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Volume 11, Number 15

DA Plan for FM Questioned

by David Hughes

Washington DC ... The NAB's FM Transmission Subcommittee, meeting 17 June, has raised some questions about an FCC plan that would allow short-spaced FM stations to use directional antennas.

The subcommittee's findings were to provide technical guidance for the NAB staff to respond to the FCC's spring Notice of Inquiry on FM directional antennas. The NAB, in comments scheduled at press time to be filed in mid-July, was expected to be critical of the plan.

NAB To Sell NRSC Filter Kits

by Alex Zavistovich

Washington DC ... AM stations who might not otherwise be able to afford equipment to comply with the National Radio Systems Committee (NRSC) audio standard will be able to purchase 10 kHz stopband filters from the NAB, due to an agreement between the association and Circuit Research Labs (CRL), an Arizona-based processor manufacturer.

Also in the works from the NRSC is a "two-tiered" technical proposal for an RF emission mask, designed to control spurious emissions from transmitter antennas.

Developments in the two areas are the latest in the committee's efforts to spread implementation of the audio standard and achieve technical comparability of the AM band with FM.

Circuit board kits

According to NAB Engineer Michael Rau, a member of the NRSC, the association has entered into an agreement with audio processor manufacturer CRL, to provide AM stations with circuit board kits for 10 kHz filters.

The filter kits, Rau said, may cost up to \$125 each, and are expected to be available by the NAB's Radio '87 convention, to be held 9-12 September in Anaheim, CA.

The 10 kHz stopband is one of two main points in the NRSC voluntary national standard on preemphasis and deemphasis, which attempts to remedy second-adjacent channel interference and other AM broadcasting problems.

The standard also recommends a guideline of 75 μ S for transmission preemphasis and corresponding receiver

(continued on page 3)

The FCC's FM directional antenna inquiry, issued in late April, considers the authorization of FM directional antenna systems to reduce the distance separations between an FM station's transmitter site and adjacent and co-channel stations and allotments.

While subcommittee member and NAB Engineer Mike Rau said that the FM group "has no objection in principle" to the proposal, "we do object to the unrestrained or uncontrolled use of (FM) directional antennas."

He added that many FM broadcasters fear that "continual shoehorning of (new) FM stations without proper technical standards" could create what some call an *AM-ization* of the FM band. "It is a complicated technical problem."

Subcommittee Chairman John Marino, of NewCity Communications, said that while the use of directional FM antennas was "okay in some cases," their widespread use could harm the already crowded band in areas such as the Northeast and in Southern California.

"We don't want directional antennas for the sole purpose of squeezing in more stations," he said.

The FCC plan

The Commission, in its inquiry on the matter, said it had "tentatively concluded that the limited use of directional antennas for short-spaced transmitter sites may provide more efficient use of FM broadcast spectrum."

It maintained that "FM directional antennas have been used successfully for many years, and their use in short-spaced situations may offer some licensees the opportunity to expand or enhance their coverage."

The "maturation" of the FM band since the 1960s, the FCC indicated, "has made opportunities for new FM stations scarce, particularly in large metropolitan areas."

"In order to increase the opportunity for new, enhanced or expanded service, we are exploring the desirability of considering directional antenna characteristics, and perhaps other relevant factors, in our technical analysis of applications proposing short-spaced facilities," the Commission added.

Two methodologies

The FCC said it is looking at two methodologies. One involves the use of distance separations and would require quantizing stations' power/antenna height combinations at various azimuths into the existing categories of station classes.

The other, the Commission continued, involves the development of a procedure which specifies interference and protected contour overlap criteria for various classes of stations.

The FCC stressed that the use of directional antennas is not under consideration for channel allocations.

The proceeding, it added, "only considers the extent to which directional antenna systems can be tailored to accommodate short-spaced station transmitter/antenna sites within the framework of the Table of Allotments."

