS, fully automatic, $2500. B Woolf, Fidelity Sound, 3986 Edidin Dr, Jacksonville FL 32211. 904-744-1661.

Adtech Brute III power supply (2), excel, $200 ea; high voltage power supply components, $35; dual voltage, regulated, wired & working, $50/BO on all; Tie Key telephones, new, $50; Econ-Key 300 touch tone, $100. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Advent 1000 video projector, trade for 35mm projector; Canon 10×1 lens for RCA TK-76 camera. S Dodson, Desert West, 1870 W Prince Rd #48, Tucson AZ 85705.

TTC/Wilkinson SIA-1, brand new surge protector, $500/BO. S Skikker, KDNK, POB 1388, Carbondale CO 81623. 303-963-0139.

Spellman HV pwr supply, 0-40 kV at 2 mA, $400. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Kepco modular rack pwr supply, 8 modules, $250. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

ASR-33T send & receive w/stand, rolls of paper, ribbons, punchtape paper, BO. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

Telemation TPD 100 pwr dist panel; ITT phone network for office, 15 phones plus electr networking equip; Laird Telemedia 2508-2520 remote control film-slide for TV prod. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

Rotary-dial, 3-line telephones (6) w/individual hold for ea line, does not require Amphenol, just modular, various colors, $25 ea; Record-a-Call 560 telephone answering machine, not remoted, $65 +ship. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

BNC cables, various lengths, 20¢ per foot. R Peterson, Pacific Comm, POB 7668, Olympia WA 98507. 206-754-7081.

Rixon T108E/G/J modem, BO. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

TI Silent 700 ASR electronic data terminal, incl Schafer encoder & decoder (800 VEL); Extel printer; fully operational, $6000 package. E Walters, WTCR, 606-739-8427.

Advent proj TV's, gd for parts, BO. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Want to Buy

Jingle collector, would like to trade any jingle, any format. D Ferreira, POB 24, Manchester MA 01944. 617-526-1394.

LEL splice finder or equiv, $40 or less. P Wayne, 4915 Heatherdowns #6, Toledo OH 43614.

UTC HM1-100 high pass filter. R Robinson, TNA, 10 George St, Wallingford CT 06492. 203-269-4465.

Station or network metal ID's for mikes & mike stands; also AFRS transcriptions. L Scott Jr, WMJS, PO Drawer 1729, Bartow FL 33830. 813-533-4654.

RCA electron tube handbook, 5 loose-leaf binders, must be in gd cond, will offer $50. J Glass, WNIU, Northern IL Univ, Dekalb IL 60115. 815-753-0212.

Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: __.

POSITIONS WANTED

Morning man, news, prod, copy writing, admin, 18 yrs exp, good voice, married, stable, avail now, prefer warm climates, medium/bigger markets. Larry Kay, 717-653-2500.

DJ experienced in top 50 market & in the industry since 1962 seeks large or medium market on-air position, currently OM & CE in small market. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 10-1.

Seeking group chief position, 17 yrs exp, medium & major markets, AM directional, FM, satellite, automation & audio. PO Box 3191, Grand Rapids, MI 49501.

Prof announcer w/4 yrs exp on-air & eng, looking for position within FL, excel refs. L James, 975 S Fla Ave, Tarpon Spring FL 33589. 813-937-1786 or 937-3429.

Corp CE, hard working, self-starter, looking for FT position w/single or group owned stations, 9 yrs, on-hand exp in AM/FM, for KS, CO, MO, NE, OK, avail immed. Larry Timmons, 913-425-6509.

Station mgr seeking AL, GA or SC position, highly qualified. BJ Gilreath, POB 129, Orchard Hill GA 30266.

SBE Certified AM/FM, 8 yrs CE, BA journalism, voice, automation, seeks Midwest/Upper-MW. B McBride, KWBE/KMAZ, Box 10, Beatrice NE 68310. 402-228-5923.

CE radio, 11 yrs exper AM/DA/FM, also RPU, STL, TSL & announcing exper, ops mgr, prefer Northeast. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 9-1.

Eng will consider air shift, 2 yrs formal training, w/7 yrs exper, certified w/FCC general, 25K min, all markets, currently employed. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-2.

CE, prod pro, air personality looking for combo position, 14 yrs exper on air & as hands on CE, presently Chief in top 50 market. Gary, 3916 Slagle Dr, Charlotte NC 28215. 704-563-8676.

Radio CE, FT, 10 yrs exper, 50 kW crit array, now ChOp, CIE grad, Grantham ASET, for resume write: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-1.

Former CE of LA based satellite network, 12 yrs exper, programming, ops, recording studio design, construction, seeking CE and/or ops mgr to eventually GM. Marty Walker, 909 Palm Ave #103, W Hollywood CA 90069. 213-659-0874.

Currently OM at Western NY station, looking for FM position, 10 yrs exper in all phases, community minded. PW, Box 43, Dunkirk NY 14048.

HELP WANTED

Woolfson Bdctg seeks CE for top rated AM/FM combo, 5 yrs exper in bdct ops. Contact Chuck Young, WGUS, POB 1475, Augusta GA 30913. 803-279-1380. E.O.E.

