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NAB Venture Revives FMX

by **David Hughes**

Washington DC ... Following a series of setbacks in 1986, a plan to give new life to the FMX FM stereo extension system has been announced by the NAB.

Boosting that effort are new tests which indicate that some of the multipath problems with the system may have been solved.

At **RW**'s press time in mid-March, NAB Science and Technology VP and FMX co-developer Tom Keller indicated that a new structure has been setup to continue development and promotion of the FMX system.

The NAB has formed what it calls "a for-profit subsidiary," entitled NAB Technologies, Inc., to handle the FMX work with several individual, corporate partners.

NAB Technologies, which will be chaired by NAB Joint Board Chairman Ted Snider, will also become involved other technologies apart from FMX, the association said. It will earn profits from its share of royalties on products it develops, the NAB added.

The new organization comes in response to a late 1986 decision by CBS, which financed FMX research and development with the NAB, to close its Stamford, CT-based technology center, and pull out as a major backer of the FMX project.

The new FMX partners, including NAB Technologies, have formed an entity called Broadcast Technology Partners (BTP) which will "complete" the development of FMX, the NAB said. "They," a source added, "would move forward with the FMX project."

Majority interest in BTP is held by a group of Detroit area investors led by Bloomfield Hills, MI-based consultant John F.X. Brown. Brown refused to comment to **RW** on the new structure, saying that many details were still being worked out.

Emil Torick, the former CBS Technology Center engineer who co-developed the system with Keller, is also an "owner" of BTP, according to the NAB. Torick, who will serve as CEO of BTP, could not be reached for comment.

Besides Keller and NAB Technologies, other members of the BTP organization include CBS, which is maintaining a scaled-down stake in the project.

CBS has continued supporting FMX research out of a facility in Greenwich, CT. Keller would not name any other BTP investors.

"We started thinking about NAB Technologies and the new structure when CBS announced (in late 1986) that it wanted out of the (FMX) project," Keller said.

He stressed that one of the major advantages of the new BTP organization is its "solid reputation" of representatives familiar with the broadcasting industry and the fact that it is "headed by an engineer."

The news of the new structure comes after several major FMX generator manufacturers—Orban, Circuit Research Labs, Inovonics and Aphex—said they would delay introduction of their proposed FMX-related products following last year's on-air tests of the system.

During those tests in mid-1986, multipath-type interference was exaggerated on some non-FMX receivers which could not deal with the FMX quadrature signal.

Those negative developments were then compounded by CBS's decision to close its Stamford tech center; the bulk of the FMX research took place at that facility.

Problems solved?

Along with the news of the new organizational structure to propel FMX developments, there are indications that multipath problems discovered during the on-air tests of FMX may be partly or completely resolved.

Torick updated members of the newly created NAB FM Transmission Subcommittee in late February on developments to solve the multipath problems, reportedly indicating progress in resolving them.

According to NewCity Communications VP/Engineering John Marino, chairman of the FM subcommittee, Torick's presentation involved details that "looked pretty positive."

He added that Torick stressed that there was "no hurdle that could not be gotten over."

Even so, Marino, like other members of the subcommittee, said they still "did not know the whole story" regarding the structure of the new partnership for FMX.

Keller said that the upgraded FMX system, which includes changes at the transmission end, did not exaggerate multipath on affected receivers—which he admitted could be upwards of 60 to

(continued on page 6)

General Electric, parent of NBC/RCA, is donating its David Sarnoff Research Center to Stamford Research Institute. See story on page 10.

Companies "Allied"

by **Alex Zavistovich**

Indianapolis IN ... Radio stations interested in buying Harris Broadcast radio products or all the other lines of equipment carried by Allied Broadcast Equipment will now be able to purchase much of that equipment from either company, owing to a recently struck joint sales and marketing agreement.

Under the US-only arrangement, announced 2 March, Allied has been designated "exclusive authorized representative" of Harris transmission gear. Allied's sales staff will market the Harris line of AM and FM radio transmitters, with Harris handling actual sales.

Harris Broadcast Division VP/Marketing, Gary Thursby, added that Allied will act as a "source of supply" for many of Harris' vendor items.

A number of Harris products—audio consoles, remote control systems, and some unspecified new products—will be moved into "general distribution," rather than OEM, factory-direct sales, Thursby commented. These products, he said, will be authorized to Allied for distribution.

Other Harris equipment for which

(continued on page 9)

Regulatory News

L-M Groups Object to ID Costs

by Alex Zavistovich

Washington DC ... High implementation costs of automatic transmitter identification systems (ATIS) for radio equipment have been cited by land mobile and other concerned groups objecting to such a system in comments recently filed with the FCC.

In August 1986, the Commission proposed an ATIS system for satellite video uplinks, and asked for comments on a similar system for all broadcast services and radio transmissions.

> *"The costs of "administering, implementing, and maintaining ATIS" outweigh any potential benefits.*

The ATIS system would assign a unique number to every transmitter upon manufacture. The number, which would be modulated onto the unit's transmission, would correlate to a licensee's database and act as a signature of the radiated signal.

Limiting interference

In its comments, the SBE supported ATIS "primarily as a means of identifying stations in the Broadcast Auxiliary Service (BAS)" which create unintentional interference. The group considered ATIS to be a "useful tool," so long as a method of translating an ID code to a particular transmitter was available.

The group held that ATIS would be beneficial for "identifying stations on BAS frequencies which have not participated in the local frequency coordination process, and which are causing interference to other users."

"Further research should be done and a prototype system should be developed and tested for aural ATIS before further regulatory action is proposed," SBE suggested.

Bellsouth Corporation, a common carrier concern, stated that "the Commission should not consider imposing a requirement that radio services other than satellite uplink transmitters use ATIS."

The company stressed that there was no adequate evidence that any benefits to services other than satellite uplink transmitters would offset the expense of the systems.

"Many radio services are making every effort to reduce costs in order to make services more widely available to the public," Bellsouth noted. "Any additional costs imposed by an ATIS requirement would impede this effort."

Not for land mobile

The California Public Safety Radio Association (CPRA), a frequency coordinator in Southern California, objected to the use of the identification system "in most phases of the land mobile radio field."

Use of such a system, CPRA said, "should be limited to service where there is a high potential for interference, such as radio transmitters with external frequency controls."

The costs of "administering, implementing, and maintaining ATIS" outweigh any potential benefits, the group added.

The Facilities Management Department of the County of Los Angeles also opposed the ATIS proposal, maintaining that, "at this particular juncture, the County feels that the Commission must conduct feasibility studies on the policy issues surrounding ATIS."

The group held that additional study must be made on "the adverse financial impact of the implementation of the technology, and clarification of technical uncertainties."

According to the county's filings, the study should yield results that guide the Commission in the structuring of rules for the use of ATIS that will be the most beneficial and economical to the eventual user.

FCC docket number is GEN 86-337. For additional information, contact John Hudak at the FCC: 202-632-6977.

INDEX

FCC Clips

Fee Inquiry Hotline

The FCC has established two "hotlines" for those with questions about its filing fee program, which is scheduled to start 1 April.

Commission staff will be available between 8 AM to 5:30 PM (EST) "to provide guidance on the amount of fees and filing procedures," the FCC said.

The phone number for mass media, common carrier and equipment authorization fees is 202-632-FEES. For information about fees in the private radio service call 717-337-1212. Both numbers are subject to long-distance tolls; the FCC said it would not accept collect calls.

Information about the fee program is available for inspection and copying at the Commission's headquarters at 1919 M St. NW, Washington DC 20036. Related documents are available in the FCC Dockets Room, Room 230, or the FCC Library, Room 639.

The complete text of the fee program can be purchased from International Transcription Service (ITS), which can be reached at 202-857-3800.

Details about the fee program are contained in FCC docket GEN 86-285. For more information contact Brent Weingardt in the FCC's Office of Managing Director at 202-632-3906.

Comment Deadlines

The FCC has released the public comment and reply comment deadlines on several docket issues that have been covered in previous issues of **RW**.

Comments on docket MM 87-7, which deals with amendments to the FCC's broadcast ownership rules, such as allowing the ownership of more than one AM station per market, are due 13 April. Reply comments are due 13 May.

Comments on docket MM 87-11, which proposes changing the FCC's call letter system, such as allowing "K" calls in the east and "W" calls in the west, are due 17 April. Reply comments are due 4 May. The plan would also permit unrelated parties to share call letters—for example, an FM station in one market could use the calls of an AM or TV station in another market.

Comments on docket MM 87-13, which proposed allowing hikes to low-powered FM boosters as long as no interference is created, are due 10 April. Reply comments are due 27 April.

For more information on these or other deadlines, call the Commission's public relations office at 202-632-5050.

Boston Office Moves

The FCC's Boston office has a new address as of 2 March. It is NFPA Building, Batterymarch Park, Quincy MA 02169. Office hours are 8 AM to 4 PM. Its phone number is 617-770-4023.

New Efforts To Promote NRSC

by David Hughes

Washington DC ... The National Radio Systems Committee (NRSC), has started a campaign to promote the voluntary AM pre/deemphasis standard, as well as beginning work to develop an RF AM antenna emissions or "mask" standard.

A logo, a direct mailing, visits to receiver manufacturers, demonstrations, and even a toll-free hotline, are being arranged to promote the NRSC's AM 75 μS pre/deemphasis standard, which was approved by the NRSC in January.

The NAB will use a new logo, designed around a microphone graphic and reminiscent of radio's "golden years" to promote the NRSC standard to broadcasters, receiver manufacturers, and listeners.

Those gathered at the 25 February meeting of the NRSC's Methods and Procedures Subgroup, discussed details of the overall "I'm Improving AM" campaign.

According to NRSC member and NAB Engineer Mike Rau, AM station managers will be receiving a mailing to detail the standard and answer key questions such as how much it will cost to comply. A telephone "blitz" of broadcasters is also planned, as well as meetings with various state broadcasting organizations, Rau indicated.

A toll free number—1-800-NAB-NRSC—was scheduled to be in operation by mid-March, Rau added. Officials from the NAB's Science and Technology office will be on hand to answer questions about the standard.

Rau reported that he has received many favorable calls in response to the standard.

Several firms have launched advertising campaigns to encourage broadcasters' support for the new standard.

In a recent ad, Circuit Research Labs (CRL) said it "fully supports the new NRSC standard." It maintained that all of its audio processing equipment can be modified to the new standard. "Full retrofit kits will be available at a nominal charge starting in April," CRL added.

The firm has also unveiled two products—the SPF-300 standard preemphasis filter for AM broadcast transmission and the MDF-400/800 deemphasis filter for AM monitors—that comply with the standard.

Texar Inc. has also started an advertising campaign to support the standard. "Cost to each station to implement the standard should be minimal," the firm stated, with conversion kits available. The firm also has an NRSC compliant monaural AM processor—the Phoenix.

At the subgroup meeting, Texar President Glen Clark said that the standard is "the hottest thing on the phones now."

"We have to spread the word," Rau added.

Also at its February meeting, the NRSC subcommittee discussed the development of a voluntary standard for an RF mask.

The meeting was said to be the first in a series in which RF emissions from the transmitter will be scrutinized for "anything spurious which might cause interference," according to NRSC Co-chairman John Marino, VP/engineering of NewCity Communications.

The worst case of RF emissions coming off the antenna, based on the 10 kHz bandwidth limit, will be the mask, he indicated.

The RF masking work follows the NRSC's approval of the voluntary 75 μsec pre/deemphasis standard. The NRSC, a joint NAB/Electronic Industries Association (EIA) committee, has also developed a 10 kHz AM transmission stopband as part of the standard.

The NRSC's upcoming work will focus on the RF mask's impact on AM stereo and various types of exciters, as well as with older transmitters. Rau indicated that a theoretical RF masking model would be needed, in addition to on-air testing.

"It could take about a year—more or less—to complete the project," Rau said.

"There is a lot of work and research to do," Marino added. "We'll be taking a look a mono first and then get into stereo."

The NRSC will continue its work on RF masking when the subcommittee holds its next scheduled meeting in late April. For more information contact Mike Rau at the NAB, 202-429-5346, or John Marino at 203-333-4800.

FM Issues Targeted

Washington DC ... The problems associated with Class A FM power upgrades, as well as the future of the FMX FM stereo coverage extension system, were key topics at the first meeting of the NAB's FM Transmission Subcommittee, held in late February.

The new subcommittee was formed to explore improved FM transmission, and parallel the AM band improvement work being conducted by the NAB and the National Radio Systems Committee (NRSC), according to NAB Engineer Mike Rau, a subcommittee member.

Subcommittee members discussed a proposal by Clear Channel Communications that is expected to be submitted to the FCC this spring for a hike in the Class A FM power limit from 3 kW at 100 m HAAT (or the equivalent) to 6 kW at 100 m HAAT.

John Furr, CE for Clear Channel Communications and a subcommittee member, said that many Class A's currently suffer severe interference from much higher powered Class B's and C's.

Furr said his firm will file the rule change request with the Commission this spring—probably in April or May,

(continued on page 8)

Multichip Study Set to Begin

by Alex Zavistovich

Washington DC ... The National Telecommunications and Information Administration (NTIA) is targeting early summer for release of its study of AM stereo multisystem chip technology.

Meanwhile in a separate action, a petition filed with the FCC by a broadcast engineer has urged the Commission "to adopt rules or cause legislation to be introduced" requiring multimode decoders.

The NTIA, which will be conducting multimode testing at its Boulder, Colorado reseach facility, proposed examining the AM stereo technology in its early February report on the status of AM radio. In doing so, the NTIA avoided choosing between the Kahn and Motorola systems as an AM stereo de facto standard.

Instead, the NTIA sugggested that AM stereo might best be served by increasing the compatibility between the two systems and radio receivers.

Study not yet begun

At **RW**'s press time, Val O'Day, the executive officer of the NTIA's Institute for Telecommunications Sciences (ITS) in Boulder, said the institute is still procuring the equipment to be tested and has not yet begun the study.

The institute, NTIA's chief office of research and engineering, will attempt to resolve questions surrounding multisystem chip technology and make a report available by "May or June," O'Day said.

A number of chips will be tested—"as many as we can in the marketplace," he said. For reasons not disclosed by O'Day, the group decided to broaden its original study, which was to be primarily directed at the Sanyo design.

Although he declined to provide details of the testing, O'Day said that ITS would look at multisystem technology in the context of both Kahn and C-QUAM stations. The group will pay particular attention to any possible system reception degradation when using multimode.

Kahn Communications President Leonard Kahn said that the NTIA was expected to have a "thorough, exhaustive testing," noting that much of the study would be conducted by engineers formerly employed by the Bureau of Standards.

At the same time, Motorola, which disagreed with the NTIA report, is working on its own study of multisystem decoders, according to Motorola's Manager of AM Stereo Frank Hilbert.

Motorola's study, which may be available at the NAB show, will discuss the history of such systems, including Sanyo's, and will attempt to show why some "failed in the marketplace."

Multisystem petition

An FCC-backed multisystem receiver standard was also proposed in a petition filed in late December 1986 by Winfield Standiford, a broadcast engineer at a Washington DC area radio station.

Among other things, Standiford, who filed as an individual, urged that "every FM/AM radio or tuner equipped for stereo reception in either the AM or the FM mode be capable of stereo reception in both."

Press Broadcasting, owner of a C-QUAM station in Asbury Park, NJ, previously submitted a multimode petition to the FCC.

At press time, according to the company's VP Robert McAllan, no action has been taken on the petition.

In defense of the multisystem position, the Standiford petition maintained that it might be to broadcasters' advantage to maintain two AM stereo systems, particularly for those stations which intend to broadcast in synchronous transmission.

"Nobody knows what interference will be like between a (synchronously transmitting) station and itself," Standiford told **RW**. He commented that "tolerances of locking a synchronous transmitter to the main will be much more precise if you use any system other than C-QUAM."

Platform motion

According to Standiford, Kahn's ISB system seems to be immune to the so-called platform motion problems experienced by C-QUAM. It would be more expensive and more difficult to lock a C-QUAM station to a single frequency, Standiford said, although he stressed it is possible.

Kahn agreed that any problems of platform motion would be aggravated in synchronous transmission.

Platform motion is caused by either skywave/groundwave interference or co-channel interference, Kahn claims. With synchronous transmission, the stereo image would move between transmitters, and at night, with skywaves/groundwaves, the movement would worsen, he feels.

However, according to Hilbert, the Kahn system is a "modified" independent sideband system and has the same sensitivity to directional array asymmetry and phase stability as C-QUAM.

Hilbert asked, "if (platform motion) was anything to worry about, would there be as many receiver manufacturers and broadcasters on C-QUAM as there are?"

Still, Standiford predicted that "ultimately, the broadcast industry will go to multimode." Using a Sony XR37 AM stereo receiver with automatic system decoding, Standiford made a number of off-air recordings of the Kahn, Motorola and Harris systems and found each signal "satisfactory."

If the NTIA uses a comparable receiver to test the systems, Standiford said, it should reach the same conclusion he did—the systems are compatible and there is no degradation.

For additional information, contact Winfield Standiford at 202-885-4141. Contact Kahn Communications at 516-222-2221, Motorola at 312-576-3495, or the Institute for Telecommunications Sciences at 303-497-3484.

Strikeout for Kahn Splatter Complaint

by David Hughes

Washington DC ... For the third time in a year, the FCC has rejected a Kahn Communications complaint alleging that rival Motorola's C-QUAM AM stereo exciters violate the Commission's emissions limitation rules.

The FCC, in a Memorandum Opinion and Order issued in February, indicated that the charges filed by Kahn Communications President Leonard Kahn that C-QUAM exciters violate bandwidth limit rules were "without merit."

The Commission also rejected Kahn's allegations that the FCC's type acceptance and station monitoring programs are not sound.

In April and July of last year the FCC rejected two previous allegations by Kahn about C-QUAM exciters.

In those complaints, filed with the FCC in March and April 1986, Kahn alleged that C-QUAM stereo exciters violated FCC rule sections 73.128 and 73.44, which contain the AM stereo emission limits.

The FCC indicated that Kahn had submitted data showing that a Motorola exciter, when fed single test tones at 10 kHz and 15 kHz at 75% modulation, failed to comply with FCC rules.

The Commission's rejection of Kahn's March 1986 complaint was followed by a second Kahn complaint April 1986. That prompted the FCC's Field Operations Bureau (FOB) to conduct field tests of 23 C-QUAM stations, in addition to several Kahn and monaural stations, in May and June 1986.

Reporting on the FOB tests, the FCC's Office of Engineering and Technology (OET) said it found no significant violation of its rules. It informed Kahn in July 1986 that it intended to dismiss the complaint.

In August 1986, Kahn reportedly filed a request to obtain test details and asked for an oral hearing with FCC commissioners.

However, Kahn told **RW** recently that the oral hearing was never held.

Results of the tests were released in September and reported in **RW** in October.

Latest dismissal

In an order issued 19 February 1987, the FCC handed Kahn its latest rejection. It said that "Kahn's fundamental disagreement with (FCC) staff is over his interpretation of Section 73.128 of the rules."

That section requires that emission limitations be met "under all possible conditions of program modulation," the FCC said.

"Kahn interprets literally the requirement that 'the transmitted wave must meet the occupied bandwidth specifications of section 73.44 under all possible conditions of program modulation.'

(continued on page 8)

Opinion

Readers' Forum

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

Colligan replies

Dear **RW**:

Here is my reply to those who have written in to comment on my article in the 15 January **RW**.

The primary issue seems to focus down to this question. Should we use the *theoretical* ratios and phases to compute proximity correction factors or use some alternative values from antenna monitor readings? My opponents seem to feel that the former is inappropriate.

The fact is that I once asked a high official in the Mass Media Bureau that very same question. He insisted that *theoretical* parameters be used and I mentioned that in my article.

In 1974 a proof of performance was done, by me, on a station in Puerto Rico. My employer was A.D. Ring & Associates. Since the station was located within a mile of the island's north shore, measurements in the ocean would have been extremely expensive and dangerous to life and limb. My own boat, a 60' twin diesel, would have never hacked it!

Put to the A.M. Branch of the Mass Media Bureau, it was not only approved but, in fact, suggested that *theoretical* parameters be used to calculate the correction factors.

The computations were done back in the DC office and sent down to me. The proof was accepted, by the FCC. So much for "traps," "misguidance," "finagle factors," "misuses," etc. The opening and closing paragraphs of Mr. Bixby's article (15 March **RW**) dignify no further comment.

The AFCCE has instituted an ad hoc committee to resolve this issue. I anxiously await their conclusions and I expect it to result in a forthcoming rulemaking petition or at least a firm policy statement from the FCC. The latter is the sole, proper and governing forum. As I always do, I will remain in total conformance with law, whatever *they* decide.

I am a senior member of the IEEE Professional Group on Instrumentation and Measurement, an area in which I am a patent holder, and we take a very dim view towards "finagle factors" and "jokes" about them. I don't deal with either. I conform to the law.

The late Chief Justice Charles Evans Hughes once stated, "the Constitution of The United States means whatever The Supreme Court says it means." It was his way of saying that the law is not always perfect but it always is the law.

When the AFCCE ad hoc committee reaches the point of filing an RM petition or a policy statement, I look forward to fully supporting it.

Frank S. Colligan
Frank S. Colligan & Associates
Bethesda, MD

AM Quad

Dear **RW**:

I think that we have all beat the AM stereo issue around enough to realize that neither "side" will give in. I believe that I have the answer that will not only make both Kahn and Motorola a lot of money, but will propel AM past FM to a level never imagined.

Let us first realize that all we have been

(continued on page 16)

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New Life for FMX?

The NAB's most recent efforts on behalf of improving FM broadcasting make sense, and are a welcome complement to its AM improvement efforts.

NAB's formation of a for-profit subsidiary, NAB Technologies, and its partnership with Broadcast Technology Partners will help foster the continued development of the FMX stereo extension system.

Last year FMX fell victim first to unresolved concerns about multipath problems and then to the closing of the CBS Technology Center where most of the FMX research was being conducted.

For FM stations to become interested in this new technology, they first need to be assured of a system which is workable, and it appears that many of the early bugs of FMX may have been worked out.

But a small warning bell should be sounded about the NAB's involvement in setting up a for-profit subsidiary.

The fact that an entity with as much influence as the NAB is getting involved in a profit-making manner with another company carries the potential for problems.

The Association will have to be cautious and engage in only true "arm's length" transactions with NAB Technologies so that there won't be even a hint of impropriety.

There is also the question of the revenue split of royalties on the FMX patent, jointly held by Emil Torick, formerly of the CBS Technology Center, and a partner in Broadcast Technology Partners, and Tom Keller, NAB Senior Vice President, who is also a partner in the new company.

Since NAB is involved, there should be a clear statement regarding the financial arrangements, which might otherwise be considered confidential.

But the biggest question might be that if the NAB is willing to promote the FMX system (even though there are no competing systems yet), why can't they put the same effort towards resolving the AM stereo situation, which remains a much more urgent concern to AM broadcasters?

The responsibility for the resolution of AM's stickiest problem still must lie with broadcasters, and it remains the responsibility of the organization that purports to represent them to become the catalyst to do that. AM stereo is the ultimate AM improvement and deserves the effort.

—RW

Combo AM-TV Good for Both

by Lloyd Berg

Tampa FL ... The ultimate destiny of the AM band (and those who hold AM licenses) is often debated. Some say that AM will die a slow painful death, or maybe shut off by mutual agreement once more FMs are created to take AMs place.

Others say it will become a secondary band, similar to minor league sports. Some believe that the law of the jungle will kill off all but the strongest and those few who remain will eventually evolve into superpower giants who will cover the whole continent but become as obscure as today's shortwave broadcasters.

In some countries the government has decided that AM is out-dated, or that the wide (international) coverage areas possible at AM frequencies is a threat to security, and have switched all internal broadcast operations to VHF FM with its carefully controlled and defined reception area.

The opposite of all of the above may be true here in America where the FCC has made some interesting proposals in the interest of saving AM.

These plans involve the removal of program restrictions and duplication rules, and the ability for a broadcaster to own an AM-TV combo in the same market.

If this type of de-regulation is enacted, I believe that we will all see a very interesting rebirth of AM purchasing, listening and ratings.

Lloyd Berg is CE of WUSA/WDAE, Tampa, FL. The opinions expressed here are his own, and do not necessarily reflect those of the station or company he works for. He can be reached at 813-876-0455.

Guest Editorial

One of the wonderfully well-timed aspects of the current move to open the AM band to new uses is that AM receivers are still very common.

If AM de-regulation does not happen now, AM receivers will start to become less and less standard and any AM band rebirth will be much more difficult.