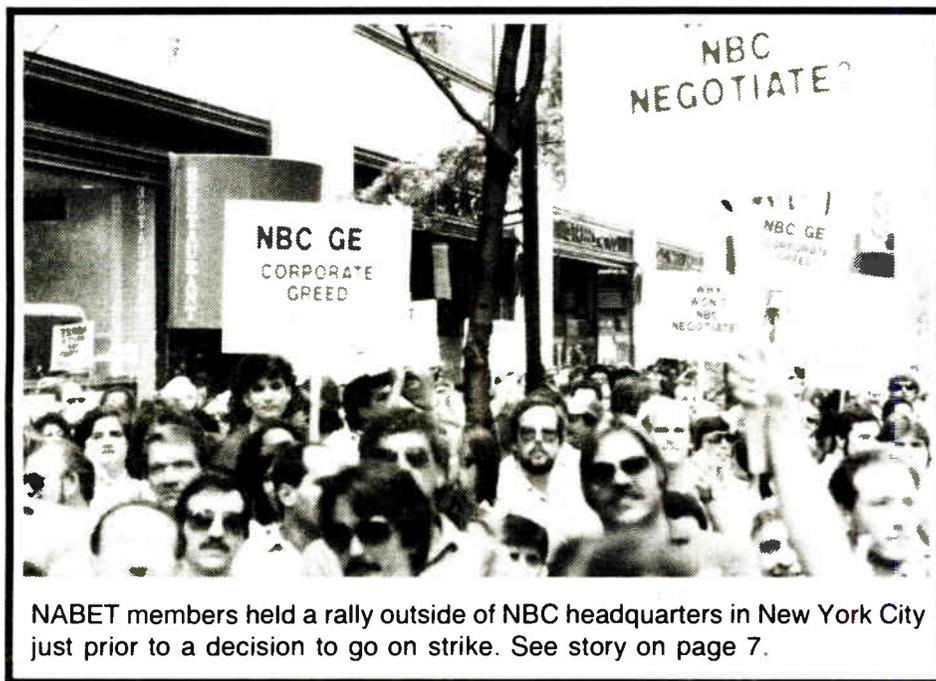
It also requested comments on antenna design issues. At press time, those comments were due at the FCC in mid-July, with the reply comments due 3 August. FCC action on the matter, which could result in a Notice of Proposed Rulemaking, is expected by fall.

"While the FCC says it just wants ideas on the plan, if they carry it a step further (closer to implementation), we would have a big problem," Marino maintained.

Manufacturers input

At the June FM Transmission Subcommittee meeting, members also interviewed chief engineers of three FM antenna manufacturing companies—to

(continued on page 9)



NABET members held a rally outside of NBC headquarters in New York City just prior to a decision to go on strike. See story on page 7.

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REGULATORY NEWS

Indecency Battle Goes to Court

by David Hughes

Washington DC ... The battle continues against the FCC's tougher stance on explicit language on radio and TV.

In June, the Pacifica Foundation asked the US Court of Appeals in Washington DC to rule that the FCC should be required to decide whether material submitted to it before broadcast violates its new, controversial indecency standard.

The organization, which owns non-

“ “

The Commission said it would not become involved in prejudging whether material is indecent.

commercial FM stations in Berkeley CA, Los Angeles, Houston, Washington DC and New York City, is challenging the FCC's decision not to issue a declaratory ruling before the 16 June reading of *Ulysses* over its New York FM station, WBAI. The reading took place as scheduled.

Pacifica in May had asked the FCC to rule in advance if a reading of the James Joyce classic would violate the new indecency standards.

No prior restraint

However, the Commission said it would not become involved in prejudging whether material is indecent or not. The FCC told Pacifica that it was not going to get into the business of "prior restraint."

At a June luncheon, Commissioner Patricia Diaz Dennis said that the FCC

will respond to complaints on a case-by-case basis. She stressed that the FCC will not seek out violations or pre-screen broadcasts.

Dennis maintained that, constitutionally, the FCC does not have the power to censor broadcasts. She admitted that even with the Commission's new policy, broadcasters still have wide leeway to determine which programming is appropriate for the community.

She added that the vast majority of broadcasters already do a good job of screening indecent material from broadcasts.

Other actions

The FCC's response to Pacifica comes at the same time a joint petition for reconsideration was filed by more than a dozen organizations, including the Radio-Television News Directors Association, EZ Communications and National Public Radio.

That petition asks the FCC to allow individual stations to determine which programming would be offensive to their communities. The NAB submitted its criticism of the policy separately.

In addition, at its Board of Directors meeting in late June, the NAB again stressed that the FCC either make its indecency policy more specific or consider abandoning it.

In early June, the broadcasters' organization had asked the FCC to "clarify" its indecency ruling which "raises serious questions of vagueness and overbreadth."

It asked the Commission to define what it would consider "patently offensive" programming and what comprises 'contemporary community standards for broadcasters.'" It also asked that a 10 PM "safe harbor" be established.

The NAB added that if the FCC fails to clarify its indecency ruling, the courts could throw out the ruling as being

unconstitutional.

The recent activities asking the FCC to be more specific come in response to the Commission's decision on 16 April that it would issue warnings, and possibly even fine or revoke licenses, if stations air material that refers to sexual and other "indecent" topics at times when children might be listening.

The new policy, which has been widely criticized by broadcasters as being not specific enough, was a change in direction for the FCC. Previously, the Commission rarely got involved in governing the content of radio and TV programs.

Pacifica was one of several station owners cited by the FCC in its April crackdown. The organization's Los Angeles station, KPDK, was cited by the FCC for airing a play about homosexual encounters.