Norther California Group seeks CE to handle studio & xmtr at one location, design & installation at other properties, benefits & car, salary negotiable. A Santamaria, KULC, 419 Mason, Vacaville CA 95688. 707-446-0200.

AM 10kW directional & 57 kW FM combo looking for CE who knows his stuff. Send qualifications to Sandy Neri, Box 309, Johnstown PA 15907.

Consultants

Contact: Radio World Newspaper PO Box 1214, Falls Church VA 22041 for availabilities. Phone 800-336-3045

Can't Find It? **Call 1-800-426-8434 For Immediate Action!** **Want To Sell It?**

Broadcast Equipment Exchange

MONITORS

Want to Sell

Gorman Redlich EBS-2 comp EBS encode-decode w/rack mt tuner. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

McMartin TBM 3500 FM mod monitor, $100. H Husbands, 6626 Talmadge Ln, Dallas TX 75230. 214-233-6351.

McMartin TBM-3500 baseband FM; TBM-2200A stereo & pilot freq; TBM-2000B SCA, all solid state & in excel cond. C Springer, KSEC, Box 890, Lamar CO 81052. 303-336-2206.

Belar FMM1 FM mod monitor, gd cond. $750; RCA mod monitor for AM, $800. B Jeffreys, WROK, 1100 Tamarack Ln, Rockford IL 61125. 815-399-2233.

Gates M-5693 mod monitor, set for 1370 kHz; GR 1181-A freq monitor. J Curtis, KFRO, POB 792, Longview TX 75606. 214-663-3700.

IFT 753, $900; Belar AMM-1, $400 ea. Steve Portier, WNOE, 529 Bienville St. New Orleans LA 70130. 504-529-1212.

Want to Buy

McMartin TBM-4500A, any cond. Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

MOVIE PRODUCTION EQUIP.

Want to Sell

Bolex M5 camera w/zoom, sync motor for sound recdg & battery pack. BO. H Deans, Deans Prods, 170 Grand St, White Plains NY 10601. 914-949-5920.

Angenieux 14-525mm lens for Fernseh camera, KCP w/road case, $300 or BO. S Judge, Tag Comm, 75 Weaver Rd, W Milford NJ 07480. 201-697-8454.

Arriflex UST581 portable mixing amp for sound on Arriflex cameras. Joe, Mainreel Comm, 67 Green St. Augusta ME 04330. 207-623-1941.

Moviola 16mm editing machine optical & magnetic sound, viewer, rewind, etc. $1200. H Deans, Deans Prod, 170 Grand St, White Plains NY 10601. 914-949-5920.

Magnetic sync recorder 16mm w/24" rack. David, Waves Snd Rec, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Beattie-Coleman K 25 Polaroid oscillotron unit used to film oscilloscopes using a Polaroid camera mounted on special housing, $45 plus ship; Vicon V113-V100 pan tilt & solid state lens control unit w/pedestal mount for surveillance camera, $125 plus ship. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

B&H 550 16mm sound projectors (2), optical sound, 2000' capacity, inc extra exciter, projection lamps, reels, fair cond, $100 for one & $175 for both, plus ship. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

RECEIVERS & TRANSCEIVERS

Want to Sell

ICOM IC-M6 (10) 6 chan VHF radios, 5 W. $325 ea. S Smith, Chicago Audio, 1005 W Webster, Chicago IL 60614. 312-327-5533.

TG43 mobile units (2), 161.76 MHz, $100. A Gable, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Motorola HT-200 VHF 2 chan w/2 ants (rubber & tele), manual, $100. D Jordan, POB 6349, Evansville IN 47712. 812-963-6882.

GE Porta-Mobil One, 161.76 MHz (4), 2 chargers & mics, $250/all. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Want to Buy

Old military radios like DC603 & 604, receiver xmtrs, A/D shock mts, FT237 & jeep radios, DC620 & 659 power supply, PE120E & FT250 shock mts. S Bartkowski, 4923 W 28th St, Cicero IL 60650. 312-863-3090 aft 5PM.

REMOTE & MICROWAVE EQUIP.

Want to Sell

QEI 7775-ATS, one unit for telco, one unit for STL, not used since factory check-up. $2500. B Lord, KQBE, POB 1032, Ellensburg WA 98926. 509-962-2823.

S-A digital satellite system w/dish for ABC, Westwood One, etc, you transport. $6000 plus frt. D Dougherty, WNVB, POB 1440, Vineland NJ 08360. 609-825-2600.

Moseley PCL 505C, great working cond, tuned to 94.30 MHz, $5000. E Schecter, KDKB, 1167 W Javelina, Mesa AZ 85202. 602-897-9300.

Moseley PCL 2B STL. tube type, split band system, working when removed from service approx 4 yrs ago, BO. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Elgin ERC 19654 recorder connector, interface to telephone line, $50. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Shafer 400-R RC system. J Curtis, KFRO, POB 792, Longview TX 75606. 214-663-3700.

Gentner Telemix IX telephone hybrid, $1500. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Gates RDC10 remote control, gd for parts only, BO. B Umberger, WNLT, 51 S Main Ave #957, Clearwater FL 33575. 813-446-0957.