If approved, I believe that you will see TV stations purchasing full-time AM stations in order to simulcast the aural portion of their programs on the radio.

Their incentive would be to pick up an otherwise untappable audience that may be doing activities that don't allow viewing but do allow listening.

Examples would be listening in the car, at work, while cutting the grass, shoveling snow, taking the kids to the park, jogging, or at the beach/pool, etc.

Those who own unsuccessful full-time AMs will be able to get their money out of them by selling to TV stations (and possibly use the money to build or purchase an FM).

Those who own day-time AMs will have fewer like-format competitors, (or they may be able to sell back their licenses to allow regional or clear channel AMs to expand and use the money to build or purchase an FM).

Those who own successful AMs and who decide not to sell will have fewer like-format competitors.

FM broadcasters will welcome the reduction in like-format competition from the AM band.

Since there are always many more AM stations than TV stations, there will still be plenty of low cost AM stations available (with fewer aural-only competitors) giving the fledgling entrepreneurs and minorities a better chance of success.

Radio listening will increase, largely due to the free publicity that the TVs will give AM in order to promote their new aural outlets.

TV production that has always relied heavily on the audio content will want to give even greater care to the audio track(s) in the future.

TV managers and chief engineers will

(continued on page 9)

Stations Choosing Liquidation

by **Alex Zavistovich**

San Mateo CA ... In addition to auctioning and brokerage of broadcast properties, a third option may exist for groups looking to sell off their facilities—liquidation, the piece-by-piece sale of a station's assets.

Traditionally, sales of AM and FM broadcasting operations have been dominated by media brokers using negotiated sealed bids and other similar methods.

Lately, however, commissioned auctioneering firms have also entered the arena, and liquidation is considered by some in the industry to be a similar marketing niche.

Gary Bell, president of the liquidation firm G. V. Bell & Associates, has noted a "steady rise" in the number of stations choosing liquidation over auctioning.

"Auction sales are not providing a consistent return on larger dollar items," Bell said, which he attributes to corporate buyers being "unable to react in the one- or two-day auction frenzy."

A liquidation is ususally conducted piece-by-piece, Bell said, and applies to equipment, licenses and real estate. Occasionally, however, a complete turnover of the facility, intact, is undertaken, he said.

The liquidation option can be more profitable to sellers than auctioning, according to Bell.

Another G. V. Bell & Associates spokesperson said that auctions usually return between 70% to 75% in sales, while liquidation can return "a minimum of 90% for sales conducted on an owner's site."

Bell declined to identify past broadcasting properties which have used his company to liquidate their assets, citing customer confidentiality.

Liquidation, Bell explained, has been used primarily in situations where a station was being dismantled; the method is also used, however, when a facility is updating and wants to sell its old equipment.

Unlike auctioning, liquidation does not have to work in a narrow time constraint, Bell said. The amount of time needed to sell by liquidating is dependent on the equipment for sale and the seller's time frame for completion of the transactions.

Including discrete trade advertising, mailing and canvassing, Bell estimated it may take three to four weeks to conduct "a good, thorough sale."

Although in many cases liquidators are used when a station is being dismantled, the method is not regarded only as a last-resort measure in broadcast sales.

The Radio Marketing Coordinator for Baltimore-based Michael Fox Auctioneers, Robert Sczepanski, said liquidation is a legitimate selling option, part of the segmentation of selling services.

Beyond the traditional means of owner- or broker-negotiated selling, Sczepanski said, there are various other niches for broadcast sales, such as auctioning.

Michael Fox, for example, has been involved in auctions since May 1986, recently completing the sale of WCCR-AM, Brentwood TN, for $150,000.

Liquidation, according to Sczepanski, is another sales strategy, for situations where selling a facility in its entirety may not be feasible.

In such situations, the "plug may have been pulled" from the operation, Sczepanski said, followed by a decision to sell, at asset value, the items comprising the facility.

Timing may also be behind a decision to use liquidators, rather than other types of seller, he added. If a broker or auctioneer had become involved with the product business earlier, Sczepanski maintained, it may have been sold in its entirety.

Sczepanski cautioned that there are factors to consider before selecting liquidation. Rather than selling off assets piece by piece, he said, it is usually preferable to sell a complete property, "because then you're also selling the potential."

For additional information, contact Gary Bell at G. V. Bell & Associates: 415-341-4242, or Robert Sczepanski at Michael Fox Auctioneers: 800-722-3334.

FMX Boost

(continued from page 1)

70% of the current receiver crop.

Tests of the new FMX system were performed in February in a hilly area of Connecticut with a "standard car radio" in a moving car, Keller said.

He would not, however, detail what changes in the FMX system were made because of what he said are legal issues involving patent clearance.

Yet Keller did reveal that recent "blending" studies indicate that the FMX system can improve a station's stereo coverage in car radios.

Tests on FM receiver blending, in which the unit automatically switches to mono in high stereo noise areas, indicate that many receivers currently stay in the mono mode within up to two-thirds of a station's coverage area, Keller said.

FMX, he maintained, can increase the zone in which car radios will remain in the stereo mode.

Details on these tests were expected to be presented at the NAB show in late March.

Research and development work for FMX will continue to be based out of space leased by BTP at the CBS Greenwich facility. For more information contact Tom Keller at the NAB: 202-429-5346.

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Group Looks at FM

(continued from page 3)

before the US holds international negotiations with Mexico this summer.

"We want to get the petition in before (the negotiations), so that they can include the Class A question in the discussions," he maintained.

The blanket power hike plan, when filed, would follow a Commission decision in late December to remove the 3 kW/100 m power equivalent restriction on the 20 reserved Class A channels. The Commission said it did not address the blanket hike because it was beyond the scope of the proceeding.

However, many Class A FM broadcasters say that band crowding conditions prohibit them from upgrading to B's and C's. They, like Clear Channel, want a blanket, across-the-board increase for existing Class A's.

Minimize Class B & C problems

Furr said that while the FM subcommittee group is "interested in doing something" to to remedy problems faced by Class A's, "we want to minimize the impact to Class B's and C's."

NewCity Communications VP/Engineering John Marino, chairman of the FM subcommittee, added: "We are not ready to say yes to Clear Channel's Class A proposal. We asked them to modify it to take into account interference to Class B's and C's—to minimize overlap."

Rau indicated that the subcommittee will study the improvement of "technical tools" which would help ensure that Class A increases do not interfere with other FM stations. Improved propagation and terrain models, as well as antenna studies are needed, he said.

FMX and more

At the February meeting, the future of the FMX stereo extension system was also discussed. Rau said that FMX Co-developer Emil Torick, formerly of the CBS Technology Center, presented a "favorable report" on possible solutions for receiver quadrature rejection problems that cause multipath type interference.

(For more details on FMX, including details about the creation of a new NAB for-profit subsidiary to aid the FMX project, see the related article in this issue of **RW**.)

The newly-formed subcommittee plans to examine many other issues during the upcoming year including receiver quality standards, new antenna designs, the plan for an "FM2" band in the 220 MHz range to aid AM daytimers, Docket 80-90 problems, as well as many "nuts and bolts issues."

The FM subcommittee plans to meet about four times per year. The next meeting is scheduled for 29 April. For more information contact John Marino at 203-333-4800.

FCC Denies 3rd Try for Complaint

(continued from page 4)

Thus he posits a 'worse case' test where at 100% modulation single test tones at very high frequencies fed into a single channel must produce no out of band emissions," the FCC said in its February order.

"Wielding this interpretation Kahn proceeds to attack the Commission's type acceptance process for failing to test stereo exciters at such rigorous parameters," the FCC added.

However, the FCC maintained that its AM emissions rule "does not require compliance during all conditions of modulation regardless of how artificial the circumstances. The obvious concern is for out of band emissions that might be caused during broadcast operations, not laboratory contrivance."

"Of course one can imagine conditions that might result in out of band emissions—Kahn has done so—but," the Commission continued, "the presence of single tones at very high frequencies and modulation levels would be 'extremely rare' in broadcast programming."

The FCC concluded in the order that it stands by its radio station monitoring and type acceptance procedures. "The Field Operations Bureau monitoring showed unequivically that there is no generic out of band emissions problem with either the Motorola C-QUAM or the Kahn AM stereo exciter," it said.

Kahn responds

Responding to the FCC's February order, Kahn told **RW** that he had not decided on a future course of action regarding the complaint. "It's not my fight, it's the broadcasting industry's fight," he said. "The AM industry must speak for itself."

However, he called on engineers at stations where Motorola exciters are in use to "do their own tests. Let's see whether or not they (the FCC) are correct." He maintained that the FOB's tests last summer, which were based on field rather than lab measurements, were "not scientific."

Motorola officials have repeatedly stated that Kahn's allegations did not merit consideration. They stress that C-QUAM equipment complies with both type acceptance requirements and the requirements of other nations with tighter rules.

For more information contact OET Engineer Bruce Franca at 202-632-7060, Leonard Kahn of Kahn Communications at 516-222-2221, or Chuck Sengstock of Motorola at 312-576-5304.

Harris, Allied Join Sales Effort

(continued from page 1)

Allied is an authorized distributor include AM antenna couplers, phasors and STL microwave products. Allied will be able to market, sell, install and service the products, another Harris spokesperson said.

Allied President Roy Ridge said his company's agreement talks with Harris began following the withdrawal of Broadcast Electronics' transmitters from Allied's available line. Having lost that transmitter line, Ridge said, Allied began looking for another "state-of-the-art" RF line to distribute.

Ridge said Harris has access to Allied's full catalog of equipment, with the exception of some unspecified "selected custom or specialty items." In sales, he noted, a customer may at times be visited by both companies, to market what Ridge called "the best of both worlds—

> *Harris and Allied sales people pursuing the same RF lead would gain nothing by bidding against each other.*

the Harris RF line and Allied's audio and systems capability."

Harris and Allied sales people pursuing the same RF lead would gain nothing by bidding against each other, Ridge maintained. He said there would be no advantage to one company trying to "sneak something in ahead of the other company" because each company, to some degree, gets credit for the sale.

In Allied's marketing function, Thursby explained, the company will represent Harris transmission products to customers, and "bring into play the Harris sales force to handle the actual sales transaction with Harris." For his efforts, the Allied salesperson would receive a "finder's fee."

The agreement with Allied does not spell the end of the Harris national sales staff, Thursby stated adamantly. Harris is committed to a factory-direct sales organization—"We need that level of sales and support," he maintained.

Among equipment manufacturers and sales people, reactions to the Harris-Allied agreement have been mixed. One source, a former employee of Harris, suggested that the sales agreement may allow the company to become more competitive.

"Harris has always been successful in selling products they manufacture themselves," the source said. However, he noted, they have become "increasingly less successful" at selling other manufacturers' products.

Harris has had to attach such a high overhead figure to all products bought for resale that the company could not offer discounts, the source contended. Competition from smaller distributors has hurt Harris' sales of such products.

According to the source, Harris employees said that management assured them they would continue working for the company as usual, except they will now be able to discount certain products. For them, he maintained, "that is good news—it should increase sales."

Allied will also benefit from the agreement because it will gain Harris' experience in RF sales, the source said.

"Allied has been at a disadvantage in selling RF equipment," he said, because of the site visits and specific knowledge required to market such equipment adequately. Allied will now recommend the Harris line, and will give Harris literature to prospective customers.

Broadcast Electronics President Larry Cervon, whose company withdrew its transmitter line from Allied's distribution earlier this year, noted, "it would be a great advantage to Allied to associate with a company like Harris." He questioned, however, whether Harris could actually stand to gain anything from the arrangement.

Cervon stressed, however, that BE's withdrawal of its line from Allied had nothing to do with dissatisfaction of Allied's performance. The company's transmitters are now handled by a group of independent representatives, chosen for their specific knowledge of RF.

"We decided to become even more sophisticated with our transmitter line," Cervon added, noting the company has established 18 sales territories in the US and Canada, with 29 sales people canvassing exclusively for transmitter business.

Cervon noted that the change in marketing applied only to BE's transmitter line—there has been no change in sales of audio or automation products regarding Allied.

For additional information, contact Roy Ridge at Allied: 317-962-8596, or Gary Thursby at Harris: 217-222-8200.

AM-TV Should Combine

(continued from page 5)

have to become aware of the peculiar coverage areas and patterns of AM transmission, as well as opportunities to upgrade that may have been too costly for the former AM owner to make.

The big TV money will allow the old and decrepit AM transmitter sites and directional arrays to be cleaned up, rebuilt and modernized, probably including new AM stereo to match the new TV stereo.

Competent AM radio engineers will continue to be, or return to be, respected, well paid and in great demand.

TV network affiliates will likely purchase Regional or Class II AMs to bolster their morning, noon and early evening news listenership, as well as mid-day soaps and weekend sports.

Aggressive independents who offer local news, first run programs and sports will also vie for the best AM channels.

Home shopping channels will also go after wide-area AMs, maybe clear channels. (Did you know that the nationally known Home Shopping Channel started here in Tampa Bay on an AM station!)

Music video channels, while struggling, may have to spend a substantial percentage of their worth to acquire an AM, and may even go the route of a merger in order to simulcast on the radio dial, in stereo of course.

Religious TV stations will naturally go after additional audiences on the AM band, ranging from daytimers to clear channel stations.

To summarize, everyone could come out a winner. What a great government we have to deregulate AM before it slowly starved to death (rather than after).

Now if we can just decide on an AM stereo standard, we will have all that we need to make AM last as long as FM and TV broadcasting.

Tower Icing Problem Studied

by Alex Zavistovich

Washington DC ... Ice buildup on broadcast antennas is at the root of "numerous" broadcasting problems, according to a final report by the US Army Corps of Engineers.

The recently released study also addresses means of reducing or preventing such frozen accumulation.

"Atmospheric Icing on Communications Masts in New England," written by N. D. Mulherin of the Corp's Cold Regions Research and Engineering Lab (CRREL), contains a survey of 108 station owners and engineers throughout the six states comprising the northern-most area of the US east coast.

Respondents to the survey reported on icing experienced throughout 1984-1985. Included were questions about regional temperatures, wind speed, wind direction, humidity, precipitation and percentage of sunshine.

"High towers on mountaintops are most likely to experience atmospheric icing and associated problems," the survey concluded.

"To protect the quality and dependability of their broadcasts, owners of high-risk installations must employ protection measures."

Causes and possible damages

According to the report, which examines levels of concern about the problem and ways to control it, " atmospheric icing of radio and television towers has long been recognized as a source of numerous problems by broadcasters."

One of the principal causes of tower icing, the study noted, is supercooled atmospheric moisture, in the form of in-cloud icing from suspended droplets. Precipitational icing from droplets that are large enough to fall from the atmosphere was also cited.

A heavy coating of ice can affect an antenna's RF wave propagation, resulting in signal feedback and voltage overload.

In some cases, the survey stated, massive chunks of ice have fallen from masts, damaging transmission lines, reflector dishes and antenna elements.

Towers can also collapse entirely under the weight of the ice. "Even with large built-in safety factors, combinations of high wind gusts and unequal weight distribution of heavy iceloads will continue to topple these structures," the report read.

Fortunately, it noted, few personal injuries have occurred in the past from falling ice or other accretion problems. Still, stations are often required to pay great costs for liability insurance.

The report recommends that stations allow for a "probable fall zone," and restrict land use in the area.

Solutions

The survey noted that tower icing in the form of glaze or frost causes thousands of dollars in damages to New England stations each year. Broadcasters in that region routinely plan for such damages.

"To most broadcasters in northern latitudes, transmitter tower icing is a phenomenon that is planned for as a normal component of operating costs," the report said.

"However, there is a level of risk that must be balanced concerning initial construction versus future maintenance."

Engineers in most cases must create their own ice protection "based on their experience in the field," according to the report.

Suggested solutions to the problems of tower icing included anti-icing (a preventive measure), and de-icing, in which ice is removed once it has formed.

The survey pointed out, however, that many anti- and de-icing procedures are not cost-effective, due to the large size of the towers.

Other reported methods of reducing tower icing problems are using polymer-coated antenna elements, heating the tower and using heat-absorbing paint.

Future work

At the New Hampshire headquarters of CRREL, where the study was prepared, investigations of atmospheric icing are continuing, Mulherin said.

He added that the research was sparked, at least in part, by "the high level of concern for the problems we have identified through the survey."

Other research underway or planned at CRREL includes vibratory tests on a guyed tower for glaze ice removal, testing of "coatings, materials, and structural shapes to reduce ice buildup," and improvements to numerical models for more accurate icing predictions.

For additional information, contact Nathan Mulherin at CRREL: 603-646-4260.

GE Gives RCA Lab to Stamford

by David Hughes

Princeton NJ ... General Electric (GE), parent of RCA/NBC, has announced that it will donate prestigious RCA Laboratories to Stamford Research Institute (SRI), effective 1 April.

The decision is the second in less than half a year in which a major broadcaster has rid itself of its research facility. In late 1986, CBS closed its Stamford, CT-based technology center which, among many other things, had been working on the FMX FM stereo extension system.

Like CBS, GE officials indicated that the company explored options to close the RCA Labs, which is more formally known as the David Sarnoff Research Center, or to possibly merge it with GE's Schenectady, NY research center.

But GE decided instead to keep it open and donate it to non- profit SRI.

Sources indicated that GE will obtain substantial tax benefits for donating the labs.

GE and SRI officials indicated that the RCA Labs staff of 1,200 faced a 25% to 35% reduction in early March, about a month before the 1 April date that SRI was scheduled to take over.

> *Like CBS, GE officials indicated that the company explored options to close the RCA Labs.*

According to RCA Labs spokesperson Julie Maddocks, 285 of the layoffs were "voluntary," in response to a benefits program offered by the company. Another 90 employees were cut, she said. Maddocks confirmed that the personnel cutbacks were completed by early March.

James Tietjen, director of the RCA facility, said the SRI agreement ended "uncertainty about the lab's future. We now know our future direction."

He added that work force cutbacks were necessary "to insure a competitive cost structure for the labs." Teitjen maintained that GE will handle severance benefits for the employees not joining SRI.

Despite the cutbacks, most at the facility were "very happy to be affiliated with SRI," Maddocks said.

According to SRI President and CEO William Miller, the acquisition of RCA Labs will give SRI "a strong presence in the important East Coast research corridor."

He stressed that the development "underlines the increasing importance of contract research" which provides research services to companies thereby freeing them of the need to have an in-house facility.

Tietjen added that GE will fund $250 million in consumer research contracts for the 350-acre facility during the next five years.

The RCA Labs facility, which was founded in 1942, was instrumental in a wide variety of research including the development of high fidelity stereo, digital techniques and computers, as well as videodisc systems, liquid crystal displays, MOS transistors and high definition TV.

Non-profit SRI, based in Menlo Park, CA, was founded in 1946. It split from Stanford University in 1970. With almost 3,000 employees and 50 laboratories, SRI conducts more than 2,000 research and consulting projects, generating more than $200 million yearly.

For more information contact Julie Maddocks at RCA Labs, 609-734-2000, Carolyn Simonds at SRI, 415-859-5815, or Bruce Bunch at GE, 203-373-2039.

Praise is a Positive Motivator

by Tim McCartney

Boise ID ... What is it that motivates you to be the best possible engineer at your station? Is it the technology? The challenge? The money? The hours? The praise? (*What* praise, you ask?)

Most employees *need* to feel needed at their jobs.

Taking compliments from the boss and peers is as important as any of the other major factors involved in a fulfilling position.

In fact, research suggests that the single most important factor is the satisfaction derived from "feeling needed" at work.

A study at Emery Air Freight Corporation in the early 1970s involved the established behavioral principle of *reinforcement* or *sharing*.

Psychologist B.F. Skinner, long associated with this approach, said Emery saved over $650,000 the first year alone during the study. How?

Appropriate, regular compliments replaced criticism of employees by their supervisors. This approach, coupled with seeking employee input on efficiency ideas, made the difference at Emery.

Lessons not learned

It seems that the lessons learned in the Emery experiment have, in general, been ignored.

However, some employees are fortunate enough to work for organizations which recognize the emphasis of praise over criticism as an effective management tool. And, those are the places where it is fun to work!

Why doesn't management do more praising and less criticizing? Labor tensions surely decrease some praise. And, pressures from competitors and other daily problems surely diminish another large share. But, the basic question goes largely unanswered.

Most engineers don't know what it would be like to have to work under conditions of incessant and persistent praise from their GMs.

Thus, there's not a lot of experience to draw upon in this area.

Let's assume, though, that most engineers could survive a regular onslaught of praise. The result would most certainly be a lot of happier and more productive engineers in the field.

One person who has been universally praised really has decided to move off center stage!

Garrison Keillor, the 13-year host of public radio's "A Prairie Home Companion" surprised several million fans in February. He announced that he would leave the show to return to writing and to the life of a shy person.

Praise notwithstanding

Keillor's long line of praise is significant: his picture on the cover of *Time*, a best selling novel, demanded on speaking and performing tours, heralded by critics, and even voted one of the ten sexiest men in America in 1986 by *Playgirl* magazine.

By all press accounts, this star has difficulty in accepting these compliments. Surely he is in the most rare position possible to take himself out of the limelight and thereby miss all the praise.

Most of us will never face choices such as this man from Lake Wobegon, Minnesota.

But, compliments at the right time and from the right person are extremely important.

They need to be brought out front and center and regularly involved in the activities of station management.

This is good advice not only for managers. Engineers who are moving into management positions also need to remember to add this tool to their collection, and put it to good use as well.

Tim McCartney, a regular contributor to RW *is CE of KBSU, Boise State University, Boise, Idaho. He is a former GM, SBE Broadcast Engineer, and has a masters degree in human resources development. He can be reached at 208-385-3663.*

The Freeman Effect

by Michael D. Callaghan

Los Angeles CA ... As engineers, we often hear complaints about strange problems that make no sense to us whatsoever. The symptoms seem absurd, and our trained analytical minds can't imagine what could cause them, so we are inclined to blame the trouble on a vivid (or expanded) imagination instead of a real cause.

Only after considerable thought and pondering do we happen across the real cause, and then the reason for the phenomenon becomes clear all at once.

That's likely to be the situation the first time an air personality tells you he isn't loud enough on the air. He says he can't hear himself in the headphones, that his voice is weak, and that although he can hear the music just fine, he can't seem to "Punch" through it when he talks.

Targeting the problem

If you listen to him off the air or in the production studio, the levels and balance are fine. Your reassurances about his levels fall on deaf ears; the announcer continues to complain about not hearing himself.

The first time this happened to me I made an aircheck for Paul Freeman, the announcer, to evaluate. I wanted him to hear what I'd been hearing.

He agreed that the tape sounded fine; but said that he wasn't anywhere near that loud while he was actually on the air. How, I was left to ponder, could he and I be wearing identical headphones plugged into the same source and be hearing different levels?

The answer took a while to surface, but it finally became apparent.

The cause has to do with the reason your spoken voice sounds different to you when you are talking as opposed to when you hear yourself through a tape recorder.

Bone conduction

When speaking, your ears actually pick up the sound of your voice by two separate paths—through the air (the same way everyone else hears you) and through the bones in your skull.

You are the *only* person hearing yourself through bone conduction, and if you are wearing headphones and the sound they produce is out of phase with the sound you hear through bone conduction, the two of them will cancel each other out, and you *will* sound weak to yourself through the phones.

The rest of the world, hearing you only through the air, will say you sound fine. But you, the only listener subject to the cancellation, won't agree with them. Because Paul Freeman brought this to our attention, we have labelled it the Freeman Effect.

Reversing the phase

The answer is to try reversing the phase of either the microphone or the headphones. Because the mic is usually balanced and the headphones aren't, it's easiest to turn the mic phase over.

We have a set of phase inversion adapters on hand just for this reason; male on one end and female on the other, with pins 2 and 3 reversed internally.

Flipping the phase should definitely make a difference, either for the better or the worse. If it doesn't seem to make much difference then it's time to look for phase rotators (sometimes called phase scramblers or all-pass filters) in the processing equipment.

In the tradition of the old Symmetra-Peak units, these are supposed to remove asymmetry to improve modulation percentages. But they also shift the phase.

If you find and want to keep them, then you may never be able to restore the proper phase relationship between the two sources—you can't correct 90° of phase shift by turning the leads in an XLR plug around.

If you elect to keep the phase rotators, you may also have to accept a compromise in the headphone system. In many cases, the use of phase rotators is best avoided anyway.

Individual mic equalization

Another step we take is to individualize the audio response of each jock by giving each of them his own equalizer. There are consoles that provide this feature, but we found it more versatile and cost-effective to use an outboard chassis.

This is a third octave graphic unit, and it's configured so that not only does each jock set his own response, but we also get to select mic gain and reverb levels.