For more information on the indecency policy actions, contact the FCC's public information office at 202-632-5050.

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FCC Clips

Synchronous transmitter deadline

The comment and reply comment deadlines on a proceeding to authorize use of synchronous transmitters by AM broadcast stations have been extended by the FCC to 9 November and 9 December, respectively.

The extension, requested by the NAB, was adopted by the Commission on 2 July, according to Mass Media Bureau Engineer Bernard Gordon. The previous deadline for comments was 7 July; replies had been due by 6 August.

This is the second such extension granted on the proceeding. On 28 April, the Association for Broadcast Engineering Standards (ABES) had asked for more time because of an absence of technical data from experimental synchronous transmitter sites authorized by the FCC.

In filing its request, the NAB pointed out that the technical data was still unavailable. The new deadline dates would "afford a reasonable amount of time for the receipt of the data," the NAB explained.

The FCC docket is MM 87-6. For additional information, contact Bernard Gordon at 202-632-9660.

Reading service comment deadline

The FCC has extended to 13 August the deadline for reply comments on a proposal which would amend Commission rules requiring noncommercial FM stations to give subcarrier capacity to radio reading services on an "incremental cost justified basis."

Commenters were asked by the FCC to provide itemized statements of charges assessed by stations for the reading services. The data would be used by the FCC to determine appropriate charges for the services.

The extension of time was requested by the Association of Radio Reading Services (ARRS). In its filing, the ARRS said it required additional time to analyze and respond to data.

FCC docket number is MM 87-9. For additional information, contact Mark Solberg at 202-632-7792.

Subgroup on Allocations

FCC Mass Media Bureau attorney Louis Stephens has been named chairman of the Subgroup on Allocations for the FCC's Advisory Committee on Radio Broadcasting (RAC).

According to the FCC, the subgroup advises the Commission conferences on international agreements regarding use of electromagnetic spectrum for radio broadcasting. The subgroup also makes suggestions to the FCC on domestic policies.

Before his selection as subgroup chairman, Stephens served as spokesperson for US delegations to international and bilateral conferences on drafting of treaties and executive agreements relating to terrestrial and space telecommunications. He was also Chairman of the Radio Advisory Committee.

For more information contact Louis Stephens at 202-254-3394.

NAB To Offer NRSC Filter Kits

(continued from page 1)
deemphasis.

Following approval of the standard earlier this year, processor manufacturers rushed to debut NRSC processing gear at the March NAB convention and trade show.

However, Rau commented, some AM stations—particularly those in smaller markets—may not be able to afford to purchase full preemphasis and filtering units.

To reduce the financial burden on those stations, the filter kits will be made available by the NAB, Rau said. He added that the 75 μ S preemphasis recommendation may be accomplished with a few minor modifications to the stations' existing audio processors.

Low-cost, add-on

Stan Salek, of CRL, said the NAB had been "looking for some time for a low-cost, add-on filter for stations with processing equipment other than that supporting the NRSC standard."

Salek noted that there has been no signed agreement between the two groups yet, but that CRL would provide a circuit board, kit of parts, and instructions on assembly and installation of the filter.

A section in the instructions would also cite several different methods of achieving a 75 μ S preemphasis.

The NAB and CRL are still talking about the quantity of kits to be provided—numbers range from 25 to several hundred, Salek said—and the final price per unit would depend on the number agreed upon. However, Salek anticipated the cost to stations would be "sub-one hundred dollars."

"We (CRL) are not looking to make a profit on this; we're just covering expenses," Salek stressed. "It's a need that had to be filled," he added.

Reducing out-of-band emissions

With work continuing on the implementation of the preemphasis standard, the NRSC has now turned its attention to the issue of reducing out-of-band emissions.

To that end, an occupied RF emission mask proposal was submitted on 3 June at a meeting of the NRSC Subgroup on Methods and Procedures.

The proposal, made by Motorola Senior Engineer Greg Buchwald, is similar to the FCC's automatic transmission system (ATS) rules regarding occupied bandwidth, but includes breakpoints which reflect the NRSC audio bandwidth specification.

According to Buchwald, the FCC

specification requires a level of -25 dB at 15 kHz. The level drops to -35 dB at 30 kHz, where it remains until reaching 75 kHz from the carrier.

At 75 kHz, the FCC requires a drop to -80 dB, Buchwald stated. This envelope is not to be exceeded by broadcast stations except under ATS rules, which set a limit of -100% no more than ten times per minute.

However, Buchwald, in submitting his proposal, maintained that the FCC bandwidth limits do not take into account "ex-

pected artifacts of transmitter distortion, incidental phase modulation components, or the expected artifacts of AM stereo signal generation or audio processing."