Ampex 440 remote control, $40. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

Micro Controls DRCR-9/RCT-9 RC system, setup for phone line, can be adapted for subcarrier, $1200. D Woodcock, WNWC, 5606 Medical Circle, Madison WI 53719. 608-271-1025.

NEC earth stations, 2-3 yrs old, like new cond, 5.5 meter k-band, avail immed, $120,000 ea. ISAUS, POB DD, McLean VA 22101. 703-759-2094.

Modulation Assoc Transtar AC demod shelf, inc down converter, (2) SCPC demods, cue decoder card & printer card, & power supply. $2500/BO. K Bartz, KWQB, Box 1301, Fargo ND 58107. 218-236-7900.

Potomac RC16+, like new, for AM/FM, in service, microwave or phone line, 16 chan control & status, digital display, video monitor & printer capacity, BO. H Reinders, WWIB, Hwy 27 & County T, Cornell WI 54732. 715-726-1229.

Harris 6550 satellite rcvr, tuned to AP/UPI transponder on Westar 3 w/dist amp, $1750. V Argo, KYLT, Box 2277, Missoula MT 59806. 406-728-5000.

Hughes aircraft terminals earth stations, 2-3 yrs old, like new cond, 5.5 meter k-band, avail immed, $140,000 ea. ISAUS, POB DD. McLean VA 22101. 703-759-2094.

Want to Buy

RPU type accepted equip, 26 MHz, urgently needed, any make & model. E Nichols, KJNP, POB O, North Pole AK 99705. 907-488-2216.

Marti equip & rcvr in 161 MHz band. P Douglas, KKAY, Box 759, Plaquemine LA 70765. 504-473-3806.

STATIONS

Want to Sell

Sacrifice, smaller AM 1 kW, full-timer in SW Wash coastal area, ideal owner operator, great potential, located on major hwy, apartment, mobile home, studios, land w/tower inc, only AM in market, $200,000. E Kazmark, POB 1369, Dear Park WA 99006. 206-875-5551 or 509-276-8816.

FT AM stereo station in top 100 markets, due to heart attack must sell, favorable terms to qual buyer, positive cash flow, on air 40 yrs, class B FM avail for comboing in 1987. J Rockwell, MGC Corp, 904 Lakeside Dr, Lynchburg VA 24501. 305-744-8751.

Colorado Mtn resort AM/FM radio station, excellent coverage, super buy & terms. J Gayer, 815 Reed, Lakewood CO 80215. 303-233-8433.

STEREO GENERATORS

Want to Sell

Harris MS-15R stereo gen, mint cond, $1500 or trade for Optimod 8000A. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

RCA BTS 1B stereo gen, vgc, $500. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

SWITCHERS (VIDEO)

Want to Sell

Dynair 153A switcher, B&W, $1500 plus ship. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

TAPES, CARTS REELS

Want to Sell

Collection of 45's, LP's & 78's, excel cond, pop, top-40, some jazz & classical. J Martin, 3655 Old Shell Rd, #321, Mobile AL 36608. 205-460-2001 or 343-2023.

Ampex 671, three groups to choose from: 7"x2400' hand picked bulk taped down ends, 70 per ctn 60¢ ea or $42 per ctn plus UPS; or hand picked taped down ends in printed box, 50 per ctn, 80¢ ea, $40 per ctn plus UPS; or as is bulk, 60 per ctn, 35¢ ea, $21 per ctn plus UPS. Call Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572. 1-800-331-3191 or in NYS 516-678-4414.

CBS audio tape & Ampex cart tape, 7500' & 8200' pancakes, 1 pack masters, BO. T Haughey, KVMV, POB 3333, McAllen TX 78502. 512-781-5067.

Background music tapes, gd cond, 15-18 yrs old, $50 buys 12 shipped FOB USA, $300 buys lot; empty new reels & boxes, 90 7" low torque #6813 reels, $25. E Davison, Multiplex Music, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Ampex 162 1" video tape on 9-3/4" reels w/NATB hubs, only subjected to 2 passes, BO. S Barkett, WPQR, RD2 Box 91, Hopwood PA 15445. 412-438-2336.

Beautiful Music Library, 425 10" reels, 25 Hz tones, $5 ea plus ship. P Martinez, KELK, 1800 Idaho, Elko NV 89801. 702-738-7118.

Audiopak A2 (460) mostly 40's & 70's, also winding machine. $2.50-3.00/cart. K Barnett, WWTR, Ocean City MD. 301-289-4545.

ACTION-GRAM

EQUIPMENT LISTINGS:

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply call 1-800-426-8434 to place your listings courtesy of Broadcast Supply West.

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an $18/25 word basis. Call 800-336-3045 for details and complete display rates.

EMPLOYMENT SECTION:

Help Wanted
Any company or station can run "Help Wanted" ads at the flat rate of $18 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of $2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted
Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a $2 fee which must be paid with the listing (there will be NO invoicing). Responses will be forwarded to the listee, unopened.

Check as appropriate: ☐ Help Wanted ☐ With Box Number ☐ Positions Wanted ☐ Without Box Number

Text (25 words maximum): _____

_____

_____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip _____

Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041

Circle Reader Service 36 on Page 24

Broadcast Equipment Exchange

TAPES . . . WTS

Video cassettes, 3/4" various brands, $5 ea. T Papa, Santa Monica Snd, 2114 Pico Bl, Santa Monica CA. 213-450-2119.