At the start of each shift the announcer simply punches his own button. This ties in his own unique EQ, reverb and level settings.

In setting the system up, the initial equalizer curves are derived using a third octave analyzer fed by a recording of the announcer's own voice.

By compensating for specific dips and bumps in each announcer's voice we can smooth out the overall vocal response the station has on the air.

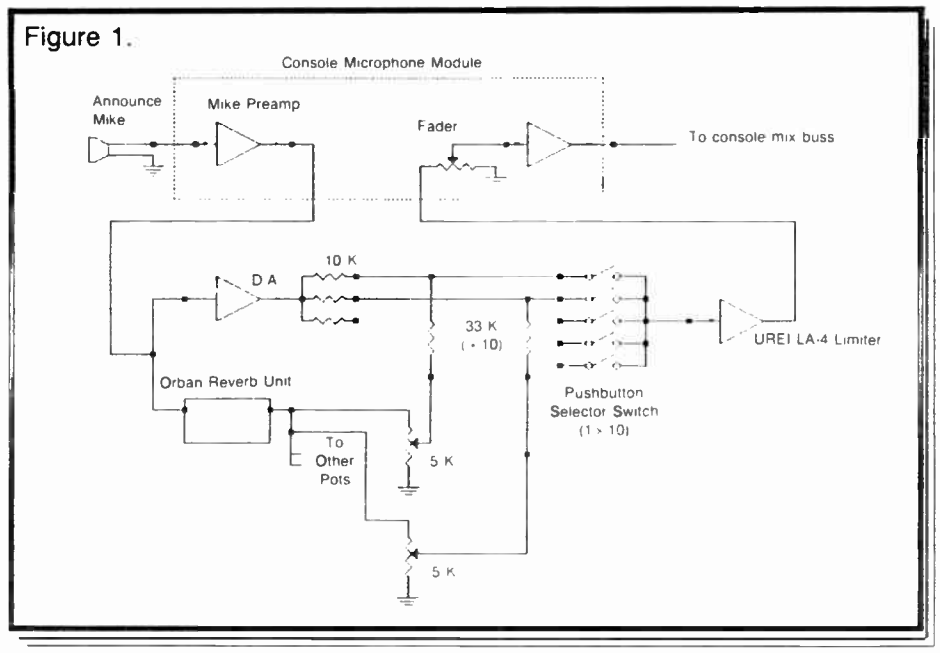
We use BSR equalizers from DAK Industries in Canoga Park, CA.

The mic system is unbalanced for the most part, and they interface easily with the system.

By using five stereo units we obtain ten channels of mic equalization. A 1×10 audio distribution amplifier provides a gain trim for each channel, and a separate panel holds the ten reverb controls. The specific circuitry can be seen in Diagram 1.

All in all, we find that being aware of the Freeman Effect has solved a lot of vexing mic chain issues for us.

Figure 1.



Mike Callaghan is CE of KIIS AM/FM and a frequent contributor to **RW**. *He can be reached at 213-466-8381.*

Self-Leverage Reaps Benefits

by John "Q" Shepler

Rockford IL ... Feeling pressured? How would you like to get a lot more done without working any harder?

Better yet, how would you like to buy something expensive without having the money or get job offers without having to fill out applications? No, it's not done with mirrors and magic. It is done with something called leverage.

There is nothing mysterious about the way leverage works. It is a principle that you work with every day at the station.

Consider the studio mic. If you connect the output of the microphone directly to the transmitter input, how loud would the nighttime screamer have to bellow to be heard across town?

I've worked with a few guys who can drive a volt and a half out of an RE-20, but they are the exception.

In actuality, our studio and transmitter equipment can broadcast a whisper over three states. Now that's leverage ... or its more familiar term: amplification.

Ever think of amplifying yourself? If you could build an engineering amplifier, for instance, you could set the gain to x10 and be chief engineer of 10 stations (for 10 salaries) all at the same time. How long would it take to get rich if you could set the gain to x100 or x1000?

Q-Tips

I don't know how to build such an amplifier directly, but there are leveraging techniques that can get you pretty much the same result.

The whole idea is to take something limited like skill, time, money, etc. and multiply it. Just like an amplifier takes a phono cartridge signal and drives a bank of loudspeakers, leverage can add a lot of power to your present skills.

Get more done per day

Let's see how we can put leverage to work in the station. One area where this would be useful is in maintenance chores.

Say you are spending six hours a day cleaning and aligning equipment and you would like to cut this down to three hours so that you can spend more time on the interesting projects. Hmmmmmm. That requires an amplification factor of two.

The first approach might be to hire a part-time assistant. If you could get a high school or college kid to clean tape heads for three hours a day, you could then spend only three hours yourself doing alignments.

The same six hours of maintenance would get done except you would have only worked three of those hours.

You probably see some snags in this approach already. First of all, no amplifier is 100% efficient and people aren't either. Therefore, you probably need the helper four hours a day plus your three hours to get what would take you alone six hours to accomplish.

Besides, you're still getting paid for six hours plus the helper is now getting paid four hours. The bill to the station just went up. So? Amplifiers don't run for free either. They run up the electric bill.

This situation might still be acceptable if what you are doing with the other three hours is needed badly enough.

Learn to delegate

Chances are that you can hire a tape head cleaner a lot cheaper than hiring a consultant or other high-priced contractor to build a studio or tune the directional array.

Another name for this type of leverage is delegation. Delegation is generally a good idea if you can live with the inefficiencies.

It's hard to delegate 100% because you will still have to give the helper directions and check-up on the work from time to time.

But delegation doesn't always have to add expense. Few people on salary are working all the time even though they are getting paid to.

I've had good luck delegating studio maintenance chores, like cleaning cart heads and pinch rollers, to the air staff.

Most of them buy the notion that it makes the music sound better if they spend a couple minutes a show with the cotton swabs and alcohol. Besides, they get bored during the network news anyhow.

Give some thought to who can help you with your duties. Maybe make a list of everything you do during the day from changing light bulbs to typing letters and see if somebody else can be sweet-talked into doing those things.

Subcontracting

It is hard to pass the buck on some jobs or even to hire part-time help. However, there are businesses that will gladly work part-time to do specific tasks.

How about lawn maintenance? Are you driving a tractor around the antenna field instead of putting new tubes in the transmitter? Hire a landscape service or a kid with a power mower.

Maybe you don't need that salaried

(continued on page 18)

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

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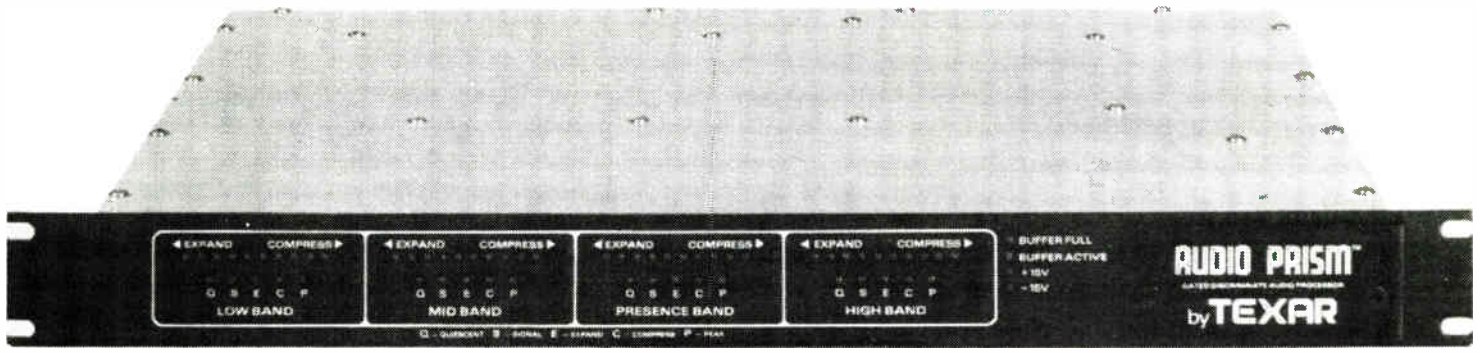


The National Radio Systems Committee (NRSC) voluntary standard for AM preemphasis and frequency response promises to bring high-fidelity to the AM band. Ratified January 10, 1987 after nearly a year in development, the standard establishes technical specifications for future transmission and reception in the AM band.

The NRSC was a joint effort of the National Association of Broadcasters (representing radio stations) and the Electronics Industries Association (representing receiver manufacturers), insuring the standard has support from both required groups.

The standard includes a preemphasis specification in conjunction with a brick-wall low-pass filter, to permit full-fidelity frequency response while preventing second-adjacent channel sideband splatter.

Come by Booth #2571 (downstairs) at the Dallas NAB Convention and hear the TEXAR PHOENIX, NRSC-Compliant monaural AM processor. With a suggested list price of $2745, you can't buy more AM processing power for less money . . . anywhere! Comparing in features and performance with units costing nearly **twice as much**, the TEXAR PHOENIX features variable-asymmetry, a voice phase-rotator to insure maximum modulation, and a low-frequency tilt corrector that can compensate for some weaknesses in plate-modulated transmitters. The PHOENIX also includes features you **don't** get with the competition, like the clean, powerful sound of digital-control, and individually-gated bands so record fades don't "swish-up."

Being on a tight budget doesn't mean you can't take advantage of the standard. Financing packages are available with monthly payments less than $100.

Present TEXAR AM users can upgrade to the NRSC standard by replacing the AMC-1 circuit board with the AMC-2 circuit board. Your AMC-1 is worth its full original price when traded in on the purchase of the AMC-2.

Not going to the Dallas convention? Call Barry Honel today at (412) 85-MICRO to arrange for a 10-day demo of the TEXAR PHOENIX in your station. Free copies of the NRSC standard are available from Barry or at the TEXAR booth in Dallas.

TEXAR

TEXAR INCORPORATED
615 Beatty Road
Monroeville, PA 15146-1502
(412) 856-4276
(412)85-MICRO

Circle Reader Service 30 on Page 22

Kit a Knight in Shining Armor

by Jack Cheese

Pasadena CA ... Back in 1964, when it was still profitable to operate a local AM daytimer, KHGL signed on the air in Pasadena, CA.

The station operated on 860 kHz and covered the city of license well using an end-fed longwire antenna.

But even in the heyday of AM radio, dollars were tight, and the station's construction budget had to be watched carefully.

For this and various technical reasons, the transmitter we chose for the new KHGL was a model manufactured by Knight Electronics.

The Knight transmitter (or Knight-*Kit*, to be accurate) was ideal for our application.

The transmitter was compact, taking up only ½ square foot of floor space, and could be powered by 115 volts AC or DC, single phase. There was no need to install three-phase AC service.

It used only three tubes and didn't have any unusual cooling requirements. In addition, the Knight transmitter included a built-in turntable and microphone preamplifier, modulation level control and an audio output for monitoring program modulation with a conventional loudspeaker.

Even with a relatively low output power of 100 mW, the Knight AM transmitter was rather cost-effective with a price tag of under $12 (plus shipping via UPS).

There was only one catch: As it's name implied, it was a transmitter *kit*; the buyer had to *build* it.

The Knight unit was assembled using point-to-point wiring; 1964 was too early for PC board technology.

Do-it-yourself assembly

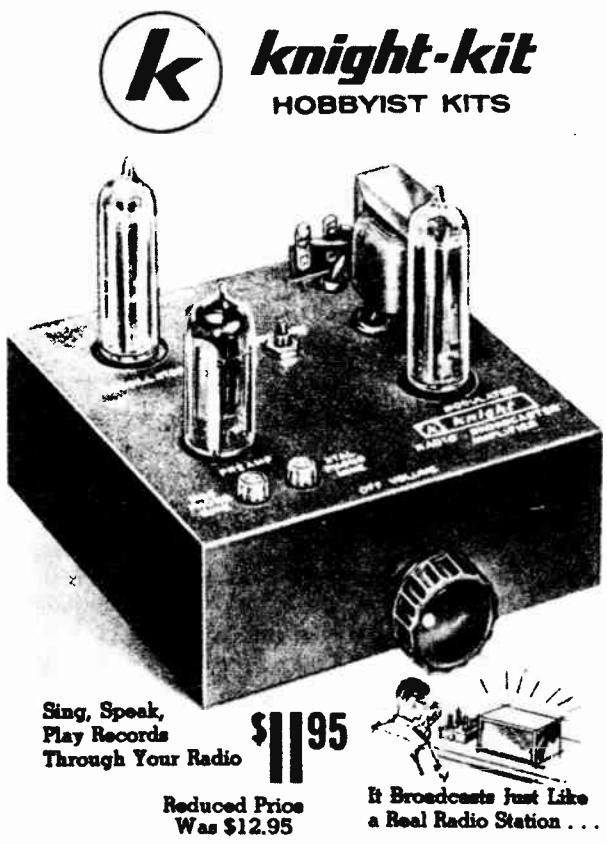
Assembling the Knight-Kit transmitter was straightforward, thanks to a well-written and illustrated manual. The process took about two days.

The transmitter design was conventional, employing three tubes: two type 50C5 beam power pentodes and one 12AX7A dual low-noise triode. One of the 50C5 tubes was the oscillator/RF power amplifier.

The carrier was generated using a free-running oscillator, the frequency of which was determined by a variable capacitor in the "tank" circuit. The operating frequency was adjustable over a range of 530 to 1610 kHz.

The RF output was taken from the plate circuit of this same tube, and coupled to the antenna with a broadband output circuit. There was no need for plate tuning or loading adjustments; the output section was broad enough to permit adequate efficiency on the entire AM band.

The RF oscillator/PA tube was plate modulated by the other 50C5, the modulator. The modulator circuit was also conventional, except that the modulation transformer primary was wired to the plate of the PA, and its secondary was therefore available for connection to an 8 ohm speaker.



This provided a convenient means of monitoring the modulating signal and eliminated the need for a separate mod monitor.

The most unique aspect of the Knight Kit transmitter was the inclusion of an RIAA-equalized magnetic turntable preamplifer.

Never since have I seen any transmitter that actually had an RCA jack on it labeled "mag phono input." The 12AX7A tube was the phono preamp, and would provide more than adequate modulation level when used with the recommended GE VRII cartridge.

A ceramic microphone was also provided, and would work when plugged into the "phono" input, though the RIAA EQ created somewhat exaggerated bass response.

When the Knight transmitter was first powered up, there was an unusually bright momentary flash from the filaments of the 12AX7A tube.

We determined this was because the 12AX7A did not have an 11-second controlled warm-up as did the 50C5's, and this was normal. (The tubes' filaments were powered directly from the 115 volt AC line.)

When all tubes reached their operating condition, full RF output was realized. The transmitter was operating perfectly, though off frequency.

The tuning capacitor was adjusted (with full RF output) until the correct frequency was obtained, as noted on a nearby RCA Victor AM receiver.

Before regular programming could begin it was necessary to run a Proof of Performance. Frequency response was tested using an audio generator, and confirmed expected response from 100 Hz to 8 kHz, being down 10 dB at 50 Hz and 11.2 kHz.

Distortion was also checked ... it averaged about 5% throughout the passband, rising to 10% at 100 Hz.

The lack of low-frequency response and excessive LF distortion was evidently caused by the limitations of the minute modulation transformer.

Noise performance was a bit disappointing. The SN ratio was only 30 dB at best, referenced to 100% modulation. Most of the noise was low frequency hum; reversing the AC line cord in the socket helped only a few decibels.

Even shorting the audio input had little effect. I suspected an AC ground loop in the chassis ground connections.

Since the Knight transmitter would operate from AC or DC, we actually connected 110 V worth of batteries to the unit and powered it from pure DC. The hum remained.

I could only assume that there was RF pickup somewhere in the audio circuitry causing the problem. Other than that, the audio performance was respectable.

Modulation was adjusted via a front panel knob (violet knob with white dot) to a maximum of about 85%.

Connecting a speaker to the audio monitor output lowered this to 70%, evidently due to the limited power output capability of the 50C5 modulator tube.

After the performance tests were complete, KGHL's regular programming began in the summer of 1964. It was very hot, yet the Knight-Kit transmitter performed flawlessly even with no cooling.

Frequency stability was good, with less than 50 kHz of drift after a 30 minute warmup period.

Only after three years of constant use did a problem develop: the selenium rectifier stack failed, causing a loss of plate HV, and producing an overwhelming odor in the control room.

Repairs were made in a few hours, and the Knight-Kit transmitter has been on the air ever since. A few rust spots have appeared on its once-gleaming blue chassis, but the transmitter has been reliable for over 20 years.

Fly by Knight

Unfortunately, Knight Electronics has been out of business for several years, probably due to stiff competition from "the big boys."

There were several hundred Knight AM broadcast transmitters made in the '60s, some of which are still on the air today.

They are an excellent choice for many AM daytimers, especially those with low-power pre-sunrise operating authority.

Though a used Knight transmitter will command a high price, usually well over five dollars, checking RW's used equipment listing will be worth the effort if you find one of these fine works of engineering expertise.

At KHGL, we wouldn't have anything else. As the saying goes ... "To keep station profits high as a kite, you must be on the air, Knight after Knight!"

Jack Cheese is CE of KCHZ Powercheese Radio (formerly KHGL) and he surfaces once a year on April Fools' Day. His alter ego, Hank Landsberg, is president of Henry Engineering, can be reached at 818-355-3656 and does not take kindly to the label "fool."

Circle Reader Service 27 on Page 22

Future Links CD to Computer

by Ron Schiller

Tenafly NJ ... The personal computer has suddenly become the focal point of a rapid convergence of technologies developed in the computer, video and music industries.

The differences in approach are as different as the spelling—it's an optical *disc* to video and audio buffs, a *disk* to the computer world.

Ron Schiller is a broadcast systems consultant, and his company R. Schiller Associates offers a variety of broadcast services. He can be reached at 201-568-1552.

The first mass market incarnation of the optical disk came recently, with the introduction of the audio compact disc, used for storing high fidelity music.

Since its commercial introduction in early 1984, the compact disc has succeeded dramatically.

The popularity of audio compact disc has resulted in an unexpected technological windfall for the record industry.

Clearly it is a seller's market for discs, and now venture capitalists and corporations are responding with an unprecedented investment in new pressing facilities. Several companies have announced plans for new disc manufacturing facilities.

Digital-based equipment is now advancing into the radio studio environment. The next step is the incorporation of compact discs with personal computers.

Software is now being designed to play in a preprogrammed sequence—or at random—any selection on any disc on any player using simple keyboard commands.

Determining needs

The computer will randomly access and control multiple CD players. The system will be able to play a preprogrammed musical sequence, or play any selection on any disk, in any order, by direct keyboard command.

The terminal will be able to display the music format including song titles, artist, ASCAP/BMI information and any other data required. The database can be encoded on the CDs themselves, or be incorporated into the system via hard or floppy disk drive.

The system will provide for prechecking, creating pauses, or start and stop cues. Time elapsed and remaining system status (i.e. edit, ready, on-line or on-air) can also be indicated.

The first step is for the radio station to construct a "wish list" of items needed to be encoded on the CDs or in the computer memory.

This wish list needs to be integrated into functional, tested software. The station will want to identify what variables or levels of control are needed so that the full benefit of CD accessibility can be achieved.

Digital quality is already legendary. With digital technology, the listener can at last begin to feel that he is there. Consequently, high fidelity will have to be redefined as higher fidelity.

Digital audio technology is not an extension of existing audio technology. It is a radically new approach. The changeover, once thought of as future technology, is in fact the immediate future.

This is because digital technology improves on cost effectiveness, sound re-

(continued on page 22)

Quad AM?

(continued from page 5)

trying to do with AM stereo is catch-up to FM. Big mistake. I don't care to catch-up to my competitor, I want to pass him.

Easy, if you think in simpler terms than nanowebers per degree day. Let us combine the Kahn and Motorola system and give the present AM listener Quadraphonic AM!

Why, I am even willing to make this idea public domain and waive all rights to royalties. I mean, if Iacocca puts four speakers in a car, he must have a reason and it's a step backwards to fill them with only 2 channels of sound.

One additional benefit is that now we will have 2 or more pilot tones to sell the rights to!

Oh, yes, the semi-registered trademark for this landmark of technology? KAHN-QUAM!

SBE can start planning for seminars, the exciter manufacturers will be able to sell us all new gear, and gosh, Herb can now ask for twice the spot rate.

Plus the FCC can say the marketplace won out after all.

The record manufacturers could produce songs that contain demonic sentences, heard only when the cart is played backwards and listening to the left-rear speaker.

Could we all imagine the next NAB with Mr. Kahn in the Motorola booth, with a smile on his face. And Motorola, why think of the nice report to the shareholders claiming that all AM recievers are now obsolete and only Motorola has the IC's.

I wanted to share this idea with my fellow broadcasters, so we can solve the AM stereo dilemma and begin a five-year argument about something new.

Mike Cable
Rural Route RE-20
(a.k.a. Tom Bosscher, assistant CE WCUZ AM-FM, Grand Rapids, MI)

Choosing a Processing Scheme

by Fred Baumgartner

Englewood CO ... In the last two articles, I argued that the way we think of audio processing can be improved. So maybe the way we assemble our audio systems can be improved.

The concept of preprocessing is most applicable to music formats (there are only two radio formats—talk and music). The center of the preprocessing scheme is a uniform storage system.

In this day and age that most often means carts or tape. Figure 1 is such a system configured for carts. Figure 2 is the all important production room. The idea is to produce carts that can be fed to the transmission chain almost directly.

In the production room, each original source is processed individually as it is put on cart. This allows the processing to be altered for each and every original source.

Each item of source material can be equalized, limited, edited, compressed, etc. so as to sound like it will on the air.

The advantages are that the processing chain is not fixed, but can be tailored. Second, it allows for the best pieces of gear to be used to reproduce the originals, as the scheme requires only one turntable, reel to reel and CD—they can be of the very best grade.

Third, the best set of ears can process every piece of audio. Fourth, as an engineer you have great control over the condition of the equipment and off-line care is easy.

The disadvantages are a lack of flexibility, the fact that all you can play are carts, and everything is second generation.

From the mix on down

The chain from the mixing board looks like the normal AGC and limiter. What is important is what is *not* here. The compressor, colorization units, loudness units, etc., are not here as these are done in the production room.

A bit more subtle is that the AGC is set to be very slow and with a much smaller "barn door" than normal—it only corrects for level variations due to tape wear, amplifier and DJ drift—and the limiter is set as a safety device to prevent overmodulation should something upstream fail or overshoot.

The noise reduction unit is to decode what was encoded during production. It minimizes the losses incurred in the mandatory second generation. The phase corrector does the same.

The live microphone can be the one exception to the cart only rule. If this is used it must be preprocessed ahead of the mixer in a manner consistent with what is done in the production room.

Mixing becomes a problem as in most other applications the AGC is used as a "ducking" amp. That is to say that when the DJ talks, the AGC reduces overall gain to "cut a hole" for the much hotter voice.

It is ideal to kick the AGC into "high gear" when the microphone opens up. This is done either by a control line telling the AGC to become faster and deeper, or setting the AGC so that past a threshold it does same.

Obviously the preprocessing scheme has great advantages over typical processing schemes, even if used in part. If the cart can be replaced (substitute reel-to-reel tape for cart in all of the above if applicable) with a digital storage medium, it becomes even more desirable.

Still there are inefficiencies and it is not applicable to full service broadcasting. Audio processing does not live in a vacuum, no system is perfect for all formats.

A different scheme

Figure 3 is a simplified discriminate processing system. The concept is to process each group of sources in the manner that is best for it.

The advantages of this are the variety of programming allowed and the reduction in man-hours required to preprocess each and every item to air.

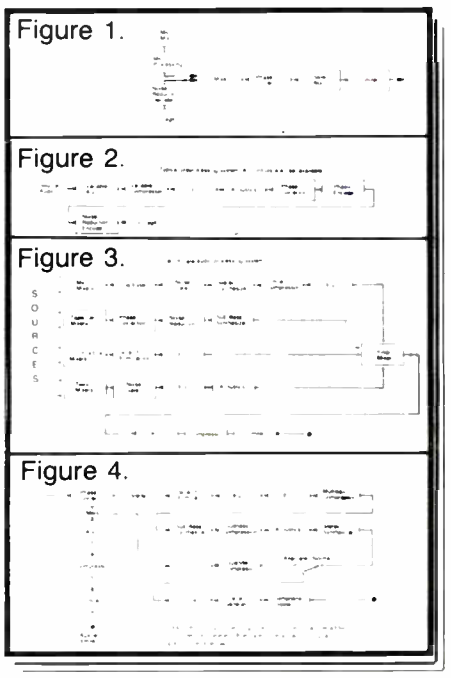
The advantage over the typical processing system is that each source can be dealt with in a manner that fits its particular strengths and weaknesses.