The proposed RF mask specification considers such artifacts, Buchwald stated, while retaining the ATS rules for peak allowable emission. Those ATS rules were kept because of special problems posed by older transmitters.

"Some transmitters, especially older plate modulated models, exhibit low frequency tilt and nonlinear power supply bounce that will, in the process of achieving competitive loudness, produce an occasional overmodulation condition," he commented.

Still, Buchwald stressed to *RW* in early July, the proposal was designed only to affect programming—processed audio through the chain—not to change current FCC specifications. The intent was to set up an emission mask that could meet NRSC output standards under audio conditions.

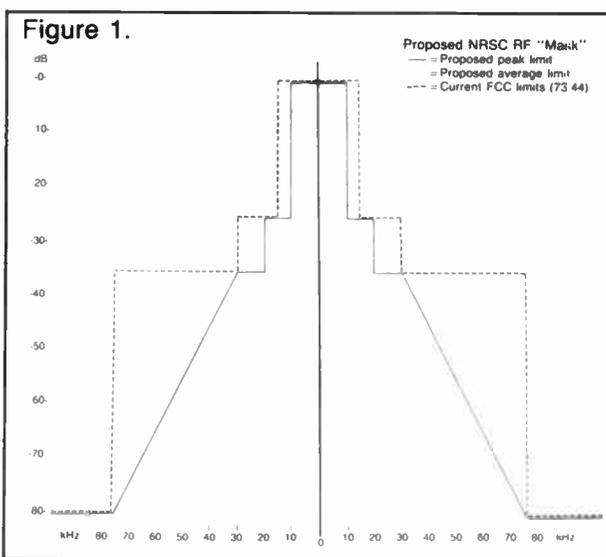
"Any transmitter that could pass FCC proof of performance requirements would meet this specification without any difficulty," Buchwald said.

Two-tiered proposal

The RF mask proposal suggested by Buchwald has two tiers: a peak specification and an average, or blanket specification for all program emissions.

The peak specification would begin with a reference level symmetrical from the carrier to ± 10 kHz, in accordance with the NRSC standard. From 10 to 20 kHz, the specification would drop to -25 dB.

From 20 to 30 kHz, the level would drop to -35 dB, after which it would begin a slope of 1 dB/kHz. The slope would continue until it hit -80 dB at 75 kHz.



In the case of the average specification, the reference level would again be symmetrical from the carrier to ± 10 kHz, dropping to -35 dB in the range of 10 to 20 kHz. At 25 kHz, the specification would taper to -40 dB, at a rate of 0.5 dB/kHz.

Under Buchwald's proposal, the average specification would continue at -40 until it intersected with the peak specification, after which there would be no further differentiation between the two.

Debate over the proposal by NRSC subgroup members centered on whether

a two-tiered standard—for peak and average limits—was necessary, Buchwald said.

Some members suggested a single limit for both of -25 dB in the 10 to 20 kHz range, arguing that it guaranteed adequate protection—a 26 dB second adjacent channel protection ratio at the 2 and 25 mV/m contours.

Buchwald, however, pointed out that his proposal would provide not only adequate, but improved second adjacency protection for wideband radios, with improved reception of second and third adjacent channels.

At press time, the NRSC subgroup was completing its July meeting in Denver, where a second RF mask proposal was presented by Don Tyrie of the Canadian DOC, according to Rau.

He explained that Tyrie's proposal differs slightly in the average limit from Buchwald's proposal in order to accommodate CCIR recommendations, but said the two are "equally viable."

The subgroup is expected to approve an RF mask specification in an early August conference call, and still plans to present a standard to the NRSC at Radio '87 in September, according to Rau.

For additional information, contact Michael Rau at 202-429-5346, Greg Buchwald at 312-576-4893, or Stan Salek at 602-438-0888.



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Support For Easing FCC Duopoly Rules

by Alex Zavistovich

Washington DC ... Comments recently filed with the FCC on behalf of various broadcast concerns showed general support for the Commission's proposal to relax its radio duopoly and one-to-a-market rules.

Broadcasters provided a range of recommended relaxation measures, including lifting of the rules entirely.

In January, the FCC issued a Notice of Proposed Rulemaking which would ease restrictions on common ownership of two radio stations in the same service area whose 1 mV/m contours overlap. The Commission suggested a new separation of 5 mV/m for AM contours and 3.16 mV/m for FM contours.

The Commission also proposed that AM-FM-TV combinations restrictions for common ownership be lifted. The so-called "one-to-a-market" rule currently prohibits the creation or transfer of such radio-television combinations.

Although the comments on file indicated general support, not all broadcasters were completely in favor of the proposal.

Shamrock Broadcasting, for example, endorsed relaxation of duopoly restrictions on AM stations. However, the company did not support similar relaxation for FMs.