Various used carts, (90) in different lengths, $45/all. R Haan, KDCR, Sioux Center IA 57250. 712-722-0885.

Blank 3/4" tapes, 20 assorted. $100. M Hamilton, WSVL, POB 338, Shelbyville IN 46176. 317-398-9757.

Audiopak AA3 approx 200. $1 ea plus ship; Fidelipac 300's & Audiopak A2 mix, about 50, 50¢ ea plus ship. R Childress, KCLB, 50 Mark West Springs Rd. Santa Rosa CA 95401. 707-528-9236.

Fidelipac 300's, (100), need reloading. 25¢ ea. E Ford, KETR, 321 E Chapman, Fullerton CA 92634. 714-879-1555.

TAX DEDUCTION EQUIP.

Non-profit college station needs: stereo cart machines, tape decks, TTs, tonearm/headshells, mics, mixers, console boards, mic cables, snake cords, mic stands & remote digital 2-chan processor. G Gutmacher, WYBC, Box WYBC, Yale Station, New Haven CT 06520. 203-432-4116/4117.

Donations: educ exhibit, antique, working, studio bdctg equip for on-air display, console, TTs, R-Rs, mics, clocks, etc. HD Norman, NDXE, 100 S 8th Ste 200, Opelika AL 36801. 800-872-6393.

Studio to xmtr equip to donate, also (3) CX1000t7 tubes, 8122 tubes, & misc equip; also solid state exciter, 90.1 MHz. Mr. Campbell, Roanoke Christian School, 515 Becker Dr, Roanoke Rapids NC 27870. 919-537-8333.

Non-profit tax exempt company needs video equip. H Walsh, Keep the Faith, POB 8201, N Haledon NJ 07508. 201-423-5395.

College radio needs SPSC & receive equip for digital radio network from satellite. D Downing, WLCC Lansing Comm College, Box 40010, Lansing MI 48901. 517-483-1670.

TEST EQUIPMENT

Want to Sell

GR 1558A octave band noise analyzer w/manual. BO. Mr. Simonsen, KHAT, POB 6006, Lincoln NE 68506. 402-423-1530.

Heathkit IO-104 15 MHz triggered sweep scope. BO. T Stein, New River Studios, 408 S Andrews, Ft Lauderdale FL 33301. 305-524-4000.

Boonton 202E gen, needs pwr supply. $50. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Tek 453 scope, needs CRT. $200. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

H-P 3300-3302 function gen-trigger phase lock for testing electr equip, $125 plus ship; Grim Corp CP 600 RP 600, 6 chan control panel & 6 chan relay panel used for switching audio & control circuits, $120 plus ship. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

Tek 527 waveform monitor, one in gd working order, other for parts, $500/BO for both. S Kafka, K61CU-TV, 941 O St #902, Lincoln NE 68508. 402-476-6115.

H-P 331A dist analyzer, excel cond. $750. J Stitzinger, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-7538.

HP-211A square wave gen, $50; GR-1432A sampler, DC to 4 GHz, $40; (2) 527 waveform monitors, need work, $100 ea. J Reichard, POB 557, Mechanicsville MD 20659. 301-373-3339.

GR-1330A RF bridge oscillator, excel cond w/case; Dielectric Thru-line wattmeter w/case & elements, both $550. J Stanford, WQUE, 1440 Canal Ste 800, New Orleans LA 70112. 504-581-1280.

Daven 35A harmonic noise & dist analyzer w/inst, in gd working cond, $150. I Kaufmann, Natl Recdg Stds, 460 W 42nd, NY NY 10036. 212-279-2000.

Potomac AA51 audio test set. $2400. J Peroyea, WYNK, 842 Main St, Baton Rouge LA 70802. 504-343-8348.

Want to Buy

Weston 1240 DMM need operators manual or photocopy of same for digital multimeter. E Jacker, WCRW, 2756 Pine Grove, Chicago IL 60614. 312-327-6860.

Tek CRT for 453 scope. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Heathkit IB-1103 9 digit freq counter, must have manual & schematics, in working order or repairable. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

Heathkit IG 72 audio osc, must have manual & schematics & be in working cond or repairable. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

TRANSMITTERS

Want to Sell

McMartin BF-1K 1500 W FM in vgc. $7000. J McKinley, WJMR, 388 S James, Columbus OH 43213. 614-855-9171.

Transformers/Chokes-power/modulation for Collins/Gates 1-10 kW; RF inductors fixed/variable; vacuum capacitors fixed/variable; mica caps; crystals, most FM for Collins 310Z-1 & A830 exciters, some AM for Collins 20V/21M; assorted meters for Collins xmtrs & studio equip. H Husbands, 6626 Talmadge Ln, Dallas TX 75230. 214-233-6351.

Versacount V322 FM stereo exciter & LA-150 xmtr, 150 W, 4 yrs old, excel cond, $3500. T Hemingway, WGAJ, Box 248, Deerfield MA 01342. 413-773-9649.

Gates 5G 5 kW FM, excel cond. w/exciter, BO. N Boswell Jr, WBKJ, POB A, Kosciusko MS 39090. 601-289-1340.