The scheme in Figure 3 requires a pretty impressive mixing board or heavy modification of the typical audio board as channels of like sources must be grouped, mixed, processed and returned for the final mix.

Using off the shelf components, this means a recording studio type board using the loops for the processors and folding back sub mixes. It is difficult to use pots for more than one source (as it must be a like source) so it becomes a 24 to 32 input board.

If the final mix is done through the board, a whole bunch of controls need to be disabled or at least not used. An advantage is that equalizers are normally part of each input on such boards.

If you buy a non-modular board the cost may not be out of line. The much more expensive modular board has an advantage in that it is easier to repair on line and generally less inclined to fail in total or in part.



Modification of a typical board requires engineering effort but puts the processing controls out of reach. Often two boards, side by side, are necessary to obtain enough dedicated inputs.

Processing each group

The microphones are equalized, compressed, stereo synthesized, noise gated, even automatically mixed if required. The very large dynamic range is the most important "fault" to eliminate.

The CDs might be lightly compressed to match the dynamic range of the LPs.

LPs are scratch filtered (not just low pass filters but active digital scratch elimination) and equalized if desired.

Tape and carts are phase corrected, noise reduction and compression and limiting is applied.

Telephone lines are equalized, frequency shifted, and so on. The receive only coupler from a sports event is not processed like a full duplex call to a typical phone.

The point is each type of source is dealt with separately. After mixing the processors in line are only those that apply to all sources.

The AGC is faster and broader than when used in a preprocess scheme. There may be some colorization, but only that which is applied to everything. Individual sources may be further colored.

The downstream compressor does not do all the work, only what is needed for every source, the other half of the job is done in each group as required. The limiter is fairly active. By itself, the downstream processing is pretty calm.

Use varies with needs

By now you should have figured out that these are pretty heavy duty approaches to audio processing. They are of course expensive, time intensive and real engineering challenges.

How much of the above a station uses depends on where on the hierarchy the station sits, its ability to understand its plight, its ability to spend on equipment and engineering, and its desire to win.

Most stations can survive without guns this big. However these are not unaffordable toys. Processing in medium facilities is typically less than 3% of the cost of the non-building physical plant.

Spending five times as much on processing often means the plant is 10% more expensive to build. If that is the cutting edge, it is a wise investment. In major facilities it makes much more economic sense. In small facilities, processing can be 5 or 6% of the plant and the economics make less sense.

A more practical approach to competitive audio processing is the longer than "normal" processing chain. Figure 4 is one such arrangement.

Wise engineers avoided these long chains because of cumulative degradation and the likelihood of processing the "trash" generated by upstream devices into much louder and nastier "trash."

(continued on page 22)

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

Using Leverage Gets Results

(continued from page 13)
helper if you can subcontract enough things to free yourself up to spend 100% of your time on engineering.

Another good use of leverage is to amplify your skills. Most of us are good at some things, so-so at others, and lousy at the rest. I'm no good at carpentry, but I still want a sharp looking studio. The answer: hire a carpenter.

As obvious as this sounds, many engineers still muddle through tasks they hate and are no good at simply because of pride.

Somewhere along the line they got the idea that they are doing the station a favor by scratch building all of the equipment, fixing the toilet pipes and tarring the roof—the jack-of-all-trades idea.

The guys I know who take this approach wind up with crummy looking equipment that has no resale value, pipes that leak and a roof that does likewise.

You are far better off to know your strengths and limitations and compensate for those limitations by hiring those jobs out.

Don't build equipment that you can buy. You really don't save that much kludging up amps and control boards from WW-II surplus parts.

The accounting department is going to depreciate the purchased stuff to save taxes anyway. Spend your valuable time evaluating new equipment or building the interface boxes that hook incompatible equipment together.

You be the subcontractor

If you're a wiz-bang at tuning antennas, adjusting audio processors, neatly wiring racks, or knowing every nuance of the FCC rules, maybe you should consider specializing in that area and subcontract your services to lots of stations. This is how consultants make the big bucks.

If your time as a chief engineer is worth $12 an hour it really means you are being overpaid to clean tape heads and underpaid to troubleshoot transmitters. It's the average value of your skills that sets the pay of the job.

Now, if you really love the feeling of being a hero by dashing off to panic-stricken stations at all hours, you might be able to make $25, $50, or even more per hour by just being an emergency transmitter technician.

The downside to this is that you may not be able to find enough business nearby to keep busy all week. That means extensive time away from home or you'll have to pick more than one specialty.

A mid-way solution is to keep a full time chief engineer job and moonlight your specialty nights and weekends. Your boss may make faces at this idea, so be sure to write out in blood that your employer is first priority.

A lot of time can be opened up for new adventures simply by making better use of the rest of your time. Strive for more efficiency.

If you are always adding wires to a certain junction box, maybe leave some crimp terminals and a tool right there instead of running back and forth to the shop.

Keep transmitter parts at the transmitter or as close by as possible. Build up a few extra microphone cables so that when one gets ripped up at a remote, you don't have to drive in extra on the weekend to solder the mic connector back on.

The right equipment

Having good test equipment pays off handsomely. Of course you need an audio analyzer or generator, distortion meter and scope on the bench.

You also need the right plugs to hook up to cart and tape decks without a lot of clip leads. Add a monitor amp so you can hear the instructions on the test tape. Keep the instruction manuals for the cart machines in a file right next to the bench.

Any time you spend cleaning up or organizing is an investment not an expense. It will pay back several times over when you can find things in seconds.

Be thinking about how you can keep tools, test equipment, spare parts and manuals as close to the place they are used as possible.

Here's something I'd like to say to your management: Whatever you do, don't "cheap-out." Some people think a $1 screwdriver is a better deal than a $2 screwdriver. They are wrong.

You will wind up buying three of those $1 screwdrivers and pay for the cost of running to the store to get them time and time again.

The same goes for light bulbs that last 750 hours instead of the 2500 hour long life variety. You will pay dearly to change those bulbs over and over. Buy the best and you'll have to bite the bullet a lot less often.

Money and leverage

Yes, you can buy without having the cash as long as you are extremely careful. A good use of money leverage is in the purchase of a home. Who has $80,000 or more laying around?

Fortunately only $5,000 or $10,000 will move you into a brand new house. You are borrowing the rest, of course.

Investment real estate works that same way except now you have a renter to pay the cost of the borrowed money while you just sit around and watch the equity increase.

Well, it's not that easy. Managing real estate can be a major pain in the neck. But, investments like real estate, mutual funds and government bonds are the best chance for most of us to accumulate any wealth.

Don't forget the leverage of having your own business or buying into someone else's. The leverage comes from the tax advantages and from the success of the business. Just remember that businesses can bust as well as boom and it is much easier to get your money in than out.

Networking for job leverage

How do you get a job dropped in your lap? For sure not by filling out applications. What you need to do is prime the pump by having your friends around the country keep an eye out for openings. Networking is another form of leverage.

Radio people seldom stay at the same address for more than a couple of years so your network of friends is always spreading out. Stay in touch.

Always keep some up-to-date copies of your resume in the desk drawer at home. An air-check tape, too, if that's appropriate.

My experience has been that the best opportunities come right out of the blue and are often the result of friends you've made and headhunters you've talked to years ago. Keep working on your network of contacts and sooner or later opportunity has to find your door.

PCBs Require Precise Logging

by Gilbert Houston

Chico CA ... If you have a transmitter built before 1980, you probably still have capacitors, maybe a transformer or two, or a dummy load that uses one or more of the various polychlorinated biphenyls (PCBs) identified by the Environmental Protection Agency (EPA) as health hazardous materials.

PCBs are a group of chemicals, developed for use as dielectric fluids in electrical and electronic equipment, which have good thermal and dielectric properties. The manufacture, use and indiscriminate disposal of PCBs was banned by Congress in 1976 when it passed the Toxic Substances Control Act (TSCA).

We broadcasters need to, once again, demonstrate leadership and responsibility toward the general public, not only for moral reasons, but because, if we do not, it will cost our stations a lot of dollars off the bottom line.

Improper handling and/or disposal of PCBs can result in very large fines imposed by the EPA for failure to comply with regulations published in 40 CFR Part 761 implementing the TSCA. Clean-up of PCB spills or leaks can be extremely expensive.

Everybody who has PCBs on hand, including broadcasters, is liable for proper handling and disposal, whether or not they are familiar with the law and EPA regulations.

If any of your PCB filled parts, installed or on the shelf, are found to be leaking, you need to contain the leakage and get immediate help in cleanup.

I recommend contacting your local power company for help since they probably have experience dealing with PCBs. Another source for information and help is General Electric since it is licensed in many locations for disposal of PCBs.

If none of your equipment is leaking, all that is required is a complete inventory and record of periodic checks, and a record of when, where and how the pertinent parts were disposed of.

At Golden Empire Broadcasting, we developed log books for use at our TV and AM transmitter sites. We do not have any PCB filled parts at either of our studios, so we do not need log books for those sites.

The transmitter logs were designed to cover all bases in a single, easy-to-use format. We chose 8½"×11" record books with the pages sewn in. We chose books with sewn in pages to preclude any possible accusation of "adjusting" the data.

Identification labels are available for reasonable prices from Seaton Name Plate Corporation in Connecticut (203-488-8059), and Brady Signmark Division in Wisconsin (414-961-2233). You may find someone locally that can supply the labels, but they did not seem to be available in our area. The two sources listed were given in the NAB Info-Pak of November 1986.

Taped to the inside cover of each log book is a copy of the NAB PCB Alert of 22 September 1986 to give users background information on why the log is kept.

The first page has three sections (see Figure 1). The upper left section lists abbreviations used in the log so anyone not

(continued on page 23)

Gilbert Houston is assistant chief engineer of KHSL TV, and chief engineer of KHSL AM in Chico, CA. Call him at 916-342-0141.

Figure 1. Page 1D/2D/3D . . . Quarterly Inspection and Transfer Information

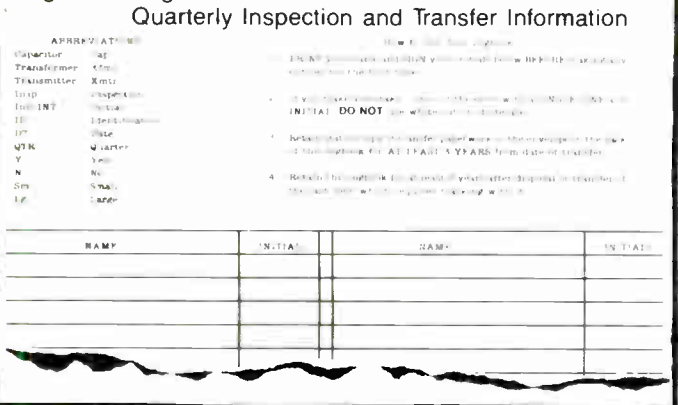


Figure 2. Page 1A/2A/3A . . . Basic Identification Info

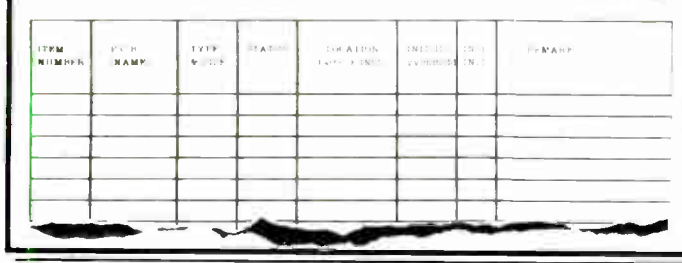


Figure 3. Pages 1B,C/2B,C . . . Quarterly Inspections

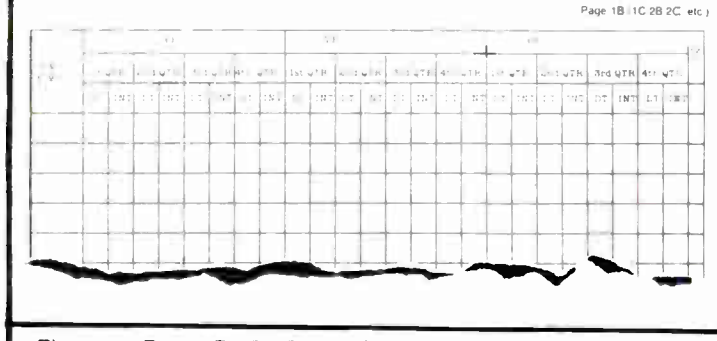
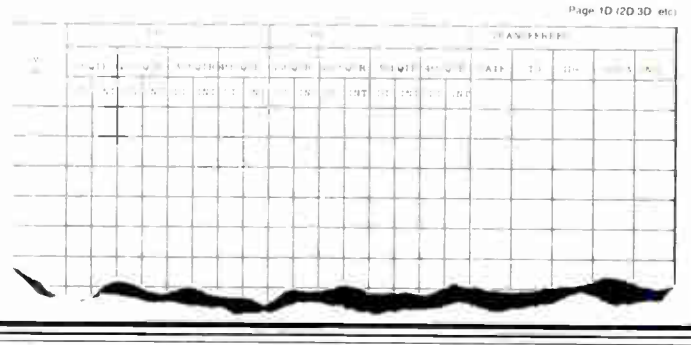
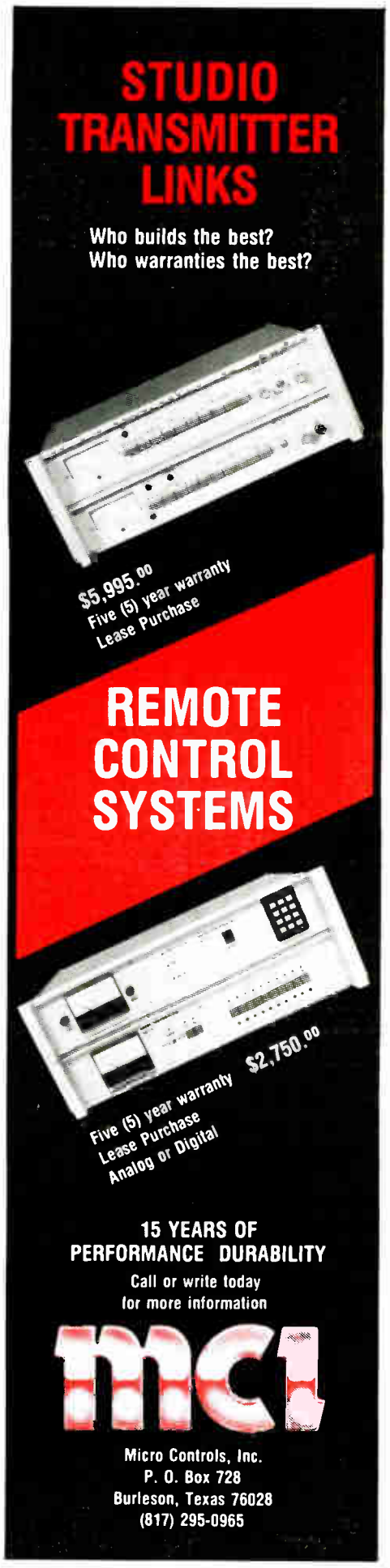


Figure 4. Page 1D/2D/3D . . . Quarterly Inspection and Transfer Information



Circle Reader Service 28 on Page 22



Circle Reader Service 44 on Page 22

Temperature Sensor Uses Chip

by Gary Wachter

Tempe AZ ... Have you been searching the depths of Solid State land for a simple, inexepensive, trouble free way to monitor temperature? Look no farther, National Semiconductor has the solution to many a problem.

For around $5 you can get a little TO-92 transistor package, the National LM34, to do some serious work.

Just feed it a little juice between 5 and 30 V and the critter will produce accurate temperature readings for your display. And the clincher is that external parts for most applications are not needed.

The LM34 output is linear and will give a direct voltage indication in fahrenheit. There are no voltage conversions or constant voltages to subtract.

The basic fahrenheit sensor is shown in Figure 1. The scale factor is +10.0 mV for each degree fahrenheit. For example, a temperature of 89° will produce an output of 890 mV.

The rated operating range is from −50° to +300°! Watch it work by hitting it with the freeze spray and then follow it with the heat gun.

It does not require any external calibration or trimming to provide typical accuracies of ±0.5° at room temperature and ±10.5° over the full temperature range. The calibration and trimming is done at the wafer level during manufacturing.

The output impedance is low which makes interfacing to a variety of indicating devices a snap. It can operate from a single voltage supply or plus/minus supplies. The current draw is 70 μA.

Display devices can be just as varied as the application demands.

You can use the transmitter remote control telemetry (most units have local readouts at the transmitter site), digital meters, mulitmeters, LED bargraph displays, input of a computer A/D converter or even one of those "old fashioned" analog meters.

Practical and fun uses for the LM34 are unlimited. At the remote transmitter site, most stations have quite a number of remote control metering positions available which can be used.

You can monitor the internal cabinet temperature, room temperature, the air conditioning system, etc.

The efficiency of the final transmitter stage can be indirectly checked by monitoring the difference in the heat rise of the output air vs. the input airflow of the tube (use good sense and don't place anything foreign in the cavity or tuned circuits and keep away from high voltage).

You can keep tabs on warm RF filters and cavities and trip an alarm if the temperature goes over a preset limit.

At the studio, the LM34 can be used

(continued on page 23)

Gary Wachter is CE of KFYI/KKFR radio in Phoenix, AZ. He can be reached at 602-258-6161.

Figure 1.

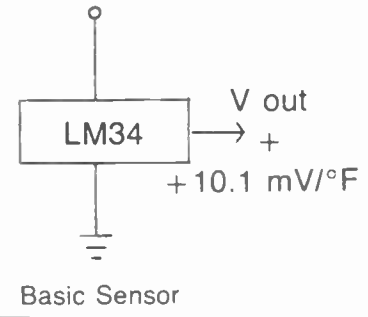
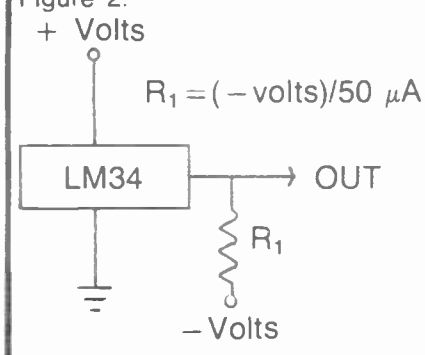
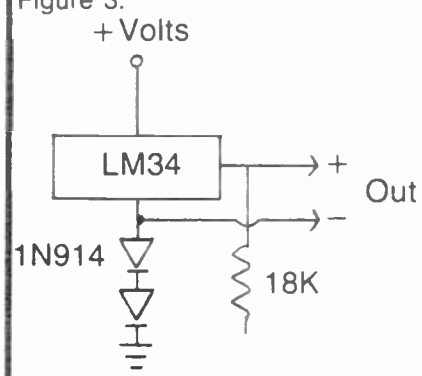


Figure 2.



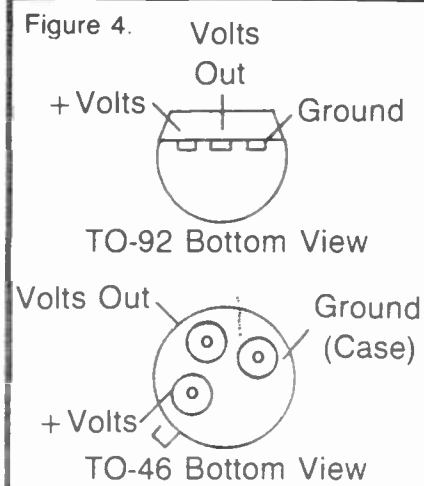
Full Range Sensor, Dual Voltage

Figure 3.



Full Range Sensor
Single Supply

Figure 4.



Contract Engineering

Contract a Must for Engineers

by Barry Mishkind

Tucson AZ ... Contract engineering can be enjoyable and profitable work, but it is a business. Simply by virtue of calling it contract engineering, we imply that there is some contract between the engineer and the client station.

This common sense approach can prevent many misunderstandings. Not only that, if you are the designated Chief Operator, it is a requirement of section 73.1870 (b) (3) of the Rules.

However, it is amazing how many times I have come across situations where the engineer has only a handshake agreement with the station, or, at best, a perfunctory contract simply to meet the letter of the law.

The Rules state that when a station uses a contract engineer, a contract is kept in the file for inspection by the RI.

But, from our standpoint as engineers, there is a more important reason to give attention to the contract: it sets needed ground rules for our relationship with the station.

This is what protects us later from misunderstandings and the problems that they always cause.

I have rarely found it necessary to involve a lawyer in this process. All of my agreements have been simple and direct documents.

Of course, we must run a disclaimer here: I am *not* an attorney and neither I nor **RW** pretend to offer legal advice in these pages.

If you feel there may be a necessity for legal action, seek out and consult a local attorney who is familiar with the laws of your state.

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

What I propose to offer is a number of common sense observations that can assist you in defining your relationship with a station on paper. Remember, this is *only* a test.

The obvious place to start in any agreement is to say what it is: an agreement for the maintenance and inspection of the station(s) involved.

I usually invoke the name of the Rules right away, to give the client the message that I am serious about having a professional relationship.

It is also a good idea to get to the money part right away, as this is a major topic of interest on both sides. If you couple that with a basic statement of what you will do, it is easy for the manager to understand why you deserve your fee.

Let's first cover the money part, because this is where a lot of contract engineers make their first mistake in dealing with a client.

There are several schools of thought as to whether your fee should be based on a straight hourly rate, a flat fee, or a middle ground where there is a flat fee for basic services, with an hourly fee added in the matter of major projects and emergency calls.

Personally, I have found the third way to serve me the best, although each situation is different.

A flat fee schedule gives the station manager a set figure he can plan on in his monthly budget. I feel the same way. I know the minimum income I will get from the client.

(Just make sure that you have figured your overhead properly so that you don't work for $2.50 an hour, whether flat rate or hourly. Remember, the hourly fee is gross income, you have to subtract your cost of doing business.)

At this point, you can add statements in the contract agreement stipulating that major installations and remodeling are additional tasks, and will be negotiated based on an hourly rate. Any reasonable client will agree to this.

The only remaining situation you have to protect yourself from is the poorly equipped station that seems to call you daily with some "emergency."

There are two reasons to deal with this as a separate issue. One, it will compensate you for all this extra time. And secondly, the manager will see the "additional billing" at the end of the month.

Unless you intend to milk the "cash cow," you will get tired of being interrupted each day to deal with that station. The "additional billing" gives the manager the incentive to get the daily problems fixed once and for all.

To be fair, I usually permit a couple of minor calls a month without charge, and show that on my statement. Managers seem to react positively to that.

Now that you have the money almost in hand (sorry, I haven't found a successful way yet to get paid in advance!), it's time to specify what you will do in return.

Referring again to Section 73.1870 at this stage is a good place to start, because whether or not you are the designated Chief Operator, your duties are likely to be those listed in part (c).

You might wish to list those duties right in the agreement, perhaps expanding on them a bit: for example, providing the operator's manual and training for the air staff.

What happens if the station calls while you are at another station, in another city, or just on vacation? It's a good idea to outline what service the station can expect if it suddenly needs you and you are not available.

Another item that may be included is a statement of qualifications. In the case of a new client, it may be helpful to specify that you or your assistants will be licensed or certified by the FCC, SBE, or whatever.

This type of statement is helpful in reinforcing the professional nature of your services. You are not just a high school student, earning a few bucks at night, are you? So make sure the station knows they are dealing with a broadcast professional.

Finally, include a statement to calm a major fear of the manager: that you won't pledge the credit of the station without approval.

Sometimes a dollar limit should be specified, but the manager will feel more secure knowing that you will inform him of any major needs before the COD arrives. I know I'd want it that way.

Besides paying you, there are a couple of things that you ought to specify that the station will do, just to prevent those misunderstandings that crop up.

For example, who takes responsibility if despite your reports of operation, the station doesn't comply with the Rules?

(continued on page 22)

Computer Link to CDs Ahead

(continued from page 16)

production and control capabilities.

The cost effectiveness is significant; not only does digital technology eliminate the need for a radio station to invest in the costly "professional line" of broadcast equipment, but it also reduces the associated high cost of maintenance.

In the past, price was essentially based on labor and parts count. A professional tape recorder was more expensive because its circuits contained a greater number of parts and required more assembly time than a consumer version.

Consumer goods will set the pace

The distinction between consumer and professional equipment will become slight as mass produced consumer products begin to set the pace of technical development.

Early examples of this were with digital audio processors. Designed originally for the consumer market, they surpassed most existing professional equipment for reproduction quality and ease of operation.

With this shift in technology, broadcast and consumer audio equipment will feature the newest technology at an affordable price.