"Relaxing the duopoly restrictions applicable to FM may adversely impact upon whatever curative effects are realized by such relaxation for AM," the company said.

Still, most of the broadcasting community appeared enthusiastic about the proposals, and comments seemed to support not only lifting of restrictions in major markets, but case by case evaluation of such combinations in smaller markets.

The National Telecommunications and Information Administration (NTIA)

recommended that the FCC ease the duopoly rules to allow AM-FM combinations in the same market and permit AM-TV combinations in some markets.

"Benchmarks" should be established by the Commission, the NTIA said, to determine where AM-TV combinations would not have an adverse impact on diversity.

Case by case evaluation of proposed combinations which do not meet the benchmark was also recommended by the NTIA.

The NAB, in its comments, suggested that the one-to-a-market restriction be lifted entirely from broadcast rules. In the interim, the association maintained, the duopoly rule for AM should be relaxed to allow ownership of AM stations whose 5 mV/m contours do not overlap.

The association, however, did not advocate a similar relaxation of the rules for FM stations.

"While NAB recognizes there might come a time when relaxation of the duopoly rule similarly may benefit FM radio, it is our belief that at this time the 1 mV/m standard does not adversely impact on the FM service."

Capital Cities/ABC also urged easing of the Commission's rule to allow ownership of an AM-FM-TV combination in any of the top 50 markets. Such ownership should also be considered in smaller markets on a case-by-case basis, the network said.

"Joint ownership of commercial radio and television facilities in this country's largest markets poses no significant threat to the helath or vigor of competition in those markets," ABC commented.

The network noted such ownership would also have only a "marginal effect at most on viewpoint diversity."

NBC, in its comments, endorsed elimination of the restriction on common ownership of AM-FM-TV combinations.

As another option, the network suggested the rules should not apply to markets with more than 30 different stations, or 15 different owners of broadcast facilities and daily newspapers.

In the case of markets with fewer facilities or owners, NBC said, restrictions should be evaluated case by case.

According to NBC, the duopoly rules should be "revised so as to permit evaluation of all relevant factors in determining whether overlap should be permitted."

As an alternative, NBC added, "the rules should be amended to prohibit only 5 mV/m AM overlap and 3.16 mV/m FM overlap."

CBS also advocated permitting joint ownership of facilities whose 5 mV/m

and 3.16 mV/m contours do not overlap.

Group ownership, CBS said, would "enable struggling stations to survive; maintain long relied-upon service; and provide incentives for the establishment of new and improved broadcast outlets." Diversity of viewpoint would not be hampered by such ownership, the network added.

Bonneville International Corporation and Northern Television Inc., in a joint filing, urged the authorization of all AM-FM-TV combinations and newspaper crossownerships. The groups maintained that cost savings accrued through such operations would "provide a much-needed boost to the AM radio and newspaper industries and better serve the public interest."

Support for the notion of AM-FM-TV combinations in the top 50 markets was given by Westinghouse Broadcasting in its comments. The broadcasting company also suggested a "liberal case-by-case waiver policy" for smaller markets.

Westinghouse argued that joint ownership would not hurt the broadcast industry.

"Grandfathered" commonly-owned radio and TV stations, such as those operated by Group W, have existed for many years without adversely impacting the diversity of services available to the public or the competitive marketplace."

FCC docket is MM 87-7. For additional information, call the FCC news media office at 202-632-5050.

Harris Moves Microwave Division

by David Hughes

Quincy IL ... Harris Corporation's Broadcast Division, following several rounds of cutbacks and an employee pay cut, will transfer its Broadcast Microwave Operation to its Farinon Division, the company announced in July.

By moving the microwave operation from its current location in Mountain View, CA, to San Carlos, CA and San Antonio, TX, where the Farinon Division has its facilities, Harris said it hopes to

"strengthen both divisions."

Farinon, acquired by Harris in 1980, produces digital microwave systems and lightwave transmission equipment. With the microwave operations moving in, the division will also produce microwave links for STL and ENG use.

Harris Communications Sector Senior VP Guy Numann said the "realignment strengthens Harris' position in the broadcast microwave market as it brings Farinon's strong technology in the microwave transmission area to bear on future

microwave products, particularly as video technology moves from analog to digital."

He indicated that by moving the microwave operations, the broadcast division will be able to more fully dedicate its resources to radio and TV transmission equipment and studio product lines.

While Farinon picks up sales duties for the microwave gear, Numann maintained that the Quincy, IL-based broadcast division will continue to handle sales and distribution efforts for the STL and ENG gear produced by the microwave operation.

This move is the latest in a series of operational changes reported by Harris.

Citing a weak broadcast equipment sales market, the broadcast division has, since late 1986, completed two rounds of personnel force reductions, one voluntary and the other involuntary.