Harris FM10G xmtr w/TE-3 exciter, tuned to 105.1 MHz. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

Gates M6400-Vanguard 1 AM 1 kW xmtr, gd cond, used as standby, avail now, freight FOB, $1500. L Murray, WHOL, 1125 Colorado, Allentown PA 18103. 215-434-4801.

CCA 20000D w/harmonic & low pass filters, working when removed, tuned to 93.3 MHz w/spare parts, $6000. E Schecter, KDKB, 1167 W Javelina, Mesa AZ 85202. 602-897-9300.

Trade, (2) Gates FM1B 1 kW xmtrs for one 5 kW FM xmtr. B Ladd, WNRR, 108 1/2 E Main, Bellevue OH 44811. 419-483-2511.

Bauer 707 AM xmtr, 1.1 kW, 540-1600 kHz, 800 lbs, $5500. M Barnes-Wing, KBND, 2600 NE Studio Rd, Bend OR 97708. 503-382-5263.

Collins 5 kW stereo FM xmtr, will tune to your freq, $9000. B Ingram, WBLE, POB 73, Batesville MS 38606. 601-563-4664.

Versa Count V-322 FM exciter, 97.1, $2000/BO. J Germer, WGLQ, 816 Ludington St, Escanaba MI 49829. 906-789-9700.

Collins 20V-2 AM 1 kW xmtr in excel cond, ready to ship. C Springer, KSEC, Box 890, Lamar CO 81052. 303-336-2206.

McMartin B910 FM exciter, spare RF module, $1000. B Umberger, WNLT, 51 S Main #957, Clearwater FL 33575. 813-446-0957.

QEI FM ATS system, both xmtr & alarm point controls, completely operational, BO. J Kendall, KRCO, POB K, Prineville OR 97754. 503-447-6239.

Dummy load, 5 kW, 75 ohm, $300. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Want to Buy

20-25kW FM, any cond, prefer Collins 831G, send price, cond & spares. H Husbands, 6626 Talmadge Ln, Dallas TX 75230. 214-233-6351.

FM exciter for under $500. R Larson, WROP, 316 S Maple, Opark IL 60302. 312-848-3172.

AM 5 kW or 10 kW, late mdl pref. P Baillon, Baillon Co, 60 W 4th, St Paul MN 55102. 612-222-5555.

FM 20 kW 1980 or later, with full doc to change freq. E Nichols, KJNP, POB O, North Pole AK 99705. 907-488-2216.

Harris 10 kW FM xmtr, less than 10 yrs old. J Bahr, WVIS, POB 487, Fredericksted, St Croix VI 00840. 809-772-1652.

Versacount LA150 or similar unit, RF amp. J McCann, MTV Networks, 35 Adams Ave, Smithtown NY 11787. 516-423-2464.

FM translator, 1 W, near new in excel cond to meet FCC req. P Holt, Omni-Lambda Assoc, Box 144, Burke NY 12917. 518-483-3900.

Gates FM5B xmtr for parts. L Smith, KRXY, 115 W 1st, San Angelo TX 76903. 915-653-3387.

50 kW AM or SW xmtrs, high level only, advise by mail model, cond, price, assembled, spares & books, location. CE, NDXE, Box 569, Opelika AL 36801.

TUBES

Want to Sell

Eimac 5CX1500A, new $500; 8877/3CX1500A-7, new $450; many used amp, rectifier tubes; new sockets for 4CX5000 & 4CX15000. H Husbands, 6626 Talmadge Ln, Dallas TX 75230. 214-233-6351.

Tubes, CK6146A, new, several avail, BO. M Kosack, C&G Assoc, 516-489-1071.

TURNTABLES

Want to Sell

Russco Studio Pro complete pair, arms, preamps, furniture. J Phillips, WDCW, 414 Washington, Defiance OH 43512. 419-782-8591.

Micro-Trak 720 w/tonearm & spare parts, excel cond, $175. J Cunningham, YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

QRK TTs (2), $250 ea. B Hunter, KIXE, Box 9, Redding CA 96099. 916-221-5800.

Technics SP15, SH15B2 base, Audio Technica ATP12T tonearm, Stanton 600A cartridge, new, $595. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-1590.

Russco Cue-Master (2). Shure tonearms & cartridges, Nidec motors w/100 hr use, all mounted in wooden boxes, $500 firm for everything. K Mortensen, Music Marathon, POB 217, Berwick ME 03901. 907-698-5678 aft 5PM eastern time.

Sony CDP 6500ESD (2) digital CD players, 6 mos old, excel cond, $850 ea. J Stitt, WLLT, 250 W Court Ste 300E, Cincinatti OH 45202. 513-241-9500.

Gates CB1200 w/Gray 303 tonearm, $125; QRK 12-8, no tonearm, BO. M Saady, First City Rec, 141-60 84th Rd #3E, Briarwood NY 11435. 718-846-2062, 7-10PM.

Technics SP10 MK III motor, $500. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

Russco Studio Pro TTs (2), $175 ea. A Goble, WIOD, POB 381177, Miami FL 33238. 305-759-4311.

Gates CB77 (2) w/M-644Z preamps & Shure tonearms, $400/both. J Stitzinger, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-7538.