The CD offers two key advantages to a radio station's operation: *control* and *permanence*. CDs can be encoded with text information along with music so that station personnel and programming syndicators can control what is played, where it is played and how long it is played.

The control available through disc encoding is virtually endless. At minimum, they will simply access to music and production libraries, and they will increase programming flexibility.

Another important consideration is permanence. Analog is a notoriously fragile storage medium: LPs are destroyed by the devices used to play them, and tapes disintegrate merely from the passage of time.

Digital is more durable and lasting. The laser light "pick-up" system of CDs makes them impervious to the effects of mechanical reproduction. Digital magnetic recordings can be reclaimed without loss. Duplication can be accomplished with much greater accuracy.

Our conversion to digital will necessitate a complete re-thinking of the recording and transmission process. Digital formats will supercede analog ones, especially since the life span of an analog recording is limited.

To replace all broadcast and consumer playback systems, and music libraries, will inevitably be a question of economics. To succeed, digital audio equipment must ultimately be practicable on the broadcaster's bottom line of affordability.

Fortunately, digital audio wlll prove to be a more cost-effective technology.

Engineers Need Contract

(continued from page 21)

Put another way, if the station ignores your warnings, how do you protect yourself in the event the station is cited for a violation?

Your answer should be written into the contract maintenance logs (remember those?). Your relationship with any client can deteriorate in a hurry if he refuses to act responsibly on your reports.

Something I consider nearly essential is a charge account at a local parts store so that parts can be obtained without delay when needed. I prefer this arrangement to the cumbersome process of writing my own checks and waiting for reimbursement.

It may seem like you shouldn't need to say anything about tools, but some stations do not have any spare parts, tools or test gear of their own, sometimes not even a corner room for the engineer to stock spare parts, etc.

It is difficult to have something in your vehicle for every problem (although there are some engineers that do very well at this), so my request to the station, written in the agreement, is that they provide a basic stock of necessities and a secure place to store them.

You can decide for yourself, based on the individual station's situation, what ought to be on-site when you arrive to work.

Lastly, you might wish to include a statement that the agreement is indefinite in length, unless terminated by written notice of certain timeliness.

Again, it puts the contract agreement in a more serious light, and the manager is more likely to respect you for your attention to such details.

Finally, in any contract, the most important consideration is the clients.

Maybe you see them only once every couple of weeks, maybe you are on 24-hour call. In any event, if you spell out the arrangement properly, you and the station are set for a long and profitable relationship.

Assembling Processing

(continued from page 17)

It is important that the processing units work together. It is very easy to assemble a chain that works against the goals.

Putting it all together

Start by selecting units that do what you want with special attention to undesirable by-products. In general, units need have a bit better than 70 dB SNR and better than 0.5% THD passive distortion.

Those units which are most transparent, least noisy, have the least distortion, and are least active with the most dynamic range, belong farther upstream.

Units with the most undesirable by-products also belong farther upstream.

Third, units that undo what another has done must be upstream of that unit.

Fourth, units that correct the undesirable aspects of another unit need be downstream of that unit.

Fifth, the feed for an auxiliary transmission path needs to be as upstream as possible.

Sixth, any STL, telco loops, or long lines need to be between the final brutal control units and the initial lighter units (with attention to the dynamic range at that point and what correction is necessary for the STL, etc.).

Seventh, each unit must have *significant* advantages to outweigh the disadvantages (noise, distortion, reliability) of using it.

A look at Figure 4 shows the first active block is a phase corrector.

The scratch eliminator is next; it is after the phase corrector only because this moves it on the other side of the auxiliary feed. Most devices along this line are very transparent, but unfortunately most are IHF.

The AGC and first compressor are next to reduce the dynamic range to reduce the effects of the following units and prevent them from either adding significant noise when the input level is low or distortion when it is high.

Colorization equipment is next. Last is the "brutal" gear: the competitive compression and hard limiting.

STL, telco and correction gear is at whatever place the path is.

For programming that is outside the ability of the main processing (sports via dial line for example can contain so much crowd and line noise with such strange frequency response and phase relationships that an aggressive system would amplify the garbage to the point of disgust) a secondary, less brutal route can be provided.

This allows you to maximize intelligibility at the expense of aggressive processing and coverage. The secondary route should have a nonaggressive compressor/limiter and lowpass filter. The added benefit is that other sources aired during the game do not stand out as so much cleaner and louder.

While these approaches have become practical inside of the last five years, I believe even better systems are practical and that is the subject of the last part in the next **RW**.

Chip for Temperature Device

(continued from page 20)

for monitoring the outside temperature, the rack where all of the cart machines are stacked up, or even the jock's chair.

If you want to take advantage of the full temperature range and read below 0° temperatures, the configuation has to be modified.

Since it is simply a linear unit, we cannot expect this chip to produce a negative voltage output with only positive applied.

One solution is to apply a negative voltage as shown in Figure 2. If a negative voltage is not available, another way is to raise the minus reference above ground as shown is Figure 3.

The only drawback here is that your indicating device minus lead must be floating above ground. You cannot use this method if your remote control metering is single ended.

Most output wiring will probably be short so load capacitance should not be a concern.

If a heavy load is anticipated, a precaution would be to insert a 470 to 1000 ohm decoupling resistor between the output of the chip and the load.

Linear circuts connected to wires in hostile environments may be affected by intense electromagnetic sources such as relays, transmitters, motors, SCR's, etc., and can have its wiring act like an antenna and internal junctions act as rectifiers.

We are using common shielded audio wiring and have never experienced any difficulty in strong RF fields.

In case of problems National Semiconductor recommends a bypass capacitor from voltage in to ground and a series R-C damper such as 10 ohms in series with 0.1 or 1.0 μF from output to ground.

The sensor can be applied by gluing to a surface and its temperature will be within about 0.02° of the surface.

Heat shrink tubing over the device and cable will lend strength to free standing applications and it will be less likely to break off in fast air streams.

Although the plastic package responds rather quickly to temperature changes, slightly faster response time can be achieved with a little more expensive hermetically sealed TO-46 metal can package.

The TO-46 package may be soldered to a surface without damage. The can is internally connected to the neqative lead. If the sensor is mounted outside or in any liquids, be sure to keep the leads clean and dry.

And for those of you who find this chip useful but need centigrade instead of fahrenheit, just ask your distributer for the LM35. It has virtually the same characteristics as the LM34, but will produce on output of 10 mV per degree centigrade.

PCB Logs

(continued from page 19)

familiar with usual (or local) broadcasting abbreviations can tell what has been logged.

The upper right section gives basic instructions for using the log, and the lower section has spaces for users to print their names and sign their initials so each log entry can be identified as to who made it.

All the rest of the pages are numbered in groups of four (1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A . . . etc.)

The "A" page (see Figure 2) is used for identification and inventory. Each identified item is labeled with an appropriately sized label, and sequentially numbered using a marking pen. Each item number in the log book corresponds to the label number on a specific part.

The PCB involved, if known, is listed. Choosing to err on the side of safety, we labeled a few capacitors that we suspected might contain PCBs even though there was no information on the individual cans.

The type of item is listed as well as its size if it is a capacitor. The status of each item (spare or installed) is recorded next, along with its location. Location includes the equipment and circuit diagram designation if the part is installed.

The next two columns are used to list the initial identification date, and the initials of whoever identified the item and entered it in the log. The last column is reserved for miscellaneous remarks pertaining to the item.

Pages "B" and "C" (see Figure 3) are laid out for quarterly inspections for three consecutive years. Page "D" (see Figure 4) has two more of the yearly columns and a column for transfer information.

Pages B, C and D allow room for eight years of quarterly inspections. The last column on pages B and C indicates whether the quarterly inspections are continued on the following page.

The last column on page D is provided to show where the inventory/inspection record is continued should the part be around after eight years.

We glued an 8½"×11" envelope inside the back cover for retention of shipping and transfer paperwork since all records (including the log books themselves) must be kept for a minimum of three years after disposal of the part or parts they pertain to.

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AMPLIFIERS

Want to Sell

Utility tower, 274' w/18" face, gd cond, on ground. M McKenzie, KALL, 312 S East Temple. Salt Lake City UT 84111. 801-364-3561.

Acoustic 260 amp, built-in reverb, fuzz, tremelo & tuning fork, BO. S Russell, Russell Music, 60410 Klett Dr. Decatur MI 49045. 616-782-9258.

Edcor HA-100 8 chan headphone amp, new w/rk mts, $1300. M Fiedler, Mahoney Fiedler Prods. 5346 Dupont Ave S. Minneapolis MN 55419. 612-822-0013.

UREI 6250, $500. M Fiedler. Mahoney Fiedler Prods, 5346 Dupont Ave S Minneapolis MN 55419. 612-822-0013.

Langevin WE clones, #AM-101-D 50 W tube, $275; AM-128XZ 25 W tube, $125; also SS & tube power supplies, amps, preamps, line amps & mixers by WE, Langevin, RCA, ADC, Altec, Ampex, call for list. R Van Dyke, Van Dyke Inc, Squires Ave, E Quogue NY 11942. 516-728-1327.

Altec 1570B tube power amp 165 W very clean, $280 for pair. W Bussetti, Lizard Stds. 1124 W 2nd St. Florence CO 81226. 303-784-3540.

Langevin AM-16 preamp, AM17 program amp; EQ251-A EQ's, PS221 power supplies; mounting trays of instruction books, excel cond. B Anderson, Anderson Prods, 1157 Sunshine Terr, Studio City CA 91604. 818-769-6569.

ITC WRA stereo record amp, $900. D Gowens. WESE, POB 660. Greenville SC 29602. 803-242-4660.

Russco mono TT preamps w/PS (2), $50 ea. N Allebaugh, WICE, 100 John St. Cumberland RI 02864. 401-725-9000.

Shure FP11 & FP12 mic to line & head phone amp, $99 ea. C Butler, Butler Eng, 8709 Pinon Dr. Jacksonville FL 32221. 904-786-6363.

Phase Linear 400, excel, $300. B Laughlin, KDCV. 2636 N 56. Lincoln NE 68504. 402-466-8670.

Crown PSA-Z w/balanced input module, mint, $1300. C Osgood, Ct Recording Std. 1122 Main, Bridgeport CT 06604. 203-366-9168.

Rust 150-3 FM RF amp, $30. M Persons, KASM. Hwy 52 W. Albany MN 56307. 218-829-1326.

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

Muzak 1008 tube type amps, 8 W ea w/4, 150, 600 & 70 V line outputs, all tested & in working cond, some w/o tubes but tested; w/tubes, $15, w/o tubes, $10. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

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

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

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

Want to Buy

McIntosh MC-50 (2) & (2) McIntosh MC-30 power amps. JP Robillard, 1803 N 1st East St, Haynesville LA 71038. 318-624-0105.

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

Marantz & McIntosh tube & solid state. C Dripps, Kurloff Entr. 818-444-7079. 800-334-8223 CA only.

RCA BA73 program amp, any cond. T Vernon, WHGB, 900 Market, Harrisburg PA 17101. 717-249-1230.

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

ANTENNAS & TOWERS

Want to Sell

Foam Heliax xmission line, 288' 7/8" & 270' 7/8". M McKenzie, KALL, 312 S East Temple. Salt Lake City UT 84111. 801-364-3561.

Harris dual cycloid 12 bay CP FM antenna, BO; Gates AM antenna tuning unit w/RF relay for different patterns, BO. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505. 318-233-7003.

Delta TCT-1 torroids (2). M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Cablewave HCC50J 3-1/8" air dielectric coaxial cable, approx 450', as is, BO. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505. 318-233-7003.

Phelps Dodge CPFM-8 8 bay CP, tuned 101.1 MHz, BO. R Goodman, WCKN, POB 650, Anderson SC 29621. 803-226-1511.

Rigid coax, 20 sections of 3-1/8", 20' length, w/bullets & non insulated hangars, BO. R Goodman, WCKN, POB 650, Anderson SC 29621. 803-226-1511.

Cablewave FCC-38-50J sampling lines, 335' lengths (2). M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Phasor & LTU's for 2-tower array. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Stainless 1" guy wire, 3000' on reels of 1000', approx 2 yrs old, BO. R Goodman, WCKN, POB 650, Anderson SC 29621. 803-226-1511.

Kintronics LTU-5B antenna tuning unit, w/remote sensor AM-1 & chokes LC-3, like new, $950. AH Bott, BHP Inc, 340 S 24th St. Quincy IL 62301. 217-224-1076.

CSI VSWR alarm panel. BO/trade. R Hahn, KDCR, Dordt College Campus, Sioux Center IA 51250. 712-722-0885.

RCA BFC 5 bay w/heaters tuned to 93.9 MHz. J Brown, WZZU, POB 33396, Raleigh NC 27606. 919-782-4709.

315' 3-1/2 Heliax w/connectors, excel cond. J Brown, WZZU, POB 33396, Raleigh NC 27606. 919-782-4709.

50 ohm EIA 90° elbow, 1-5/8", $30. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Cablewave 3-1/8" air hardline HCC-300-50J w/EIA flanges, 7 spools of 200', any or all, BO. B Brown, Brown Co, POB 59204, Birmingham AL 35259. 205-879-1621.

Scala FMO-4 4 bay omni directional antenna tuned to 95.3, only used 4 mos, $700 plus ship. R Phipps, KHLC, 998 A Sidney Baker So, Kerrville TX 78028. 512-257-7711.

Transmission equip in excel cond, BO, write for list. R Bishop, Unwest. POB 3115, Cooper Mountain CO 80443.

HCC300-50J hard line coax 3-1/8" diameter, 200' lengths, 1400' total, EIA fittings. B Brown, Brown Co, POB 59204, Birmingham AL 35259. 205-879-1621.

Kintronics 7.5 kHz isocoupler, can be retuned, never used, $800/trade for stereo console. B Hoisington, WTCG, POB 1776, Andalusia AL 36420. 205-222-8849.

Tower 60', 12" base, 7' sections, $600/BO D Hubbard, KKRE, Box 1385, Monument CO 80132. 303-481-4700.

CP 4 bay FM antenna. S Lawson, KAK FM. 928 Hyland, Santa Rosa CA 95404. 707-528-4055 (eves).

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

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

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

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

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

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

Want to Buy

CP antenna, 10 bay, 96.5 MHz. B Oliphant, KDZN, Glendive MT. 406-365-6996.

FM 8-12 bay CP, 105.7 MHz. B Dodge, Harvest Bdct, POB 105FM. Hinsdale NH 03451. 802-254-2560.

Foam heliax, 200', 7/8", plug connectors. A Bowab, WDLT, 2402 Wolf Ridge Rd, Mobile AL 36618. 205-344-3698.

FM 2-3 bay CP, 96.3 MHz, w/deicers or radomes. B Dodge, Harvest Bdct, POB 105FM, Hinsdale NH 03451. 802-254-2560.

Tower, 500' w/top mounted pole for FM 4-bay antenna. J Stitt, WLLT, 250 W Court Ste 300E, Cincinatti OH 45202. 513-241-9500.

6-bays on or close to 105.9 MHz. M McKenzie, KALL, 312 S East Temple. Salt Lake City UT 84111. 801-364-3561.

Tower, wind load B, 1200' & 500' tower, wind load B. F Hinds, WJIZ, POB 5226, Albany GA 31706. 912-432-7447.

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

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

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

AUDIO PRODUCTION (OTHER)

Want to Sell

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

RCA BA-43 program amps, rack mount w/VU meter (2), $75 ea. S Portier, WNOE. 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Eventide digital delays, 3.5 sec unit & 7 sec unit. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-3645-3561.

dbx 142 encoder/decoder (4), $175 ea; dbx 148 decode only (6) w/408 mod's, $50 ea. G Faltus, WKGR, 600 Atlantic Ave, Ft Pierce FL 33450. 305-461-0099.

Timestar 2400C prototype timer, programmable, will give station ID's at top of hour, $2700. E Moore, 1102 N 31st Ave, Omaha NE 68131. 402-556-4999.

Garron STE-100, stereo phase enhancer, $150. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Eventide FL201 flanger, excel cond w/manual, bal in/out, $450. C Cooper, Admix Bdctg Srvs, 960 Woodward Dr, Charleston WV 25312. 304-744-0022.

UREI 565 filter set w/manual, $280. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Symetrix 108 System, 8 line phone system, 6 mos old, used 2 mos, excel cond, w/extra control box for screening, $1600. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

Shure M268 neatly modified for mic or line input, rack mt, new cond, $179. C Butler, Butler Eng, 8709 Pinon Dr, Jacksonville FL 32221. 904-786-6363.

Studio equip in mint cond, little use in low demand situation, write for list, BO. R Bishop, Unwest, POB 3115, Cooper Mountain CO 80443.

Custom built mobile studio, newly painted, new glass, Dodge frame & engine, elec or gen operated & air conditioning, BO. B Klaus, WNIR, POB 629, Kent OH 44240. 216-673-2323.

ADC SA-1 spectrum analyzer, 10-band, like new, $700. B Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

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

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

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

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

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

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

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

AUTOMATION EQUIP.

Want to Sell

Harris 995-7867-001 RR source interface cards (2) for System 90 or 9000 automation, $150 ea. C Bryson, Comserv, 93 Robinhood Dr, Zelienople PA 16063. 412-776-5204.

Cetec 7000, Level 2, memory load/dump, real time clock, VEL logger/encode ctr, 2 Audiofile 2A's, 2 R-Rs, comp tested & checked, on-site interfacing & training avail, $14500. D Gatherun, WBDY, POB 509. Bluefield VA 24605. 703-326-3519.

Cetec Beehive B100 CRT on-air automation, 4 stereo ITC PB machines, 4 stereo 24 cart SMC Carousel, extra source boards, call for price. E Stern, KSPL, POB 2150, San Marcos TX 78666. 512-396-3354.

Cetec 7000, 4 Otari ARS 1000, 2 Go-Cart 24, 2 Audiofile 48 Carousel, encode terminal, remote terminal, BO. S Scott, KEED, 1330 Day Island Rd, Eugene OR 97401. 503-686-9123.

Gates SSA-1, silence sensor, $95. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Shafer 7000 automation system, used less than 1 yr, 3 racks, 2000 event memory, 48 tray Audiofile Carousel, (2) R-R Otari's, $15,000. D Nance, WCDO, 75 Main St. Sidney NY 13838. 716-335-2273.

SMC 92A R-R cart deck, $500, (3) RCA 12" 3345 TTs, $75; Collins ERI G5CPS 4 bay CP 92.5 MHz, $2000; GE console 4BC1A1, BO. Shafer 8000 control, BO. B Harlan, WFAH/WDJQ, 393 Smith, Alliance OH 44601. 216-821-1111.

Harris Sono-Mag Carousels, Ampex R-R's, digital clock, tone sensor, Shafer racks, BO. R Huggler, WSUL, 250 Broadway, Monticello NY 12701. 914-794-0242.

SEI Set-master controller, (3) IGM Go-Carts, mono, rack mounted, wired & ready to run, $12K/BO. E Fisher, WSDR, Box 399, Sterling IL 61081. 815-625-3400/1240/3540.

Control Design automation controller incl 12-source switcher, 2K-event memory, 10-event clock & power supply, all manuals & instructions, avail 2/23/87, $4000. G Meloon, WDBA, 28 W Scribner, DuBois PA 15801. 814-371-1330.

CD-25S tone sensors (2), $200 ea w/manuals; CD-60T time-announce controller, $350. G Meloon, WDBA, 28 W Scribner, DuBois PA 15801. 814-371-1330.

IGM 200, (2) Instacarts, (2) Revox A77, spare brain w/manuals, $12000. K Harnack, Harnack Engr, 1197 Gibbons, Memphis TN 38127. 901-353-4837.

ABC Q command decoder, never used, BO or trade. M Shannon, WAMJ, 1129 N Hickory Rd. South Bend IN 219-234-1580.

Audiofile IIA refurbished, tested w/warranty (2) rack included w/ea purchase of 2, $2750 ea. JD Bela. WKOY, POB 800, Bluefield WV 24701. 304-327-6125.

CD-24R stereo random-access Cartel, w/manuals & interface cables, working well, $1000 plus ship compromise. G Meloon, WDBA, 28 W Scribner, DuBois PA 15801. 814-371-1330.

SMC ESP1 automation system w/programmer, (7) 350 Carousels, logger, remote control & 450 10-1/2 min carts, BO. K Hollingsworth, WCSP, 214 E Georgetown St. Crystal Spring MS 39059. 601-892-3001.

Harris 9001 w/full logging, 2 CRT, (2) 48 tray Instacart, 42 tray Go-Cart, (4) ITC 750's, (2) mono Criterion, sell complete for $11,000, will consider selling parts. B Tesch, KIXR, POB 2631, Ponca City OK 74602. 405-765-5491.

SMC 25RS Carousel, $500 ea. B Harlan, WFAH/WDJQ. 393 Smith. Alliance OH 44601. 216-821-1111.

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

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

SMC remote control system, DP4 data terminal, time announce, 3 Carousels, output card rack, PDC4 super click, PS20A digital switches, silent 700 ASR w/dual cassettes, DP2 controller, RAC30, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

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

BGM decks & Carousel (3), w/telco remote ctrl, sequencer, 25 Hz gen, 2 racks, $3000. T Trott, Pepco Cable Radio, 5477 Carter Rd, Lake Mary FL 32746. 305-323-0472.

Want to Buy

Carousels (3), programmer cables, used OK but must be working. D Carlisle, WTIP, 817 Suncrest Pl, Charleston WV 25330. 30-342-3136.

CAMERAS (VIDEO)

Want to Sell

Ikegami HL79A w/Angenieux 95:126, AC adapter, batteries w/charger, shipping case, cables & more; Sony BVH 500 1" VTR w/case, batteries, charger, AC500 power supply, HT500A chroma stabilizer, assorted cables, will sell VTR separately, call for price. T Cereste, Lightscope Prod, 420 W 45th St 4th FL, NY NY 10036. 212-757-0204.

RCA pedestal, gd cond, BO. L Saldona, A/V Prod, 1801 Nickerson St, Austin TX 78704. 512-444-3959.

RCA TK43 camera parts & access, BO. L Saldona, A/V Prod, 1801 Nickerson St, Austin TX 78704. 512-444-3959.

Circle Reader Service 12 on Page 22

RW Broadcast Equipment Exchange

CAMERAS . . . WTS

Hitachi FP40, 3 tube Saticon w/all access & travel case, low hrs on tubes, will trade for newer chip cam plus cash, $3000/BO. M Glaser, C&G Ent, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Hitachi FP-10 w/1.5" viewfinder, 10X zoom lens, AC adapter, tripod adapter, carrying case, BO. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

ITC730 w/CCU, 1.5" viewfinder, Fujinon 1:1.6, 11-110mm zoom lens, tripod adapter & carrying case, ITC-62, BO. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

Sony DXC1610 camera & mate recorder, pkg or separate, BO. F Chlebowski, Ontario Recording Srvc, 45 Sobieski St, Rochester NY 14621. 716-342-5331.

JVC KY210 w/Fujinon 10:1 lens & access, excel cond, $3195. D Brennan, Custom Video, POB 26126, Birmingham AL 35226. 205-823-0088.

Hitachi GP61 1 tube camera, $400. C Kent, ACS Inc, 443 Elbert, Ramsey NJ 07446. 201-825-7807.

Want to Buy

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

CART MACHINES

Want to Sell

UMC Beaucart Type 20, 3-cue tones, motorized azimuth adjust, $2500. S Portier, WNOE, 529 Bienville St. New Orleans LA 70130. 504-529-1212.

Tapecaster X700RP, $250; X700P, $200. M Gottesman, KAMP, POB 1018, El Centro CA 92244. 619-352-2277.

Audicord A-10 mono, PB (4), like new, $350 ea; BE 3200 RP mono, excel cond, $950. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Harris Criterion 90-2 stereo cart R/P w/all three tones, never out of original box, $2100. J Newman, 143 WBUC Road, Buckhannon WV 26201. 304-472-3932.

ITC 3D matching WRA record head, mono 1 cue, 1 owner, unit has never seen bdct use, factory rebuilt last year w/svc man & spares, $2150. P Appleson, Appleson Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

RCA RT-7 cart deck, $50; Sparta 300-CP cart deck, $50. J Ross, NW Audio, 3860 Ritamarie, Columbus OH 43220. 614-459-4292.

Ramko ACL-25/E cart loader, $250. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

ITC 3D stereo PB w/WRA record amp, $1850. D Gowens, WESE, POB 660, Greenville SC 29602. 803-242-4660.

Collins 642A-1 rack mount. S Portier, WNOE, 529 Bienville St, new Orleans LA 70130. 504-529-1212.