Reportedly, the reductions have resulted in the loss of about 160 workers, narrowing the workforce at the Quincy plant to about 350.

The division also instituted a 10% temporary salary cut for remaining Quincy plant workers. The salary cuts are scheduled to be reviewed in the fall, when the firm reassesses the business climate.

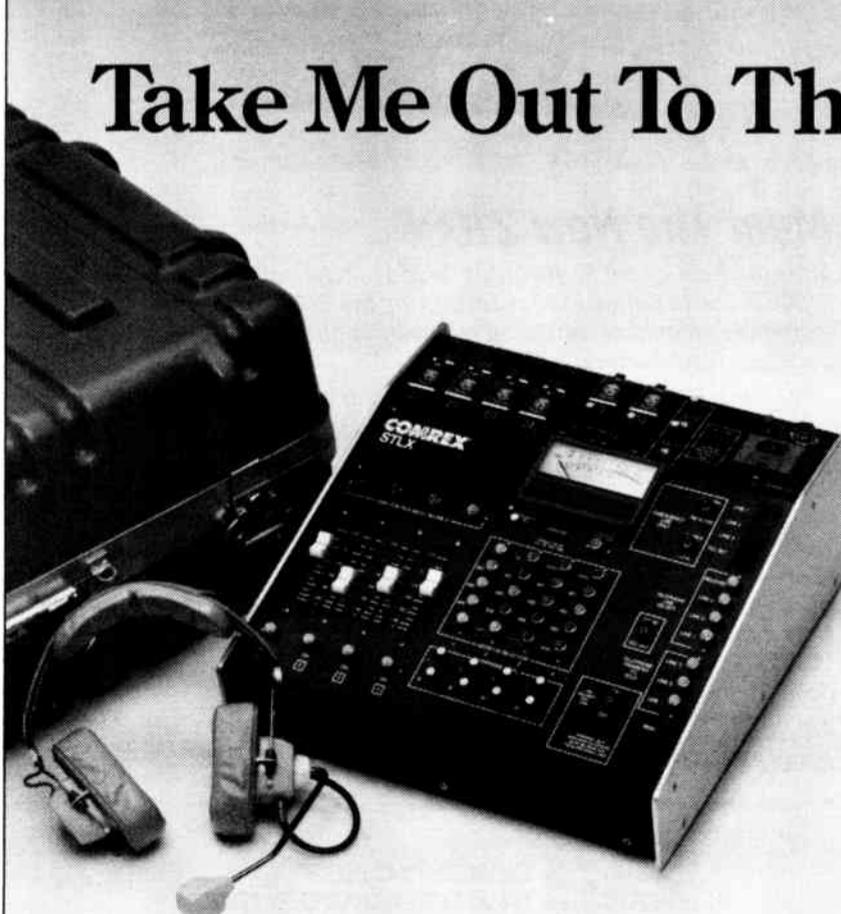
While business levels are still down from last year, Numann told RW that "things are looking a bit better."

He stressed that the recent restructuring of microwave operations is not related to a slower business climate.

"We are not resizing or cutting costs. We see this as an opportunity to take full advantage of our resources to compete in the market. We want to remain the leader, and gain a bigger share of the market," Numann added.

For more information on the Harris Broadcast Division, contact Martha Rapp at 217-222-8200.

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OPINION

Readers' Forum

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More dial-up comments

Dear RW:

We at QEI have been reading your series on Dial-Up Remote equipment with great interest.

The articles underscore some of the choices manufacturers and users alike must reconcile when dealing with advances in technology as well as FCC requirements.

Even with today's highly reliable transmitters, flexibility in control is deemed to be an essential requirement of engineers in choosing equipment.

When and if a problem does develop, whether due to an Act of God or Murphy's Law, a responsible station employee needs to get fully informed, exercise judgement and take action quickly.

Pre-microprocessor ATS systems were widely shunned by broadcasters due to lack of flexibility. They were not used, or often bypassed, if present.

But today's remote systems, including those with dial-up capabilities, have come a long way toward meeting the legitimate needs of the industry.

Manufacturers cannot provide a system which is both completely flexible and completely foolproof. The more flexible the system, the greater the potential for abuse.

But broadcasters have over the years chalked up an outstanding record for responsibility adhering to FCC regulations.

We feel that dial-up remotes are being used and will be used responsibly in the vast majority of cases.

To round out RW's examination of available dial-up products, I'd like to call your readers' attention to our ARC-27 remote control and terminal option package.

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The system allows several levels of password protection including an "identify and call-back" scheme which completely eliminates any possibility of unauthorized control.

Incidentally, a "clean" phone number is really no protection against willful abuse, because a computer or autodialer can easily dial every number.