Sparta GT w/pedestal cabinet, $190 +ship; Gates large platter w/Syntec arm, top mounting board & cabinet, $200 +ship. J Emmel, Emke Media Ent, POB 401, Olyphant PA 18447. 717-383-1118.

Sansui SR222; QRK specially mounted w/Audio Technica arm; Pioneer P1-10. David, Waves Snd Rec, 1956 N Cahuenga, Hollywood CA 90068. 213-466-6141.

Technics SP-25 w/hardwood base, Stanton 310 preamp & 680 cartridge, all in excel cond w/manuals, BO. M Lewis, Africa News Service, 720 9th St. Durham NC 27705. 919-286-0747.

Want to Buy

Ortofon cutting head DSS601, one for parts, any model that works. F Badeaux, Musk Faktory, 1812 Proctor St, Port Arthur TX 77640. 409-982-7121, 4-8 PM CST.

Neumann cutting lathes, comp w/console & elec. C Dripps, Kurloff Ent, 4331 Maxson Rd, El Monte CA 91732. 818-444-7079.

RCA 70D & BQ2 parts, inc cartridge & needles for 70D. L Scott Jr, WMJS, PO Drawer 1729, Bartow FL 33830. 813-533-4654.

Technics SP10 MK II pwr supply. T Maguire, TMI Engr, 415 W 55th, NY NY 10019. 212-969-9494.

TV FILM EQUIP.

Want to Sell

RCA TK27, TP66 film chain, 16mm, multiplexer, TP5 fly chain, 8mm Super 8 transfer, comp system plus spares, $10,000/BO. S Weiss, Stevens Quality Video, 28759 Greenfield, Southfield MI 48076. 313-424-8439.

VIDEO PRODUCTION EQUIP.

Want to Sell

RCA TK760 (2) remote panels & camera cables. S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

TV Research Intl EA-3/EA-6 VCR edit controller w/manual, $250. F McCall, Performance Srvs, 1521 W St Mary's Rd, Tucson AZ 85745. 602-323-0901.

Video prod equip inc: Microtime T-100 TBC, Leader waveform monitor & vectorscope, Panasonic monitors, JVC ESP-2AT edit system, JVC KM 2000 SEG, Panasonic triple 5" BW monitors, Panasonic WV 555 studio camera, Panasonic WV 555 ENG camera, RTS BP 300 comm system, Knox Ki28-MOD 8 char gen, Lowel omni light kit, call for details, sold seperately or for $29,000 complete w/custom console. Baker Street Stds, 10 Wheeler Ct, Watertown MA 02172. 617-924-0065.

GVG 900 series sync gen, 1 section of plug in modules working; (2) 955 color lock 2-950 sync gen; (1) 951 sync change over 1-908 color black gen, $150; RCA TA19 proc amp, working, $300; 3M DP-100 video processor, has pwr supply problem, $50. J Reichard, POB 557, Mechanicsville MD 20659. 301-373-3339.

Knox K-60 char gen, excel cond, $575. P Costa, Eastern Snd/Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

Panasonic AV8650 special effects gen, gd cond, $350/BO. M Hamilton, WSVL, POB 338, Shelbyville IN 46176. 317-398-9757.

GVG 940H video processing system, has AGC/sync/color lock/color processor, never used, $1000/BO. S Kafka, K61CU-TV, 941 O St #902, Lincoln NE 68508. 402-476-6115.

Chyron VP1 char gen, gen lock & software upgrades, $3600/BO; Microtime T120 TBC, $4200/BO. L Froom, SPS Video, 1901 Chapel Hill Rd, Silver Spring MD 20906. 301-598-5392.

VIDEO TAPE RECORDERS

Want to Sell

Ampex VR2000 (3), all rebuilt, 3M-DOC, Velcomp, WFM. S Dodson, Desert West, 1870 W Prince, Tucson AZ 85705. 602-293-1849.

JVC 6060 U 3/4" deck, excel, $1000. R Robinson, TNA, 10 George St, Wallingford CT 06492. 203-269-4465.

Sony VO3800 (2), AC adaptor, charger, gd cond, all for $2200. E Mateo, KGKL, 1301 S Bryant, San Angelo TX 75903. 915-655-7161.

Panasonic 1/2" editing system, w/(2) NV 8500, one NV A500 editing controller, low hrs, great shape, $4995. P Costa, Eastern Snd & Video, 462 Merrimack, Methuen MA 01844. 617-685-1832.

JVC 8250 U-matic editing system; 8250 editing recorder; 5550 player; RM-86 editing controller, $5500. B Dombrowski, WhirlWind Prod, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

JVC 6060U 3/4" rec, $700; JVC BY110, 10:1 power zoom, $2000; Thomson 32 plumbicon Minicam, 12:1 power zoom, $3000; RCA component M-format editor, same as Panasonic AU300, $9000. D Weber, Video Prod, 208 E 28th, NY NY 10016. 212-685-0302.

NEC VC 7505, 3/4" time lapse VCR, records in normal time plus 9, 18, 32 & 72 hr intervals, $450 plus ship. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

Sony 1800, 3/4" VTR (2), gd cond. $300 ea; Sony 1800 3/4" VTR (4) needs some work, $100 ea; Sony SLO 320 Beta, gd cond, $250. R Peterson, Pacific Comm, POB 7668, Olympia WA 98507. 206-754-7081.