Spotmaster PB in vgc, $250; Spotmaster 405 R/P vgc, $350. B Hoisington, WTCG, POB 1776, Andalusia AL 36420. 205-222-8849.

ATC mono cart machine, operating, $400. P Wolf, Wolf Eng, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

BE Spotmaster 500 (2) stereo PB, gd cond, $300 ea. M Phillips, Phillips & Co, POB 985, Laurenburg NC 28352. 919-276-1306.

ATC stereo R/P, $350. M Phillips, Phillips & Co, POB 985, Laurenburg NC 28352. 919-276-1306.

Gates Criterion stereo, R/P, needs repair, $500. P Wolf, Wolf Eng, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

ITC Delta stereo w/record unit, never used; Broadcaster Cartimer, 3 digits to 9:59 w/4 remote machine, start switches, new. M Sirkis, Peak Audio, 3107 Bedlington Pl, Holland PA 18966. 215-860-0303.

Contel 101P-B mono PB, $150. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

Gates Criterion cart deck, $350; (3) Scully 270 PB decks, $200 ea. B Harlan, WFAH/WDJQ, 393 Smith, Alliance OH 44601. 216-821-1111.

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

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

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

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

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

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

Want to Buy

Cue cards, 150 Hz, for Collins 642 Twin Tape; also need unit for parts. B Hoisington, WTCG, POB 1776, Andalusia AL 36420. 205-222-8849.

BE 3000 & 2100 cart machines wanted. Exporter needs 90 used machines, working cond, not more than 6 yrs old, reasonable price avail. Send particulars to: RW, POB 1214, Falls Church VA 22041. Attn: Box 1-1.

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

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

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Ampex MM1000 16 trk, $6500. Joe, River City Studios, 147 Goodrich SE, Grand Rapids MI 49503. 616-456-1404.

Crown SX822 stereo, 2.5 yrs in prod, manuals, rack mount w/record amps & hubs. $390 ea. B Larson, KSOS, Layton Hills Mall, Layton UT 84041. 801-546-1722.

Two trk NAB head stack, 1/4 trk head stack in fair cond, svc manual; (3) Panasonic RS1520 2 trk rack mt, bias & EQ, 2 yrs old, w/svc manual. $875/$1300 pay freight $2200 for 2, $3300 for 3. P Appleson, Appleson Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Studer Revox A700 used in gd cond, rebuilt power supply, $187. P Appleson, Appleson Stds, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Technics SVP100 (3) VHS tape PCM processor combo, digital audio, sold seperately $1200 ea, pckg deal $3000; Sony PCM 10 digital processor, no hrs, $2500. J Aulik, Jeff's Elect, 322 Crooks, Green Bay WI 54301. 414-435-7937.

Ampex AG440 (7), some spare parts thrown in, gd cond, BO. E Terry, WETA, 3700 S Four Mile Run Dr, Arlington VA 22206. 703-998-2790.

ITC 750 PB only, $250. G Faltus, WKGR, 600 Atlantic Ave, Ft Pierce FL 33450. 305-461-0099.

Revox A77 not working, $150. WB Welden, KVLG, POB 1276, Sealy TX 77474. 409-885-4778.

Ampex 440C excel cond, $2500; Revox A cassette, $500. L McElroy, 875 S Clarkson, Denver CO 80209. 303-722-1109.

Telex Magnecord 1022 R/R, 1/2 trk, recently serviced, excel cond, $295. S Campbell, Campbell Prods, 105 Cowlview Dr, Seneca SC 29678. 803-882-2762.

Scully 270's (3) 14" reel, 2 trk stereo 7.5/15 ips, perf working cond, w/manuals, $750 plus ship. J Hurray, Steiger Hurray & Assoc, 253 River Rd, Hinchley OH 44233. 216-278-2600.

Ampex 351 rack mount, mono, works, $150. J Cunningham, YSDA Radio, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Ampex 351 2 trk w/remote, overbridge, rollaround, tube elec, 15/7.5 ips, gd heads, $650. J Green, WHPC, Stewart Ave, Garden City NY 11530. 516-222-7438.

Vega 1/2" 4 trk in console, 7.5 & 15 ips, $3100; Studer A62 1/4" 2 trk, 7.5 & 15 ips, $1200; Ampex MM 1000 8 trk 1" R/P, excel cond, $5000; Scully 280 2 SP-14 2 trk 1/4" in console, one w/remote, 7.5 & 15 ips, w/remote $2100, w/o $1850. Executive Recdg, 300 W 55th #4P, NY NY 10019. 212-247-7434.

Scully 280 1" 8 trk w/4 trk head, excel cond, $3100. E Mauro, Natl Recdg Std, 3016 Greenmount, Baltimore MD 21218. 301-467-7900.

Pioneer RT2022 1/2 trk 10-1/2" reel w/TAU-11 elect, gd cond, new heads, BO. C Cocxis, Rejouyssance, 2820 Raymond Ct, Falls Church VA 22042. 703-237-2590.

Metrotech logger, 10.5" reels, $100/BO. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

Ampex 350 elec tube type. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

Pentagon cassette duplicators w/R-R & cassette masters, one 12-slave, one 4-slave system. Nigel, Technichrome, 1212 S Main St, Las Vegas NV 89104. 702-386-2844.

Scully 280-4 4 trk, rack mount, rolls tape & heads look gd, as is, $995. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Ampex 351 2 trk in wooden custom console, vgc, excel heads, $1100. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Sony 1/2 trk, 766-2, closed loop, dual capstan, 10-1/2", 7.5 & 15 ips, 4 head w/remote, gd cond, $550. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Tascam 22-2, used twice, in new cond, orig box & manual, $600/BO. K Demucci, Bethany Lutheran Church, 35 W Messenger St, Rice Lake WI 54868. 715-234-3177.

Teac X7R R-R, dual capstan, bi-directional record & play, excel cond, $375. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Revox A77; Sony TC630, both excel cond. B Michaels, Tye Bdct, POB 5105, Abilene TX 79608. 915-695-7300.

Tascam 32 7.5 & 15 ips, $575. J Englander, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-474-6043.

Tascam 40-4 4 trk R/R w/dbx, excel cond, $950. J Englander, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-474-6043.

Metrotech 552A Series 500 logger elects & reel machine (2), $250 ea. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Tascam 122 bal & unbal inputs & outputs, dual VU meters, $575. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Ampex PR10, $100/BO. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

Revox B225, CD player, $1200. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Ruslang tape cabinet, roll-around, never used, $150. J Green, WHPC, Stewart Ave, Garden City NY 11530. 516-222-7438.

Ampex AG351, FT, $500. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

Ampex AG351 2 trk, gd cond, $600. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

Ampex AG-350-2 in Ampex console w/manuals, used for editing, $800 plus ship compromise or $800 for all except console. G Meloon, WDBA, 28 W Scribner, DuBois PA 15801. 814-371-1330.

Revox A-200, excel w/manuals, $850; Sony TC-650, 7" 1/4 trk, plug-in head block, vgc, $250. B Laughlin, KDCV. 2636 N 56, Lincoln NE 68504. 402-466-8670.

Ampex recorders, 6011-2 $250; 600, $150; 601, $175, tan cases. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

Ampex recorders, 8 trk w/ss; 4 trk w/ss; 3 trk/Neumann U47 mic, $4850; 2 trk/2 trk/FT/1/2 trk/Pultec EQP1A, $3250; Ampex remotes (2), $100ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

MCI JH110C-8 working, gd cond, w/locator & rollaround. J Barcroft, KGB, 7150 Engineer Rd, San Diego CA 92111. 619-292-1360.

Sony TC7562, 10-1/2" R-R, 7.5-15 ips, gd deck, $350, free ship; (3) Gates solid state M6629 AGC, $150 ea or all for $375, free ship. J Sheppard, Globe Prod, 539 W Minister Ln, Salem VA 24153. 703-389-1670.

Scully 400 logger, 4 chan record, PB, erase, constant run/VOX operation, gd cond, low hrs, BO/or trade. M Glaser, C&G Ent, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Technics SV-P100 digital audio tape recorder. J Aulik, Chnl 26, 960 Watermullen Dr, Green Bay WI 54304. 414-494-2400.

Sony TCD5PRO stereo portable cassette deck w/built-in limiter, NR & balanced/unbalanced inputs, $275/BO. J VonVleck, Aras Cons, 2844 Beechtree Ln, Woodbridge VA 22191. 703-221-6984.

Nagra III (4), w/sync option, 3.75:7.5:15 ips, mint cond, $1500 ea/BO. J VonVleck, Aras Cons, 2844 Beechtree Ln, Woodbridge VA 22191. 703-221-6984.

Ampex 601, $150. A Crain, WWEE, Box 157, Collierville TN 38017. 601-895-6483.

Pioneer RT-707 autoreverse, gd cond, (9), $100. J Andrew, KYKY, 111 S Bemiston, St Louis MO 63105. 314-725-9814.

Akai GX-4000D 7" R-R, 4 trk stereo, 2 speeds 7.5 & 3.75 ips, $100. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

TEAC A-3300SX 10-1/2" R-R, 2 trk stereo, 2 speeds, 15 & 7.5 ips, $250. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

Sony TC630 excel cond, new heads, $300. B Michaels, Tye Bdct, POB 5105, Abilene TX 79608. 915-695-7300.

Revox A77, excel cond, $300. B Michaels, Tye Bdct, POB 5105, Abilene TX 79608. 915-695-7300.

3M M79, all kinds of parts, heads, motors, etc, scrapping 6 machines, 1 yr warranty on all parts. B Youger, UCA Recording, 1310 Lenox, Utica NY 13502. 315-733-7237.

Otari MKII-4 excel cond, 1/2" 4 trk, BO. R Kaufmann, Solid Gold Time Machine, PO Box 29804, Atlanta GA 30359. 404-636-2787.

Scully 280, in floor cabinet, mono, BO. G Erway, KBOW. Rt 2 Box 26B. Cordell OK 73632.

MCI JH110BX 1/4" R-R, 8/82, selling for upgrade, w/remote control, $3000/BO. G Dalton, KKDA, POB 530860, Grand Prairie TX 75053. 214-263-2806.

Nakamichi 550, battery operated, excel cond. R Kaufman, Solid Gold time Machine, POB 29804, Atlanta GA 30359 404-636-9911.

Otari MKII-4 1/2" 4 trk, excel cond, BO. R Kaufman, Solid Gold Time Machine, POB 29804, Atlanta GA 30359. 404-636-9911.

Nortronics 9211 tape heads, new, reproduce 2 trk stereo, 1/4", orig equip for Scully 280B & 250, 255; Revox PR99, 2 trk stereo, 7.5-15, used less than 40 hrs. M Sirkis, Peak Audio, 3107 Bedlington Pl, Holland PA 18966. 215-860-0303.

MCI JH-10 2" 16 trk w/autolocator & varispeed, $8500; Scully 280 1/4" mono w/Ruslang cabinet, $1300; Teac A-2000R 1/4" stereo auto-reverse, $325. C Osgood. Ct Recording Std, 1122 Main, Bridgeport CT 06604. 203-366-9168.

Tascam 70, $200; Soundcraft Series II manual, $5; TEAC 2300S stereo deck inst manual, $5; 3M 400 inst manual, $20; Ampex ops & maint manuals for AG-440B & AG-445B, AG-350 & AG-355, $20 ea. D Green, Waves Snd Recrds, 1956 N Cahuenga Blvd, Hollywood CA 90068. 213-466-6141.

Ampex 440C 4-tk, 1/2" format, excel cond, $3500 firm. E Caldwell, Production Block Stds. 906-E 5th St, Austin TX 78702. 512-836-0666.

3M M79 24 track, rebuilt, all new Saki heads, auto locator, $16,000. B Youger, UCA Recording, 1310 Lenox, Utica NY 13502. 315-733-7237.

Ampex 440B (3), stereo 1/2 track in gd cond, working, several cabinets, $1500-$1800 depending on cabinet. B Youger, UCA Recording, 1310 Lenox, Utica NY 13502. 315-733-7237.

Eumig FL-1000 cassette deck, excel cond, BO. R Kaufmann, Solid Gold Time Machine, PO Box 29804, Atlanta GA 30359. 404-636-278.

Magnacord 728 2-track stereo rack mount, working but rough, $75 w/manual & reel knobs. G Meloon, WDBA, 28 W Scribner, DuBois PA 15801. 814-371-1330.

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

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

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

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

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

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

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

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RW Broadcast Equipment Exchange

CASSETTES . . . WTS

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

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

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

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

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

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

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

Want to Buy

Technics RSM85 cassette in gd cond. R McDaniel, KJRG. Box 567, Newton KW 67114. 316-283-5150.

1/2" 2 trk, record, reproduce & erase heads. D Love, Coincidence Digital Recdgs, 3700 Wingate, Waco TX 76706. 817-662-2551.

Ampex 15/30 ips servo motor. D Love, Coincidence Digital Recdgs, 3700 Wingate, Waco TX 76706. 817-662-2551.

Elect for Ampex 351. D Love, Coincidence Digital Recdgs, 3700 Wingate, Waco TX 76706. 817-662-2551.

Revox A77's. M Persons, KGIM, 8th Ave NW, Aberdeen SD 57401. 218-829-1326.

CONSOLES

Want to Sell

Tascam M-35, 8 in 4 out, talkback, effects, slate, cue, 8 band EQ, slate tone, volume for control room, studio, headphones, gd cond, $1250. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Tascam 10 3 mainframes & over 50 modules, all for $400. B Hildebrand, Hildebrand Comm, 1819 Beltway, St Louis MO 63114. 314-427-2727.

McMartin B802S 8 mixer, stereo, $1100. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Spotmaster 4BEM50 4 chan mixer for cable/bdct news, gd cond, $500. D Lilling, Lilling Assoc, 1301 20th St NW #202, Wash DC 20036. 202-667-3276.

Allen & Heath 16 in & 8 out, $5000. Executive Recdg, 300 W 55th #4P, NY NY 10019. 212-247-7434.

Tascam 30 mixer, new cond, $950. T Stoller, 2320 Eade Ave, Ft Wayne IN 46805. 219-484-4913.

Auditronics 501, 10 x 10 x 2 & quad, $4500; & Auditronics 501, 26 x 16 x 26, $15000. Joe, River City Studios, 147 Goodrich SE, Grand Rapids MI 49503. 616-456-1404.

RCA EC-6B (2), 1 clean & working, other for parts, $400 for both. J Ross, NW Audio, 3860 Ritamarie, Columbus OH 43220. 614-459-4292.

Allen & Heath 168D 16 x 8 x 2 3 aux sends, new cond, $2200; Kelsey Club 4, 16 chan, in case, $650. E Glenn, Madison N Prods, 1 Williams Cross Rd, Stormville NY 12508. 914-831-3644.

Tascam 2A, 6 x 4 mixer, $250. J Englander, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-474-6043.

Altec 250T3 12 chan, solid state stereo, works but needs some repair, $200 plus ship. R Larsen, WROP, 316 S Maple, Oak Park IL 60302. 312-848-3172.

RCA BC2B one needs work, one for parts, BO. L Houck, Rollin Recdg, 210 Altgelt Ave, San Antonio TX 78201. 512-736-5483.

BE 5S150 stereo, $1200. D Angrem, WTMX, 4210 Norrose Dr, Indianapolis IN 46226. 317-545-8100.

Collins 212G1 gd cond, recently recond w/solid state, VU meters replaced w/stereo equip, $1000. J Tudor, WKGX, POB 1080, Lenoir NC 28645. 704-433-5713 aft 6PM.

Gates Stereo Statesman 6 chan stereo console in working cond w/manual, $200 plus ship. R Phipps, KHLC, 998 A Sidney Baker So, Kerrville TX 78028. 512-257-7711.

Shane & Young Cherokee 300 8 pot mono console, solid state, works good, $600/BO. J Walters, KKJO, POB 166, St Joseph MO 64502. 816-279-6346.

MCI 416 24 chan frame 18 in by 16 out w/producers desk, API faders, $10,500. C Osgood, Ct Recording Std, 1122 Main, Bridgeport CT 06604. 203-366-9168.

Shure M67, $250. B Jeffreys, WKMQ, 1901 Reedfarm Rd, Rockford IL 61111. 815-877-3075.

McCurdy mixing console, 12 chan stereo w/power supplies & phono preamps plus extra modules, power supplies & EQ's, BO over $6500 plus ship if req. Bill, Vintage Country Radio Programs, 1219 Ogden, Mississauga, Ont, Canada. 416-274-7534.

Gates 4 chan mono console, cond unknown but board intact w/manual, $75 plus ship. R Phipps, KHLC, 998 A Sidney Baker So, Kerrville TX 78028. 512-257-7711.

Harris Stereo 80, 8 chan mixing console, gd cond, BO. J Camperson, Rolling College, 1000 Holt Ave, Winterpark FL 32789. 305-646-2112.

Teac M308 8 x 4 x 2 x 1 8 chan, excel cond, BO. S Yates, KDEY, 121 Calder Sq, Lufkin TX 75901. 409-634-6661.

Shure M267 (2) 2 yrs old, mint cond w/rack mts, $289 ea. C Butler, Butler Eng, 8709 Pinon Dr, Jacksonville FL 32221. 904-786-6363.

Collins 212F 5 pot, operational when taken out of service of service 1 yr ago, $250. S Vellmer, KDMN, Box 639, Buena Vista CO 81211. 303-395-2004.

Ramsa WRT 820 w/meter bridge option, brand new, $3800/BO. B Covert, WMBO, Box 980, Auburn NY 13021. 315-253-7355.

Ampex MX35 mixers (3), $325 ea; SA3761 Sigma 4 chan mixers (3), $150 ea; Presto 4 chan 50/200/500 ohm mixer, $75; 1567A Altec portable mixers, 4 chan/master/VU meter, $350 ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

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

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

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

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

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

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

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

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

Want to Buy

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

DISCO & SOUND EQUIP.

Want to Sell

UREI direct boxes for instruments, new, $180 ea. M Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Eventide 1745M digital delay, mono, $990. Executive Recdg, 300 W 55th #4P, NY NY 10019. 212-247-7434.

dbx 310D modules in 216 mainframe, 16 chan, as is, $1600. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Sparta stereo remote unit, Russco TT & stereo preamps, comp rebuilt, $1200. C Lawson, LB Engr, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

dbx 310D modules in 216 mainframe, 8 chan, works fine, $1100. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Ceiling Star chase light system, Revox B77 half trk, 7.5 & 15 ips, very little use, $300. C Lawson, LB Engr, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

dbx 310D module, 2 tks in custom power supply rack, 8 XLR connectors, gd cond, just recond by dbx, $350. R York, Jewel Records, POB 31078, Cincinnati OH 45231. 513-522-9336.

Yamaha R1000 reverb, new cond, $725. T Stoller, 2320 Eade Ave, Ft Wayne IN 46805. 219-484-4913.

Gollehon PA cabinet, unloaded spks to fit 2-15" spks. S Russell, Russell Music, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

E-V Sentry IV PA horns, 1823M or 1824M drivers w/horns. S Russell, Russell Music, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Orban 622 EQ, 2 chan, $400. M Fiedler, Mahoney Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Echo Springs K10 expanders (3) w/3 elec, $50 ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

EMT 140 tube mono w/remote, stereo preamp & pickups, $1750; EMT 140ST stereo transistor plate, $2750; UREI 813, $1250; Altec 604E speakers (5) $475 ea; Dolby M16 A-type, excel cond, $7950; AKG BX20 spring reverb, $1250; Electro-Harmonix vocoder, $100; Altec 604 silver speaker cabinet w/cross-over, $80. C Osgood, Ct Recording Std, 1122 Main, Bridgeport CT 06604. 203-366-9168.

Echo bleeds (3) for passive mixer as Sigma, $25 ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

Klipsh LaScala, excel cond, BO. R Kaufmann, Solid Gold Time Machine, PO Box 29804, Atlanta GA 30359. 404-636-2787.

UREI 811-A Time Align studio mon w/ceiling mt brackets, $850/pr. T Suckling, Cozy Dog Recdg, 603 SE Morrison Rd, Vancouver WA 98664. 206-694-1845.

Orban 111B dual reverb, $250. D Green, Waves Snd Recdrs, 1956 N Cahuenga Blvd, Hollywood CA 90068. 213-466-6141.

E-V Sentry III 15" woofers (2). J Aulik, Chnl 26, 960 Watermullen Dr, Green Bay WI 54304. 414-494-2400.

Cerwin Vega-like speakers, 12", $100. D Green, Waves Snd Recdrs, 1956 N Cahuenga Blvd, Hollywood CA 90068. 213-466-6141

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

Want to Buy

Older JBL, Altec, Jensen speakers. C Dripps, Kurloff Entr. 818-444-7079. 800-334-8223 CA only.

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

LIMITERS

Want to Sell

Kahn SP58-1A Symmetra-Peak, $95. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

DAP 310 (3), 4400 Audiomax, 4440 Audiomax, 4111 Volumax, call for price. D Groth, Radio Engineering Assoc, Box 416, Poughkeepsie NY 12602. 914-471-1500.

CBS 411 stereo peak controller; CBS 4450A stereo compressor; Collins 26U1 tube type compressor; Fairchild 206 stereo compressor, BO on each. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505 318-233-7003.

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

Dorrough 310 tri-band processor, gd cond, replaced w/stereo equip, BO. J Tudor, WKGX, POB 1080, Lenoir NC 28645 704-433-5713 aft 6PM.

BE FM601 stereo AGC limiter, $700. M Wilson, KNOE, 1400 Oliver Rd, Monroe LA 71201. 318-388-8888.

CBS 400 Volumax, older white face unit, working cond, $200. J Tudor, WKGX, POB 1080, Lenoir NC 28645. 704-433-5713 aft 6PM.

Gates Solid Statesman IE-1. $800. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

UREI LA4 compressor/limiter, $450. D Angrem, WTMX, 4210 Norrose Dr, Indianapolis IN 46226. 317-545-8100.

Dorrough DAP 310 mono processor, $900 AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

UREI 1178 stereo C/L w/manual. $500/BO. UREI BL40 C/L, $250/BO. WB Welden. KVLG, POB 1276, Sealy TX 77474. 409-885-4778.

CBS III Audimax, working cond, older white face unit, $200. J Tudor, WKGX, POB 1080, Lenoir NC 28645. 704-433-5713 aft 6PM.

RCA BA-28A, tube type AGC program amps (2), $95 ea. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Modulation Sciences composite clipper. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Spectra-Sonics Complimiters (2). M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Orban 9000 Optimod AM, $1895. G Wachter. KFYI, 631 N 1st Ave. Phoenix AZ 85003. 602-258-6161.

Orban 9000A Optimod AM. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Dorrough 310 AM audio processor, $900; Marti CLA40, $200. M Persons, KGIM, 8th Ave NW, Aberdeen SD 57401. 218-829-1326.

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LIMITERS . . . WTS

CRL CC300 composite controller, $200. R Huggler, WSUL, 250 Broadway, Monticello NY 12701. 914-794-0242

Delta AMC-1 mod controller, excel cond, $2100. T Cochran, KNOM, POB 988, Nome AK 99762. 907-443-5221.

UREI LA-3A (2), excel cond, BO. R Kaufman, Solid Gold Time Machine, POB 29804, Atlanta GA 30359. 404-636-9911.

Dorrough 310 limiter/comp, $650; Inovonics 230 limiter/comp, $500. A Crain, WWEE, Box 157, Collierville TN 38017. 601-895-6483.

Optimod-FM 8000A, great cond, $1900; Audimax 4450, works great, $400. D Byrd, WZGC, 603 W Peachtree, Atlanta GA 30308. 404-881-0093.

Inovonics MAP-II multiband processor plus 215 limiter clipper, excel cond, $700. T Cochran, KNOM, POB 988, Nome AK 99762. 907-443-5221

Fairchild Conax 600 limiter. $350; Gates Stay-level M5167, $300. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660

UREI 1176 lim amp needs minor troubleshooting, $280; UREI BL-40 lim amp w/manual, $200; Harris 994-7059-001 lim amp w/manual, $200. N Allebaugh, WICE, 100 John St. Cumberland RI 02864. 401-725-9000

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

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

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

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

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

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

Want to Buy

Orban 8100A, used FM Optimod. B Ladd, WNRR, 108-1/2 E Main, Bellevue OH 44811. 419-483-2511.

Inovonics MAP II 230 audio processor. B Kramer, WQXO, POB 3176, Longwood FL 32779. 305-682-5463.

Orban 8100A FM or Texar Audio Prism, substitutions OK. J Stitt, WLLT, 250 W Court Ste 300E, Cincinatti OH 45202. 513-241-9500.