Because the QEI remote control and transmitter have been designed as a to-

(continued on page 19)

The FCC's plan to allow for the creation of short-spaced FM stations through the use of directional antennas is worth serious consideration.

Broadcasters already enjoying the semi-monopolistic status owning an FM station affords are rightly unhappy about increased competition.

And others, like the NAB's FM Transmission Subcommittee, charged with protecting FM stations' technical integrity, may fear overcrowding or the so-called "AM-ization" of the FM band.

But the fact remains that the FM band is not yet in danger of reaching the saturation point.

Room for More FMs

The bidding up of FM station prices indicates there are not too many FM stations, maybe not even enough to warrant undue concern.

With the NAB and other ownership interests acting as watchdogs over future allocations, and without

skywave and clear-channel station considerations, it's unlikely that more short-spaced FM stations would yield the same results that the AM allocation system did on the AM band.

Also, more stations would mean benefits in the way of more opportunities: more jobs for engineers and other staff, more equipment sales and industry growth. It's an idea which could in the long term prove beneficial to everyone—even current owners.

Previous use of directional antennas for short-spaced FM shows that it can be successfully accomplished.

If technical evaluations show that it's possible to add such stations without increasing interference to FMs already in existence, then fears should be put to rest and the short-spaced plan should move ahead.

The spectrum belongs to the public and its use should be maximized.

—RW

VOA Project: Business as Usual

by Alfred W. D'Alessio

New York NY . . . Since the Reagan administration approved a capital improvement project backed by \$1.3 billion funding for rebuilding VOA's aging facilities around the world, VOA administration of this program has been intelligently criticized in the non-trade press.

Beginning with investigations by the Inspector General and last October's examination by Jack Anderson into the mismanagement of the modernization program, investigators have turned up numerous irregularities and waste.

The result has pressured VOA management into taking "safe" action. Unfortunately, this backlash is at least partially responsible for the controversy looming over the current renovation of 19 of VOA's broadcast studios in Washington.

Upon reading the June 15 RW article "VOA Bids Raise Questions," it appears that a rather naive broadcast industry is shocked at VOA's performance in attempting to secure a contract for modernizing 19 of its broadcast studios.

However, from our previous expertise in public works broadcast projects (including VOA) totaling over \$8 million, our own response is that the Government is conducting "business as usual."

Short of a Congressional investigation, we offer the following information to help put RW's coverage of VOA in perspective . . .

Al D'Alessio is president of Northeastern Communications Concepts, Inc., a New York City-based firm providing systems and acoustical consultation for the broadcast and recording industries. He notes that the company has not offered its services to any firm under contract or sub-contract with the USIA nor has it been solicited by them. He can be reached at 212-972-1320.

The procedures followed by the Government in procuring products and services must follow the Federal Acquisition Regulation (FAR).

While it is a well intentioned document designed to standardize federal procurement practices and encourage

Guest Editorial

fairness, Government bureaucracy and political pressures often intervene in FAR administration.

This results in travesties which run the gamut from Senator Proxmire's "Golden Fleece Awards" for \$700 hammers, to the bankrupting of honest firms attempting to do business with the Government.

The complexities in renovating 23 of the VOA's Washington studios are unprecedented in commercial broadcast.

For the renovation project, National Teleconsultants was awarded an initial sum of \$439,360 for the modernization design and engineering.

The extensive plans and detailed specifications they issued were competently prepared, and serve as the architectural, electrical, mechanical and broadcast contract documents for the project.

Following a protracted approval process, the US Information Agency, of which VOA is a part, publicly issued an IFB (Invitation for Bids) in the hope of attracting proposals from a field of prime contractors for a turnkey project.

Because of the scope of the architectural work required and the bonding requirements associated with it every broadcast manufacturer and vendor interested in the project declined bidding as a prime contractor, preferring to offer their services as a subcontractor to the prime instead.

Issuance of an IFB is the "safest" action that could be taken by the USIA, in response to the political and journalistic pressures that have been mounting over VOA's questionable spending habits.

It technically would award the entire project to a single "qualified" prime contractor, who would assume responsibility for the entire renovation.

Not only would VOA be relieved of managing and coordinating separate contracts for general construction, electrical, mechanical and broadcast systems, but by definition the contract would be awarded to the lowest bidder capable of bonding (guaranteeing) his performance and that of his subcontractors.

Before the forum of its critics, VOA must have felt secure in creating an image of efficiency and cost effectiveness that would protect it from further accusations regarding the management of its \$1.3 billion modernization program.

Inconsistent with VOA's illusion of security is the reality in which Government contractors have become conditioned to operate.

In preparing a bid response, each contender is aware that a contract can be secured on the basis of lowest price alone.