VCR portables, 3/4" (3), other pieces of video & audio equip, $650 ea. G Fox, Fox Video, 795 NE 163rd St, N Miami FL 33162. 305-940-8466.

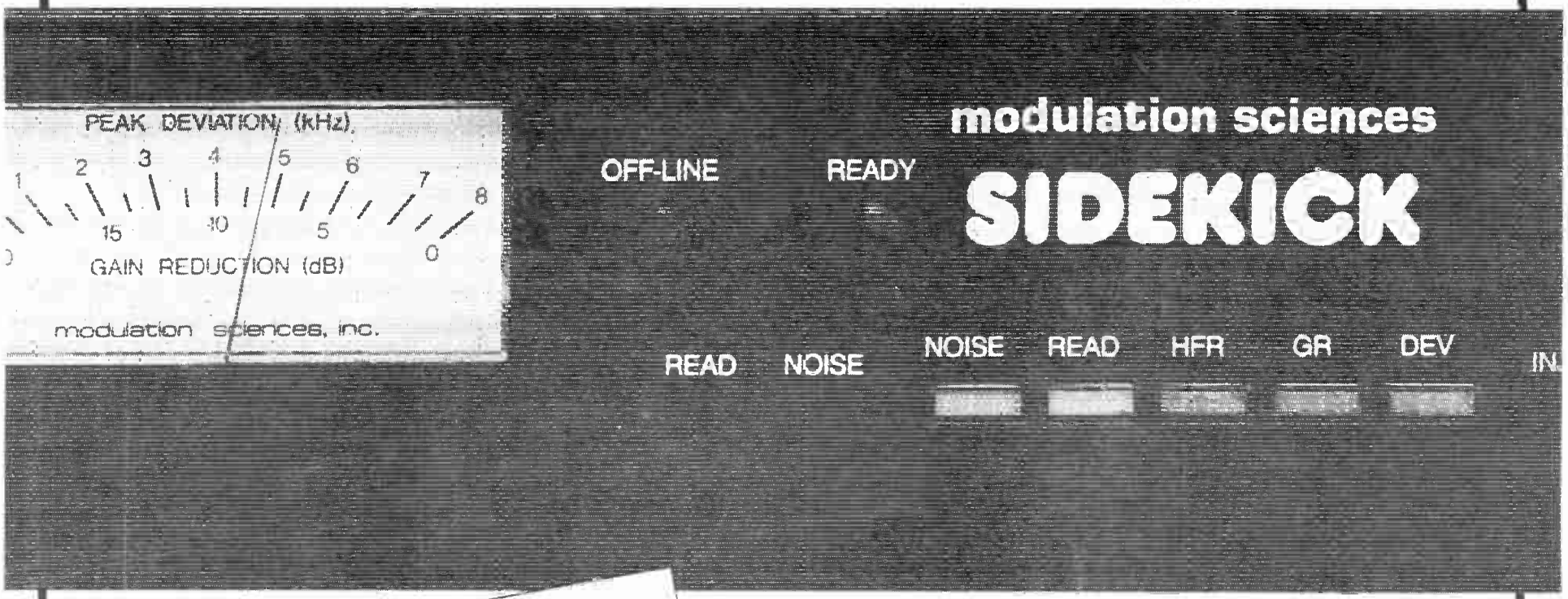
Ampex Mark 10 high efficiency video head, plug in unit, overhauled by Videomax, in fiberglas shipping container (4), $500 ea. J Wood, Wood Airborne Remote Sensing, 162 Peruvian Ave, Palm Beach FL 33480. 305-832-2159.

Sony VO1800 3/4" player/rec, 2 chan audio, RF out works fine $375. R Peterson, Pacific Comm, POB 7668, Olympia WA 98507. 206-754-7081.

Want to Buy

RCA TR600A remote panels. H Henson, Henson Prod, 4569 Havencrest Rd, Winston Salem NC 27106. 919-924-8717.

THE ONE BOX SOLUTION THAT MADE SCA WORK



RF IDEAS

E.J. PRYOR, JR. *Broadcast Technologies, Inc.*

"I have been operating one SCA on 67khz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

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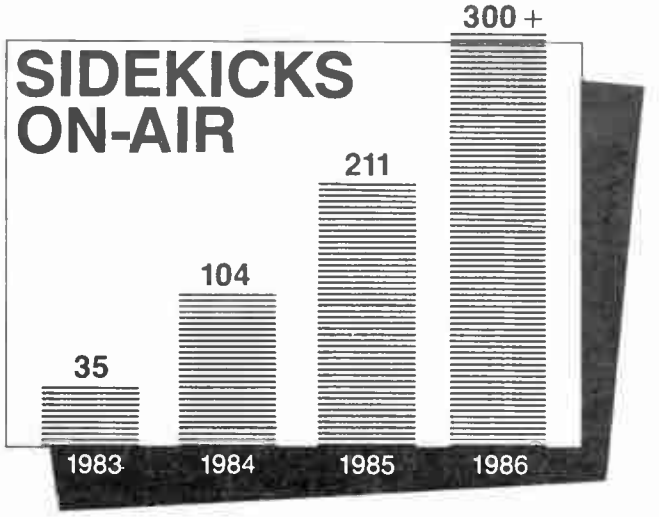

Here's how Sidekick® makes SCA work:

Sidekick installation is quick, easy, and problem-free:

- Install at studio or transmitter.
- Insert anywhere in chain via Sidekick's loop-through composite input/output (SCA input NOT required).
- Remote control provisions standard.