CBS Audimax 4450. D Davis, Davis Bdct. 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

CBS stereo Audiomax in any cond, can repair. G Miller, PA Network, 260 S Broad St, Philadelphia PA 19102. 215-732-7100.

Limiter for use on Harris 1 kW AM xmtr, must be bargain. KBAK, 3933 Geneva Pl, Anchorage AK 99508. 907-835-2405.

MICROPHONES

Want to Sell

AKG 414EB 48 V phantom power, $500. M Fiedler, Mahoney Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Cerwin Vega B30's, mint cond, ideal for disco or vocal use, 15" 3 way, carpeted. $475. J Green, WHPC, Stewart Ave, Garden City NY 11530. 516-222-7438.

WE 633A historic mic's from the UN, $45; WE 24A desk stand for 633 or 639, $45; E-V 635A, $60; E-V EL-103, $20; Luxo mic booms w/adpt for 635A, $35; will trade for old mic's or parts. R Van Dyke, Van Dyke Inc, Squires Ave, E Quogue NY 11942. 516-728-1327.

Crown PZM6LPB, PX-T, PZM3LVB, PZM30GPB; Shure SM57-CN, AM528, SM11-CN, SM81; E-V RG-11. BO. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

EV CLS42 pro condenser mic sys, 4 heads, 2 preamps, PS all access, $600; Sony ECM-33F electret condensers (pr), excel, $175. B Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

EV CO90 lavalier (5), $125 ea or $500 all. C Springer, KLMR, Box 890, Lamar CO 81052. 303-336-2206.

AKG C60 PS, swap for Sony C87A. E Obrien, Outhouse Recdg, 3041 Crawford St, Terre Haute IN 47803. 812-238-9312.

EV RE-15, vgc, $120. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Sennheiser MD421U, less than 1 yr old. $189 ea or $369/both. C Butler, 8709 Pinon Dr, Jacksonville FL 32221. 904-786-6363.

Large selection mics from Canon, RCA, Sennheiser, etc, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Want to Buy

Shure SM5B mic or RE-20, in gd cond, reasonably priced. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

Mic shock mount assem & cable strain relief for RCA-77D; also gd used Altec 639B mics. P Dalton, PBS, 105 S Utah St, Arlington VA 22044. 703-892-6923.

E-V RE20 mic. D Brown, WBSN, 7929 Zimpel St, New Orleans LA 70118. 504-865-9812.

MISCELLANEOUS

Want to Sell

Oak equip rack, 19", 22 x 33 x 16 5" w/casters, $100. J Nigro, 25 Patton Ct, Wayne NJ 07470. 201-790-1415.

FREE, about 50 copies of Radio & TV News & Radio Elect, dating back to 1952. J Maveux, 313 N Kenmore St, Arlington VA 22201. 703-524-7651.

Bird 8931-115 10 kW load, new in box, $2000 GV Bell, POB 11100, Truckee CA 95737. 916-562-1164

Vacuum crystal, T-12A, 1590 kHz for Gates BC-1H. $75. D Davis, Davis Bdct, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

New tech manuals for Sparta Elect products. write for product. D Peluso, DGP Consult, 2900 E Charleston Blvd #197, Las Vegas NV 89104. 702-384-0081.

Ribbon inductors, new, 7" dia, 16T (2), $100 ea. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Spencer Microscope w/arm for mounting & light, $100. L Oliver, 304 West 89th, NYNY 10024. 212-874-7660.

Apple II-C w/monitor, 2nd disk, mods, $785. B Laughlin, KDCV, 2636 N 56, Lincln NE 68504. 402-466-8670.

Alden 9271M 4 speed weather chart recorder, set up for GOES landline fax use, gd cond, recently removed from service. $2495. LT Killion, KRVN, 104 West 8th, Lexington NE 68850. 308-324-2371.

Robot from NAB convention, he walks, talks, passes out cards, he's remarkable, great for remotes. R David, KLTC, POB 1478, Dickinson ND 58601. 701-227-1876.

Nortronics AT320B, want to trade stereo align cart, used once for 1/4 trk 7.5 ips stereo R-R align tape. R Koch, A/V Ent, POB 5195, Greensboro NC 27435. 919-273-1385.

Telephones, 6 button, Bell elect, (14), some cable, $600/BO. D Hubbard, KKRE, Box 1385, Monument CO 80132. 303-481-4700.

Record-A-Call 560 answering units (2), not remoted, like new, $60 ea plus ship, vgc. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

ASR-33T send & receive teletype w/punch tape maker/reader, numerous rolls paper, punch tape, ribbons & stand, BO. J Emmel, Emke Media, PO Box 401, Olyphant PA 18447. 717-383-1118.

Rack mountable road case, 20" x 8" x 20" storage, ideal for cassettes/amp, $75 plus ship. J Green, WHPC, Stewart Ave, Garden City NY 11530. 516-222-7438.

Crystal oven for RCA BTA-1R, 550 kHz, $40. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Rank 78 rotoverter 17.5 kVA, 208 V, 3 yrs old, $1500. J Verkest, WFCL, POB 269, Clintsville WI 54929. 715-823-5128.

Pelco pedestal mount w/controls for CCTV, $80; Ionics 200 W mercury ARC power supply, $55; Dukane microfiche reader, $45 plus UPS. J Baltar, Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Budd equip rack, tall w/rear door, like new, $200. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Soft drawn copper wire, approx 5000' of #10 for AM ground systems, $1800. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Stabaline EMT-4106C voltage reg, 6.6 KVA, new cond. T Smith, CCI Comm, 192 Lancaster Ave, Frazier PA 19355. 215-289-1725.

UTC LS141 transformers (3), 600 ohm primary, (2) 600 ohm secs, new/excel, $40 ea; Sylvania studio lamps, new, (9) EGK, EHK, BTL, (4) 176-018, 176-022, $7 ea. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Electrodyne SM-9 switch modules, (20) 1.5" wide, 7" long, 8 bus assigns & one solo button, BO. R Robinson, TNA, 10 George, Wallingford CT 06492. 203-269-4465.

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

ADC T-R-S 1/4" 2 x 26 (3); also T-S 1/4" 2 x 26, $250/BO each & wire. M McCarthy, KTVI Prod, 1116 Tamarack, Mt Prospect IL 60056. 312-640-8965.

Sparta Elec tech manuals, write for product wanted. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104 702-384-0081

Misc gear including DC motor, spares for RCA 16mm film projectors; rectifiers, sound effect filter, old TV EQ instruction manuals, lens for RCA B&W camera and more, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Want to Buy

Service manual for Akai GX635D, will pay for xerox & ship. Chris, Y107, 101 E Harris, Caddilac MI 43601 616-775-1071

Radio & Electronic Engineering by F. Terman, prefer edition from 50's. S Bauder, WLEF, E 1825 Hwy 182, Park Falls WI 54552 715-762-2611.

Book or copy for HB400D-HB410B Simonsen KHAT, Box 6066 Lincoln NE 68506. 402-423-1530

Rack mount(s) for Panasonic TN-63 video monitors; rack mount(s) for Conrac ENA-12 video monitors. F Vocpe, WLIO, POB 1689, Lima OH 45802. 419-228-8835.

MONITORS

Want to Sell

Elcom Engr 300, standard freq rec & monitor system, $300. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Belar FMM1-FMS1-SCA1-FM RF amp, FM monitor stack, BO; Potomac Inst RMP19, BO; McMartin TBM 4500A, BO; Gates M4990, BO; McMartin TBM 3000, BO; McMartin TBM 3000, BO; Karr monitor, unknown mdl cond unknown, BO. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505. 318-233-7003.

McMartin TBM 3500 FM mod monitor, just taken out of service, in working cond, $100/BO plus ship. R Phipps, KHLC, 998 A Sidney Baker So, Kerrville TX 78028. 512-257-7711.

McMartin TBM 3000 FM monitor in working cond, just taken out of service. $100/BO plus ship. R Phipps, KHLC, 998 A Sidney Baker So, Kerrville TX 78028. 512-257-7711.

Gates GTM-88F FM freq monitor, need crystal, $150; Gates GTA-88F freq comparator for pilot & SCA freq, have manual, $100. D Gander, KDUZ, Box 10, Hutchinson MN 55350. 612-587-2140.

Harris M6659 mod mon: McMartin TBM 3700 FM mono; McMartin TBM 2200A FM stereo; McMartin TBM 2000B SCA monitor. S Wallace, WDAO, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

Want to Buy

Collins 900C-3 mod mon, schematics & oper info. H Schardin, 8639 178th Ave, Forest Lake MN 55025. 612-464-7587.

Belar RFA-1 FM RF amp, schematics & oper info. H Schardin, 8639 178th Ave, Forest Lake MN 55025. 612-464-7587.

Belar FMS1, gd cond. B Kramer, WQXO, POB 3176, Longwood FL 32779. 305-682-5463.

Type accepted AM mod monitors in working cond. J Coursolle, WCKK, 889 W Sunnyview, Oshkosh WI 54901. 414-324-4441.

EBS monitor, decoder/encoder, Gorman-Redlich CED or similar. J Powley, WIIM TV, 1536 Logan, Altoona PA 16602. 814-943-2607.

Aural TV mod monitor, mono, Belar TVM-1 or similar. J Powley, WIIM TV, 1536 Logan, Altoona PA 16602. 814-943-2607.

MOVIE PRODUCTION EQUIP.

Want to Sell

Kodak Ektagraphic Arc 35mm slide projector, uses Marc-300 pwr supply (not inc), $650. G Ormrod, GFO Productions, 122 E 19th, Olympia WA 98501. 206-352-8028.

Large selection of movie/video prod gear, call for details & prices. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Want to Buy

High-speed 16mm film camera, pref inexpensive, G Ormrod, GFO Productions, 122 E 19th, Olympia WA 98501. 206-352-8028.

RECEIVERS & TRANSCEIVERS

Want to Sell

GE lo-band xtal FM monitor mdl 4ER7B5 rack mount, tube type, $50 ea. J Newman, 143 WBUC Road, Buckhannon WV 26201. 304-472-3932.

Walki-Talkies (5) police/ind type, gd working cond. D Pickett, KIBG, 5001 Lionel Ave, Texarkana TX 75503. 214-832-5410.

UHF portable transceiver/base station, $100. D Pickett, KIBG, 5001 Lionel Ave, Texarkana TX 75503. 214-832-5410.

Kenwood KR-6170 AM/FM reciever, 60 W w/built-in reverb & synth, $100. M Gottesman, KAMP, POB 1018, El Centro CA 92244. 619-352-2277.

Gonset G50, last used in 1971, free, you pay ship. R Koch, A/V Ent, POB 5195, Greensboro NC 27435. 919-273-1385.

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

CE, radio, FCC gen'l lic, BS Engr, exp in FM, pro sound systems & computers (H/W & S/W). A Melnyk, 200 Stockbridge Rd, Lenox MA 01240. 413-637-0838. X105

New eng looking for place to grow & learn, have some exp, want more, ready to go! M Forster, 702 S Cherry St, Hammond LA 70401. 504-345-8963.

Prof high energy DJ seeks PT position in upstate NY, have refs/exp. G Collette, 237 N Hueison Ave, Stillwater NY 12170. 518-664-5094.

Journeyman TV control engr seeks employment in any aspect of video, cable or commercial TV bdctg in Denver area. Bdct major, AS-USNY, Marine radio FCC license, 4 yrs military TV prod/troubleshooting, 4 yrs civilian commercial TV prod. Contact Sharon Smith: 303-430-7159

Tech person, 10 yrs exper video/film, elect & bdctg. Seeks PT/FT work inhouse/location film/video. Gen FCC, SBE, SMPTE, H Gray, 408-246-5563/241-9637.

Young successful PD seeks OM/GM in small/medium market, AM or FM, challenge a must! B Jones, 870 Pike St, Wabash IN 46992. 219-563-8619.

Exp announcer seeks new position w/VA station, 5 yrs on-air, great prod, former MD. G Hale, POB 52, Pratts VA 22731. 703-786-3423 or 703-948-6459

Seeking tech position, radio, TV or recg studio, studio design, construction, LA area. K Meades, POB 71098, LA CA 90071. 213-666-9570.

Pro PD/MD, 19 yrs exper, looking for a home, all formats esp A/C, oldies. Dan Marks, Rt 1 Box 79B, Gladstone VA 21153. 804-946-2259.

HELP WANTED

C.E. for NY rental company w/audio & RF skills, maint of sophisticated audio/video/communications equip, customizing rental equip, set-up systems, actual trouble-shooting experience is preferred but not necessary, gd benefits. Lucia, A/T Scharff Rentals, 1619 Broadway, Ste 414, NYNY 10019. 212-582-7360.

Consultants

Can't Find It? **Call 1-800-426-8434 For Immediate Action!** **Want To Sell It?**

Broadcast Equipment Exchange

RECEIVERS . . . WTS

Motorola MX340 4 chan w/PL, $400. G Dalton, KKDA, POB 530860, Grand Prairie TX 75053. 214-263-2806.

Motorola MX330 walkie talkie, portable, 2 chan w/PL, $300. G Dalton, KKDA, POB 530860, Grand Prairie TX 75053. 214-263-2806.

Want to Buy

HF380 0-30 MHz transceiver. N Chavigny, Radio Ranch, 1309 Elton Ln, Austin TX 78703. 512-472-5379.

Collins 5157 0-30 MHz receiver, incl 55G preselector. N Chavigny, Radio Ranch, 1309 Elton Ln. Austin TX 78703. 512-472-5379.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Marti RMC2 remote control system, gd cond, $700. M Wilson, KNOE, 1400 Oliver Rd, Monroe LA 71201. 318-388-8888.

Marti modulator & demod cards for RMC-15 to STL use tuned to 66 kHz, $100/pair; Moseley DRS-1A 10 chan digital remote control, BO. P Keogh, WKFX, POB 11907, Green Bay WI 54307. 414-468-5445

Misc older RPU gear, Marti, GE, Motorola M McKenzie, KALL 312 S East Temple, Salt Lake City UT 84111. 801-364-3561

Misc STL equip, Marti preamp, iso-coupler. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561

Gentner VCR 1000 remote control system, never used. C Harrison, KGEM, POB 5278, Boise ID 83705. 208-344-3511.

Anixter Mark 4' grid dishes for 950 MHz STL (2), as is, working when removed, BO; Moseley PCL 505 composite audio STL system, BO; Moseley TRC 15AW radio remote control system, BO; Gates RDC200A wireline remote control, BO. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505. 318-233-7003.

Motorola MR96 wideband audio microwave link, duplex, $2000. B Ferguson, RJF Bdctg, Box 132, Salem NJ 08079. 609-935-1510.

Collins MW318A transceiver, 6 GHz TV, $1200; RCB TVA7, 6 GHz TV, $300. G Bell, Bell & Assoc, POB 1762, San Mateo CA 94401. 916-562-1164.

Moseley TRC-15 parts, subaudible metering gen & demod plus analog front panel meter & brand new front panel, $100/BO. D Mussell, Bdct Tech Serv, POB 13475, New Orleans LA 70185. 504-866-3846.

Moseley TRC15 w/manuals, excel cond J Brown, WZZU, POB 33396, Raleigh NC 27606. 919-782-4709.

Microwave Assoc VR-3X sat receiver w/IF & demod card, $1000. N Allebaugh, WICE, 100 John St, Cumberland RI 02864 401-725-9000.

Moseley TRC15, gd working cond, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

Modulation Assoc analog satellite mono audio receiver, $350. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039

RCA BTR-30A remote control, 30 chan, Hallikainen & Friends TEL-172 digital telemetry kit, vgc, $1200. B Surratt, WINA, 501 E Main, Charlottesville VA 22901. 804-977-3030.

Moseley TAU-3 tolerance alarm unit, $250 Moseley DRS-1 selector unit, $250, Moseley DRS-1 status control terminal panel, $125 S Keating, Keating Tech Srvs, 18653 Ventura Blvd, Tarzana CA 91356. 818-708-7768

Tek 485 scope 350 MHz, w/manual, $3500, Sencore SG165 stereo analyzer w/manual, $600. J Pancraty, Satellite Network Corp, POB 4080, McAllen TX 78502. 512-787-7855

Marti RMC20 digital remote control, $800. J Verkest, WFCL, POB 269, Clintsville WI 54929. 715-823-5128

Moseley TRC15 studio end, BO Joyce, KBOG, Rt 2 Box 26B, Cordell OK 73632 405-832-5432.

Want to Buy

Moseley PCL606C STL & MRC1600 remote control or equiv. J Stitt, WLLT, 250 W Court Ste 300E, Cincinatti OH 45202 513-241-9500.

Marti MR-30 rec. B Iadd, WNRR, 108-1/2 E Main, Bellevue OH 44811. 419-483-2511

Remote control w/26 kHz control & 67 MHz telemetry. B Murphy, KVRH, 7600 County Rd 120, Salida CO 81201. 303-539-2575.

S-A DAT32 satellite system 7.5 kHz audio decoder card. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

Digital satellite receivers, Fairchild, Dart or equal. A Bowab, WDLT, 2402 Wolf Ridge Rd, Mobile AL 36618. 205-344-3698.

Video STL for LPTV, inexpensive. B Gray, K26BH/K38AT, POB 1838, Yucca Valley CA 92286. 619-228-1133.

Digital Sat System for ABC, from dish to demod or separate equip. R Beaty, WBRB, POB 288, Mt Clemens MI 48046. 313-797-1400.

Moseley AW-15 or similar, phone line control, 8 sources min. F Vobbe, WLIO, POB 1589, Lima OH 45802. 419-228-8835

STATIONS

Want to Sell

Florida outskirts of Tallahassee, only station in county, 1 kW 130K clear channel pre sunset authorization, J Hyden, WMFL, 1275 S Jefferson St, Monticello FL 904-997-3536

Very profitable 5000 watt AM & Class A FM w/upgrade to C2 applied. Owner retiring. Bldg & 9 acres highway frontage, Oklahoma. D Ballard, KEOR/KHKC, Box 608, Atoka OK 74525. 405-889-9153

AM station, 1 kW day, near major market, good dial position, good price, terms. A Crain, WWEE, Box 157, Collierville TN 38017 601-895-6483

Want to Buy

AM construction permit. P Hunn, Hunn Radio, RD1 Box 1067, Westpark NY 12993 518-546-7985.

STEREO GENERATORS

Want to Sell

Moseley SCG8 & SCD8, both $200. G Faltus, WRGR, 600 Atlantic Ave, Ft Pierce FL 33450. 305-461-0099.

Gates stereo gen for TEI exciter, can be adapted to other exciters, w/manual, $180. D Gander, KDUZ, Box 10, Hutchinson MN 55350. 612-587-2140.

SWITCHERS (VIDEO)

Want to Sell

Visual Elec 24-10 24 input, 7 buss prod switcher, just removed from service, $1000/BO B Ellis, KOZK, MPO Box 21, Springfield MO 65801 417-865-2100.

TAPES, CARTS REELS

Want to Sell

Recortec tape eval, 1", 2" & 3/4", several of each. Nigel, Technichrome, 1212 S Main, Las Vegas NV 89104. 702-386-2844

Ampex 671, three groups to choose from 7" x 2400' hand picked bulk taped down ends, 70 per ctn 60¢ ea or $42 per ctn plus UPS; or hand picked taped down ends in printed box, 50 per ctn, 80¢ ea, $40 per ctn plus UPS, or as is bulk, 60 per ctn, 35¢ ea $21 per ctn plus UPS. Call Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572 1-800-331-3191 or in NYS 516-678-4414

Ampex 1/4" tape, 60 min $10. L McElroy 875 S Clarkson, Denver CO 80209 303-722-1109

Fidelipac & Audiopak 20 sec to 4 min like new, some unused (450), $1.50 ea. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301 217-224-1076

Audio tape, 5, 7, 10" reels, each quality checked, gd prices. J Newman, 143 WBUC Road, Buckhannon WV 26201 304-472-3932.

Memorex 360 2" quad tapes, properly stored, sealed, packaged w/precision aluminum take up reels, BO. A Woontner, 23A Locust Ave, Lark Spur CA 94939. 415-927-0865.

Scotch 1/2 mil bdct quality automated tape in boxes, 900 reels avail, $2 ea. J Geedy, Geedy Assoc, POB 1467, Wilmington NC 28402. 919-251-8800.

MCI JH110B (6) w/cab's in gd cond, $2500 ea. M Drayton, WPFW, 700 H St NW, Wash DC 20001. 202-783-3100.

Spotmaster 500 Series, R/P, rack mounted, solid-state, accepts A, AA, B or C carts, $325 plus ship. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

Spotmaster 500 Series older tube table top R/P, needs some work, $225 plus ship, fair/good cond. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

Fidelipac, numerous sizes & Anstocrat in 8.5 min length, BO. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

Aristocart carts, (200) brand new, must sell, w/stereo Hot Tape, $3 ea or all for $600. B Prenevost, WQFL, 5500 E Riverside, Rockford IL 6111. 815-654-1200

Various carts, (154) 10 min Aristocarts, (186) Fidelipac 300 or various lengths, (19) other carts, total 359, $250. K Harnack, KOSE, 509 S Walnut SE, Osceola AR 72370 501-563-2641.

Fidelipac 300, various lengths, used cond, 50¢ ea plus 10% ship, min order 25, new Fidelipac 300 shells, $2 ea plus 10% ship, min order 10. S Tuzeneu, WIHS, POB 117, Middletown CT 06457. 203-346-3646

Fidelipac 300 carts, 14 ea long lengths, $1 ea, (19) Mastercarts, $1.50 ea/BO. M Saady First City Rec, 141-60 84th Rd 3E, Briarwood NY 11435. 718-846-2062

Scotch 208, 226 pancakes & reels, new, BO. Scotch 5" & 7" new empty reels in boxes, BO. B Laughlin, KDCV, 2636 N 56, Lincoln NE 68504. 402-466-8670.

Mono country cart library, excel audio quality, good tape & pads, Fid's 300's, one or all, $2.50 ea. B Taylor, KWSS, Box 292, Miami AZ 85539. 602-425-4378.

Fidelipac 300 gray carts, used, loaded, 75¢ ea, unloaded 50¢ ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039

Fidelipac 300, (85) various lengths, $1 ea. C Shelonberger, WFTW, POB 10, Ft Walton Bch FL 32549. 904-243-7676.

Sesac 16" transcription library, like new cond, collectors items, BO; RCA transcription player, 16", works, fair cond, BO. R Bellavia, WSBC, 4949 W Belmont, Chicago IL 60641. 312-777-1700.

Want to Buy

Fidelipac Master Carts, red or gold, any length, need 2000. D Davis, Davis Bdct, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Dr. Dimento shows wanted for non bdct use in any format. S Fink, Clackboard Prod, 2289 S Green Rd Beachwood OH 44122. 216-382-4886.

TAX DEDUCTION EQUIP.

Non-profit hands-on museum for children needs donated on-air light & studio equipment. M Sherk, The Discovery Center, 164 Hawley St, Binghamton NY 13901 607-773-8750.

High school tech video program in desperate need for 3/4" editing system & any A/V equip for our studio. C Burke, Matawan Aberdeen Chan 19, Atlantic Ave, Matawan NJ 07747 201-290-2840

Cart machines, stereo or mono, prefer R/P J Scott, KBU, POB 6423, Malibu CA 90264. 213-457-3887.

IRS qualified, non-profit org needs multitrack tape recorder or other equip, any cond. B Golges, Balalaika Orchestra of Detroit, 1937 Byrd, Dearborn MI 48124 313-271-3261

Non-profit college needs prod & test equip for bdct & cinema depts. K Wolfe, Columbia College, 925 N La Brea, Hollywood CA 90038 213-851-0550

Non profit college station needs all kinds of bdct gear & test equip. S Walter, WMMR, 328 Kaufman Union, Mpls MN 55455 612-625-5926

Need mixer board, cart machine, stereo or mono & carts. B Murphree, Water Valley JC's, 120 Simmons, Water Valley MS 38965 601-473-2501

Non-profit religious org needs complete FM facilities for foreign & domestic bdct, STL, FM xmtr 10 kW or less, antenna rings, TTs, audio console R-R cassette, etc. B Diefenderfer, Morning Star Ministries, 590 Main, Slatington PA 18080. 215-767-5985

Permittee of chan 35 soliciting tax deduct donations of video equip, esp 3/4" recorders, editors, & tapes. K Sleeman, Ind Public Media of Phila, 2714 Quarry Rd NW, Wash DC 20009. 202-332-6130

TEST EQUIPMENT

Want to Sell

Jasoni TAS-1000 audio tape analyzer, prototype, $250. D Peluso, DGP Consult, 2900 E Charleston Blvd #197, Las Vegas NV 89104. 702-384-0081.

Yaesu Musen YC-355D, nixie-tube freq counter, 35 MHz/30-200MHz, $125. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130 504-529-1212.

RW Broadcast Equipment Exchange

TEST . . . WTS

Tentel T2L20-A Tentelometer, never used, $110. M Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Waveforms 452A, transmission measuring set, $100. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

HP-332A dist analyzer; HP-202 osc, both for $500. P Moore, WBBA, RR1, Pittsfield IL 62363. 217-285-2157.

RCA BI-11A, transmission measuring set, $100. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

HP audio gen & dist analyzer, tube types. M McKenzie, KALL, 312 S East Temple, Salt Lake City UT 84111. 801-364-3561.

Gates M3625, test set, $95. S Portier, WNOE, 529 Bienville St, New Orleans LA 70130. 504-529-1212.

Amp-volt (roll) chart recorder, dual scale, model A601C, $150. D Pickett, KIBG, 5001 Lionel Ave, Texarkana TX 75503. 214-832-5410.

Potomac AT51 test system. D Zimmerman, KCLD, POB 1458, St Cloud MN 56302. 612-251-1450.

GE TM-17 test set w/2 cables & metal carrying case, $150; Fluke 8000A digital multimeter, $75; Heathkit AV-3 AC-VTVM, $20. W Arnett, WBAT, 723 Horton St, Marion IN 46952. 317-664-2411 (eves).

Potomac FIM41 field strength meter, near new, calibrated 3/8/85, 0.54 to 5.0 MHz, prefer accept trade-in of older type field meter. A Crane, Crane Eng, POB 157, Collierville TN 38017. 901-853-4735.

Sprague TO-3 condenser checker in gd cond, $35. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

B&K 1022 beep freq osc, BO. P Bear, KXCI, 145 E Congress, Tucson AZ 85701. 602-623-1000.

GR-1191 freq counter, BO. P Bear, KXCI, 145 E Congress, Tucson AZ 85701. 602-623-1000.

GR-1926 multi-chan RMS detector, BO. P Bear, KXCI, 145 E Congress, Tucson AZ 85701. 602-623-1000.

Multitester 480; Presto dummy load w/meter; Heath scope 012; Lafayette audio gen TE22; Fisher K10 expanders (3) w/echo springs; VU meter w/input control; pwr transformer PC8411; Hot Stylus w/meters. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

Nems Clark 120 AM field strength meter, $600. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Audio/video test equip, jigs, fixtures, Sound Tech 1000A FM gen; Tek NTSC waveform mon & vectorscope, JVC color camera, etc; library of A/V manuals w/file cabinets; spare parts of Sony, Hitachi, JVC, Panasonic, Pioneer, etc, A/V srvs dept close out, call for more info, sell by price or BO for all. Karl, 603-352-8400.

Itek up/down counter, $40 ; Lear Siegler 7650 digital multimeter, 19" rack mount w/3 printer connectors, $125; Tek 547 scope, $85; Matec 1204 master sync & exponential gen, $150; Tapaz 250 GW static inverter, $125; Weston Roter 840 RMS/DC converter, $150; HP 3420B DC diff voltmeter rationmeter, $150; Macrodyne Erdac 1100A transient recorder, $175; Tek RM 564 scope, $85, plus UPS charges. J Baltar, Maine Reel Comm, 67 Green St, Augusta ME 04330. 207-623-1941.

Sencore Cricket transistor checker, vgc, $60. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

McMartin BFM 1521R audio gen, gd cond, w/manual, $75. R Eaton, WFHC, 158 E Main, Henderson TN 38340. 901-989-6000.

Sound Tech 1710A w/Ind, dist analyzer, excel cond, $3000. D Denton, Denton Engr, 16142 Via Harriet, San Lorenzo CA 94580. 415-278-6463.

B&K 1403, $125; Telequipment D61A dual trace, $325; LSI ADM-3 CRT terminal, $100. B Urz, NCS, 2620 S 36th, Omaha NE 68105. 402-553-4591.

Jasoni Elec audio tape analyzer prototype, $260. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Want to Buy

Delta in line bridge, Delta revr/gen. J Battison, 890 Clubview Blvd N, Columbus OH 43085. 614-888-3364.

Field strength meter for AM, gd cond. V Baker, Box 889, Blacksburg VA 24060. 703-552-4252.

TRANSMITTERS

Want to Sell

Gates BC50C 50 kW AM stereo xmtr (1966), Motorola AM stereo incl, avail June 1st. D Gehman, WASG, 1210 S Main, Atmore AL 36502. 205-368-2511.

Continental 802-A FM solid state exciter, gd as new, 2 yrs old, $4000. R Goodman, WCKN, POB 650, Anderson SC 29621. 803-226-1511.

Harris FM5H3 5 kW FM, less exciter, as is, working when removed, BO. P Shirley, Lafayette Bdctg, POB 52046, Lafayette LA 70505. 318-233-7003.

Collins 830D 1 kW FM 3 kW class A pkg, FMC LP7 7 bay antenna w/mounts, 300' Andrew 1-5/8" heliax, Collins 542-1 freq mon 107.1 MHz, Shafer automation brain & racks, $11,800. B Larson, KSOS, Layton Hills Mall, Layton UT 84041. 801-546-1722.

Weston 2031 percent power meter for Continental AM/FM xmtrs, $45. D Peluso, DGP Consult, 2900 E Charleston Blvd #197, Las Vegas NV 89104. 702-384-0081.

Harris BC10H 10 kW AM stereo xmt (1981), Motorola AM stereo incl, avail June 1st. D Gehman, WASG, 1210 S Main, Atmore AL 36502. 205-368-2511.

Collins 550A, 500-250 W AM, $1500. S Vellmer, KDMN, Box 639 Buena Vista CO 81211. 303-395-2004.

RCA BTF10D 104.1 MHz, $7500. J Eves, WPAY, 1009 Gallia St, Portsmouth OH 45662. 614-353-5176.

RCA BTA-1R, 550 kHz, $3000. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Plate xformer TMC, 18 KVA, 3 phase, 210-250 V primary, sec yields 6000 VDC, 3 A, $300. A Emerald, Emerald Ent, 8956 Swallow Ave, Fountain Valley CA 92708. 714-962-5940.

Gates BC1T 1 kW AM w/100' tower tuned to 1450 kHz, BO. J Chidester, KGLN, 162 W 6th, Glenwood Springs CO 81602. 303-945-6501.

Collins 20V2 500-1000 W, mint cond, 1140 kHz, BO. S Vellner, KDMN, Box 639, Buena Vista CO 81211. 303-395-2004.

Continental 814R-1 2.5 kW FM, 802A new type exciter, 3 yrs old, new final tube, $17,000. B Michaels, Tye Bdct Co, POB 5705, Abilene TX 79608. 915-695-7300.

RCA BTA10F, all or any parts, plenty of gd parts avail. B Emanuel, KASH, 1300 E 68th Ave #208, Anchorage AK 99518. 807-522-1515.

Continental 317-B 50 kW AM, 710 kHz. R Benson, KEEL, POB 20007, Shreveport LA 71120. 318-425-8692.

Gates Vanguard 1 1 kW, as is, BO. D Bergstrom, KCSJ, 1st & Main, Pueblo CO 81003. 303-543-5900.

Weston 2031 power meter for Continental Power Rock & FM xmtrs, $45. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

Want to Buy

QEI 675 exciter. D Dietz, WZOQ, 710 N Cable Rd, Lima OH 45805. 419-222-9292.

Rust 5225 xmtr, EMT 15ASCXB & manuals, will negotiate. R Speichinger, KBSR, 4040 Tower Rd, Rapid City SD 57702. 605-343-6822.

Lower power TV UHF & VHF xmtr, call collect. N Davis, Davis Comm, 25 Tall Pines, Defuniak Sp FL 32433. 904-892-4038.

5 kW AM, gd cond, decent care, reasonable price. B Ell, WTNX, Rt 2 Box 96, Lynchburg TN 37352. 615-759-7111.

AM, 1kW or less for wide area carrier current system. B Diefenderfer, Morning Star Ministries, 590 Main, Slatington PA 18080. 215-767-5985.

Gates BC5B 5 kW AM xmtr, 570 kHz, parts avail for retune to 1310 kHz, w/book & tubes, BO. Bob Dobbs, KBBX, POB 388, Salt Lake City UT 84110. 801-292-5229.

Harris MW10 or similar unit. H MacDonald, KUMT, POB 710, Ennis MT 59729. 406-682-7598.

LPB carrier current xmtr, pwr line coupler & instruction manuals, prefer solid state, paying $100. D Sites, AmConGen, MRS, APO NY NY 09108.

Non-commercial station needs your xmtrs, 1-10 kW, need in any cond, will pay cash & pick-up. R Van Zandt, WGNV, POB 500, Petersburg IL 62675. 217-632-3115.

FM 1 kW xmtr needed, near $4000 Doug Booth, WLTS, 504-943-9019.

FM 1-3.5 kW, non-profit station. B Shiver, KBJS, Box 193, Jacksonville TX 75766. 214-586-8724.

AM xmtr, 5 or 10 kW. B Sadler, WFSI. 918 Chesapeake Ave, Annapolis MD. 301-269-6500

TUBES

Want to Sell

New, boxed, small audio & RF tubes, from $1-5, write for list. D Peluso, DGP Consult, 2900 E Charleston Blvd #197, Las Vegas NV 89104. 702-384-0081.

Transmitter tube, 6181, still in factory sealed container. L Nixon, WTKV, 601 N Lee St, Valdosta GA 31601. 912-247-3333.

IO 3" #5820A early TV pick-up tube, collectors item, $300; Vidicon 8480-4810 for RCA TK-27 film chain, gd cond, $90; many receiving tubes. WE & industrial numbered tubes, gd selection, single or lot. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

EIMAC 4CX1000A, used, $125. C Shelonberger, WFTW, POB 10, Ft Walton Bch FL 32549. 904-243-7676.

Small audio & RF tubes, from $1-5, write for list. D Peluso, DGP Consultants, 2900 E Charleston #197, Las Vegas NV 89104. 702-384-0081.

EIMAC 4CX1000D, never used. R Benson, KEEL, Box 20007, Shreveport LA 71120. 318-425-8692.

EIMAC 4CX5000A, factory sealed box, late date code, $1025. A Emerald, Emerald Entrp, 8956 Swallow, Fountain Valley CA 92708. 714-962-5940.

Tubes, 813 at $20; 845 at $20; 6252 at $50; 829 at $30. J Cunningham, KEOR, Rt2 Box 113B, Stonewall OK 74871. 405-265-4496.

Want to Buy

Tubes, 242C or 211 for WE-451A xmtr. H Parrish, WOZK, POB 910, Ozark AL 36361. 205-774-5600.

Tube socket for 6076 tube, needed immed. L Smith, Foster Comm's, 115 W 1st, San Angelo TX 76903. 915-653-3387.

TURNTABLES

Want to Sell

Russco Studio Pro's, (2), $450 both. D Angrem, WTMX, 4210 Norrose Dr, Indianapolis IN 46226. 317-545-8100.

Gates CD100 16" (2), Micro-Trak 303 tonearms, excel cond, $300/both. C Lawson, LB Engr, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Technics SP25 (2)same as new, about 5 hrs use, perf cond & working order, $250 ea. C Dix, KJRG, Box 567, Newton KS 67114. 316-283-5150.

Sparta D-12 12" 3-speed TTs (2), fair cond, $75 ea. D Davis, Davis Bdct, 1217 Valencia Dr NE, Albuquerque NM 87110. 505-255-2431.

Gates CB-500 16" transcription TT, excel cond, $175; console cabinet for CB-500, $50; dual console for CB-500, $100; also equip by Rek-O-Kut, Presto, Grey, WE, send for list. R Van Dyke, Van Dyke Inc, Squires Ave, E Quogue NY 11942. 516-728-1327.

Micro-Trak long tonearms (2), one new, one slightly used, excel cond, $75 & $50. C Dix, KJRG, Box 567, Newton KS 67114. 316-283-5150.

GA CB77 drilled for Micro-Trak tone arms, BO/trade. R Hahn, KDCR, Dordt College Campus, Sioux Center IA 51250. 712-722-0885.

Presto 6N lead screws/disc cutting 224/104/106 lines, $65 ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

Sparta GT w/pedestal cabinet, $150 plus ship, vgc. J Emmel, Emke Media, POB 401, Olyphant PA 18447. 717-383-1118.

Russco MK-V variable TT's w/Micro-Trak 303's & 2 Harris preamps, excel cond, $750 plus ship. R Kerbawy, WTNJ, Box 1127, Beckley WV 25801. 304-877-5592.

Rek-O-Kut, 3 speed, gd cond, $125, free ship. J Sheppard, Globe Prod, 539 W Minister Ln, Salem VA 24153. 703-389-1670.

12" TTs w/tonearms (2), direct drive, excel cond, $175 ea. S Vellmer, KDMN, Box 639, Buena Vista CO 81211. 303-395-2004.

Rek-O-Kut CVS 12 TT speed variance, $150; Harmon-Kardon mixers (2) DPR7, $100 ea. L Oliver, 304 W 89th, NY NY 10024. 212-874-7660.

Russco Cue Master, like new, w/Micro-Trak tonearm, $150. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Micro-Trak 303 tonearm (3), $225, free ship. J Sheppard, Globe Prod, 539 W Minister Ln. Salem VA 24153. 703-389-1670.

QRK Studio Pro TT w/Micro-Trak arm (2), $250 ea. N Allebaugh, WICE, 100 John St, Cumberland RI 02864. 401-725-9000.

Gray 108B viscous damped tone arm, 16", new cond, extra slides, silicone fluid, $100; phono preamp, PS audio, stereo, like new cond, $60. Good Sound, 171 Drexel, Lansdowne PA 19050. 215-626-9322.

Russco Studio Pro, vgc, $275/BO; Russco Studio Pro (2) fair, $85/BO ea; RCA 16" in RCA cabinet antique, $150/BO. W Brassell, Brazro Rec, 1215 N Concord, Chattanooga TN 37421. 615-892-5995.

QRK 12-8, no tonearm, BO. M Saady, First City Recdg, 141-60 84th Rd #3E, Brairwood NY 11435. 718-846-2062.

Gates CB1200 w/Grey 303 tonearm, BO. M Saady, First City Recdg, 141-60 84th Rd #3E, Brairwood NY 11435. 718-846-2062.

Want to Buy

2.5-3 mil styli for GE RPX040 & VRII mono cartridges, also need RCA pickup for Mod 70 transcription TT or diamond retipping if avail. RL McDonald, Mission Recdg, 5231 Horton SE, Mission KS 66202. 913-722-2677.

Blank recording discs, Audiodisc, Soundcraft, Presto, Transco, Allied, etc, any sizes, any amounts. B Leslie, Pro Recdg Service, 13709 Mapleleaf Dr, Cleveland OH 44125. 216-662-1435 (eves).

EMT 927's, 930's, Thorens TD124, Gerard 301 & 401. C Dripps, Kurloff Entr. 818-444-7079. 800-334-8223 CA only.

VIDEO PRODUCTION EQUIP.

Want to Sell

Sony 2850A editing system w/Convergence controllers, ECF10B. R Brady, Apollo Recdg, 6142 Beach Blvd, Buena Park CA 90621. 714-994-3761.

Goko VS10 photo to video album editor, transfers 3x5 to video using conventional or camcorder, w/dissolve controller & 50 picture holders, excel cond, $200. B Whatrous, Whatrous Prods, 745 S Orange Ave, Sarasota FL 33577. 800-334-3658 at tone dial 3316.

Ikegami, Sony, Hitachi, Sanyo & JVC, various monitors from 9" to 25", BO. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

CVS 504B TBC w/manual, excel cond, $2000/BO. L Saldona, A/V Prod, 1801 Nickerson St, Austin TX 78704. 512-444-3959.

CMX I Squares 6 VPR2, VR1200, VO2860, GV1600, MM1200, BO. Nigel, Technichrome, 1212 S Main St, Las Vegas NV 89104. 702-386-2844.

Misc video equip inc audio systems, cameras, encoders, lenses, mikes, conferencers, power supplies, mixers, monitors, speakers & viewfinders. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

Crosspoint 6006B sync gen, dist system w/4 phase adjustable black burst outputs, gd cond, $995. D Brennan, Custom Video, POB 26126, Birmingham AL 35226. 205-823-0088.

Shintron 336 video dist amp, 1 input, 6 outputs w/manual, $100. A Ross, 8022 27th NE, Seattle WA 98115. 206-525-4624.

Want to Buy

TBC, any make, any model, must be working w/manuals. Grossman Assoc, 1555 Astor St, Chicago IL 60610. 312-944-6248.

Ward TA-903 & TA-901 video DA's, modules, racks & schematics. M Hill, KOZY TV, 990 Garfield, Eugene OR 97402. 503-484-3044.

BVU 110 or 150 or entire remote portable video package, priced reasonable for a school. M Glaser, C&G Ent, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Panasonic TN-63 video monitor. F Vobbe, WLIO, POB 1689, Lima OH 45802. 419-228-8835.

VIDEO TAPE RECORDERS

Want to Sell

Quad VTRs, VR 1200, VR2000, BO. Nigel, Technichrome, 1212 S Main St, Las Vegas NV 89104. 702-386-2844.

JVC CR6600 U-matic VCR w/remote control, new heads, excel cond, $1795. D Brennan, Custom Video, POB 26126, Birmingham AL 35226. 205-823-0088.

Ampex Mark X video tape head, newley refurbished, $800. G Stewart, WPCB TV, Chan 40 Dr, Wall PA 15148. 412-824-3930.

Ampex helical 2" & 1", working cond, BO. F Chlebowski, Ontario Recording Srvs, 45 Sobieski St, Rochester NY 14621. 716-342-5331.

Sony VO2610 3/4" R/P, $600; JVC 6000U, 3/4" R/P, $600. C Kent, ACS Inc, 443 Elbert, Ramsey NJ 07446. 201-825-7807.

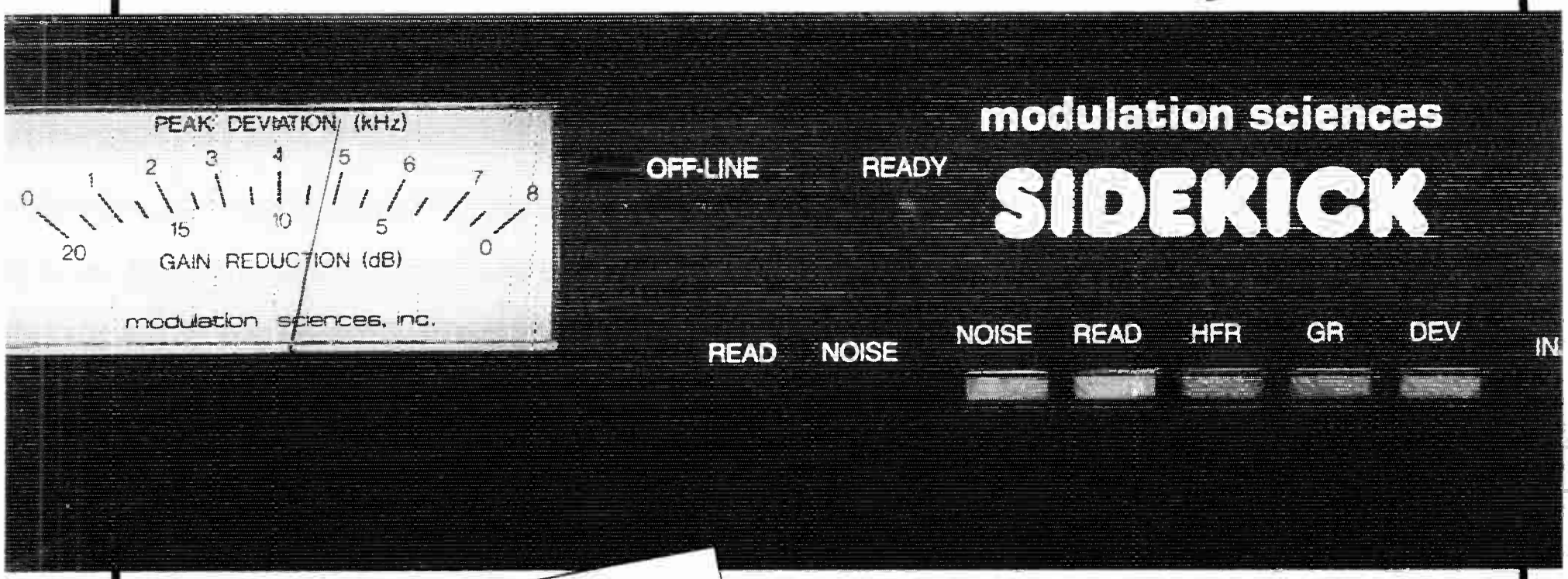
Sony VO-4800 3/4" portable VCR w/Portabrace carry case, $1200/BO. B Ellis, KOZK, MPO Box 21, Springfield MO 65801. 417-865-2100.

Sony VO-4800 portable 3/4" VCR w/2 batteries, charger, Kangaroo pack, $995; Sony VP-1000 3/4" player only, fair cond, $115; Sony VO-1800 3/4" VCR, fair cond, $165. G Ormrod, GFO Productions, 122 E 19th, Olympia WA 98501. 206-352-8028.

Want to Buy

Carts 1" for IVC VC100 or VC200 VTR, threading leaders only OK, also open reel adapter kit. M Cassiere, NTV Prod, 4 M.noru St, Esmond RI 02917. 401-231-0425.

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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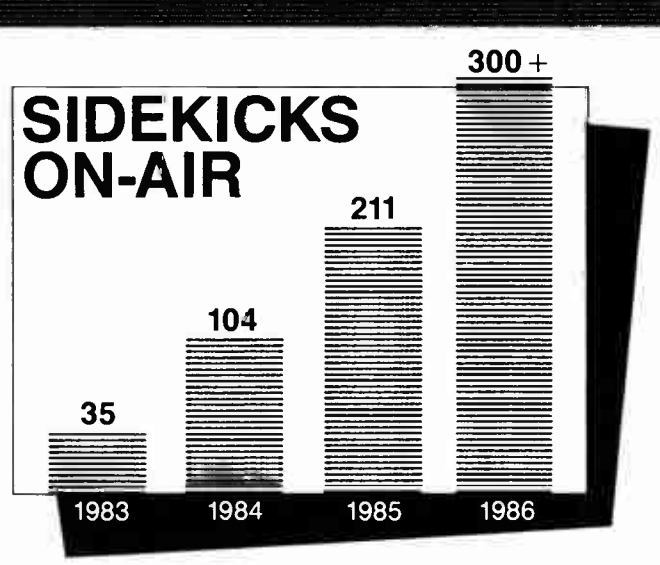

30-Market Survey Results:

SIDEKICK IS THE #1 CHOICE OF MUSIC SCA OPERATORS.

From SCA: Radio Subcarrier Report 9/85

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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.

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And Get Sidekick Working For You.

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Circle Reader Service 15 on Page 22

A SUCCESS STORY

THE OBJECTIVE was no small task: design a radio console that would become the new standard.

THE METHOD involved listening to veteran broadcast engineers and installers. After all, they're the people who have seen and experienced all the ideas that came before. From this research we learned of the problems that had to be solved and the features that broadcasters required. We then added ten years of console building experience and innovation, and created the A-500a console.

THE RESULT: An unsurpassed console that exceeds prior broadcast standards. Its module/mainframe interface borrows from the computer industry, utilizing all-gold contact insulation displacement technology. The logic system is based on programming the module slot, allowing full module interchangeability. It also provides for separate programming of the module's "B" input selection, thus avoiding embarrassing false starts and mutes. Full console-to-machine control is supported without extensive use of interface boxes and cables. Three audio busses are provided to enhance talkshows and remote functions. There are separate processing loops for the speech and music paths, as well as individual channel insert points. A complete line of microphone and line inputs, remote selectors, and machine control modules is offered in virtually any combination, configuration or mainframe size you desire. The A-500a also features a full family of studio turret and turret components to ease facility design.

THE PERFORMANCE: Needless to say, it's a new age for audio, and the A-500a is a step ahead. While specifications don't say it all, ruler flat frequency response, .003% distortion, crisp square wave response and a noise spec that's unheard of deserve merit. Couple such performance, reliability and innovation together, and a new broadcast standard is set.

THE SUCCESS: WHEATSTONE broadcast consoles are installed in major markets all over the country, from frontline independents to national networks. They are in use right now at some of the world's largest institutions.

THE POSSIBILITIES: The possibilities are up to you.

Wheatstone Corporation

6720 V.I.P. Parkway, Syracuse, N.Y. 13211 (315-455-7740)

Circle Reader Service 10 on Page 22