Sidekick's elegant circuit design takes the hassles out of SCA:

- Sidekick is tweak-free and drift-free.
- Crystal-locked synthesizer is stable over time/temperature.
- Excellent RF and EMI shielding.
- Performance certified by an independent P.E. (to receive a copy, just call).

Sidekick's "One Box Solution" builds in everything you need:

- Integrated audio processor for superb SCA performance.
- Noise generator and synchronous AM meter lets you tune transmitter for minimum crosstalk.
- Super-accurate peak & hold SCA deviation monitor.

30-Market Survey Results:

SIDEKICK IS THE #1 CHOICE OF MUSIC SCA OPERATORS.

From SCA: Radio Subcarrier Report 9/85

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Call **Toll-Free (800) 826-2603**
And Get Sidekick Working For You.

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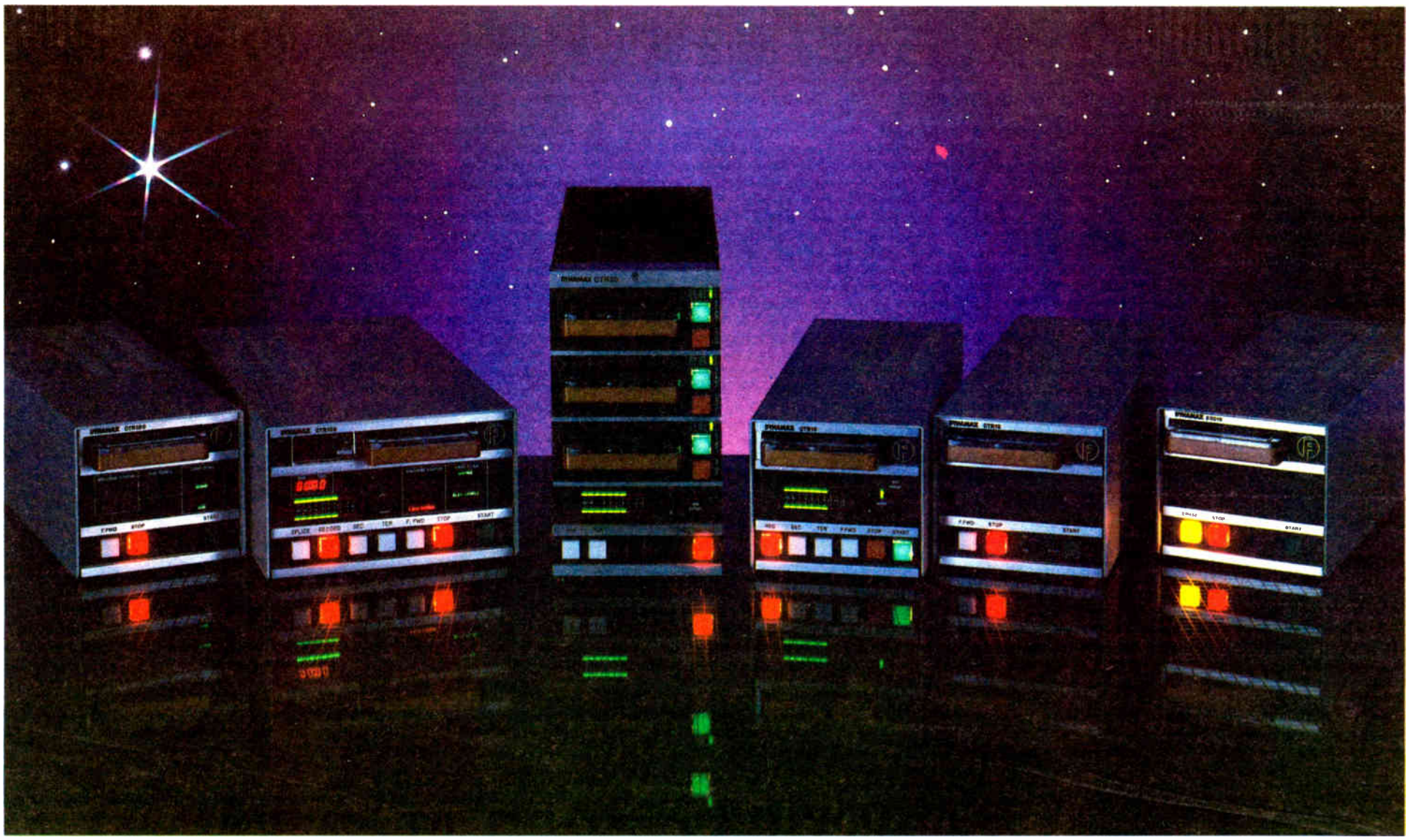

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DYNAMAX products are designed and manufactured in the U.S.A.

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