Therefore during the estimating process potential contractors consider every loophole and omission in the design documents in addition to keeping their overhead and profit low.

By default the contractor who is the most successful at chiseling away at the intent of the designers will return the lowest bid and secure the contract.

Any deviation from this process puts a potential bidder out of Government business.

The payoff occurs during the execution of the contract, when the contractor can

(continued on page 9)

Radio World

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FCC Urges 10 Watt PSA Plan

by David Hughes

Washington DC ... The FCC has proposed a minimum 10 W pre-sunrise authority power (PSA) level for daytimers affected by the advancement of daylight savings time (DST) in April.

Likely to disappoint some daytimers, the Commission's plan comes after it had proposed a 50 W minimum PSA level for the month-long period earlier this year.

The lower 10 W level, which would be contingent on there being no interference to groundwave (primary) contours of Class I clear channel stations, was proposed because "some daytime-only stations operating pre-sunrise with 50 W or even 25 W would cause significant co-channel interference to domestic Class I clear channel stations," the FCC said in a 23 June announcement.

The plan would permit daytimers with no authorized PSA operations, or less than 10 W, to be able to operate at the 10 W level during future April months. Daytimers already authorized to operate with more than 10 W PSA would continue to do so, the FCC said.

The proceeding was originally started because daytimers complained that with the advancement of DST, starting this year, from the last weekend in April to the first, they would lose an hour of key full-power morning drive time each day for three weeks.

Late last winter, the FCC proposed permitting daytimers to operate between the first Sunday in April and the last day of April each year from 6 AM local time

until local sunrise with a minimum power of 50 W.

Greater powers, up to 500 W, would be permitted provided that no interference would be created, the FCC had originally said.

However, the Commission maintained that it did not have time to study the comments it had received in the proceeding by the early April 1987 deadline, and therefore passed an interim measure allow a minimum PSA of 10 W for daytimers.

In the meantime, many fulltime and

clear channel AM broadcasters told the FCC they opposed a 50 W PSA minimum contending it would cause unacceptable skywave interference during the pre-dawn period.

The FCC said it agreed with comments filed by the Clear Channel Broadcasting Service which, according to the Commission, offered a 10 W minimum plan that balanced two concerns, "enhanced pre-sunrise operation while avoiding undue interference."

NAB Daytimer Committee Chairman David Palmer, who had originally cri-

ticized the FCC when it instituted the 10 W level instead of the 50 W level in its interim ruling, also said he was unhappy with the latest 10 W proposal.

He said that the clear channel interests had "deep pockets" and did a better job at swaying the FCC's opinion.

Palmer added that the interference generated by a higher PSA level would be more than counterbalanced by improved local radio services the daytimers would provide.

Comments on the proposal, which is contained in FCC Docket MM 87-3, are due 28 August, replies 14 September. Contact Louis Stephens at the FCC: 202-254-3394.

Daytimers' Preference Upheld

New York NY ... A federal court has rejected an appeal filed by the National Black Media Coalition (NBMC) challenging the FCC's so-called AM daytimer preference.

On 24 June, the US Court of Appeals for New York maintained that the FCC can award preference for past broadcasting experience to the owner of an AM daytimer applying for an FM facility.

The court, in effect, upheld the Commission's preference plan—which was unveiled in 1985 in connection with the Docket 80-90 plan to create almost 700 new FM assignments.

The FCC plan gives the so-called "daytimer preference" as much weight as similar preferences for "local residence" or "minority ownership."

The preference, which the court said sets the "correct balance" between daytimers and minority applicants, is also

being used in other, non-Docket 80-90 proceedings for new FM facilities.

In originally challenging the daytimer preference, the NBMC maintained that the FCC, instead of encouraging the awarding of new FMs to existing AM broadcasters, should attempt to "remedy the marketplace imperfections which have resulted in nonexistent or inadequate service to minorities in many communities."

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

In response, NBMC Attorney David Honig pointed out that of the 689 Docket 80-90 communities, only about 90 have

the potential of being financially successful. And of those, he said, all but 16 communities have existing AM daytimers.

The NBMC also argued that the FCC did not provide adequate notice about its intention to create a daytimer's credit.

However, the NAB, in defending the Commission policy, said the daytimer's preference was fair because the past broadcasting experience credit was equal to the credit for minority ownership.

In responding to the court decision, the FCC said that "broadcasters who have done a good job of serving the public under difficult conditions are especially likely to operate an FM facility in the same community in the public interest. The court concluded this was a reasonable conclusion and within the FCC's authority."

It maintained that daytimers deserved

(continued on page 13)

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Radio Unhurt by NABET Strike

by Alex Zavistovich

New York NY . . . At press time, members of the National Association of Broadcast Employees and Technicians (NABET) are still on strike against NBC and its owned stations, and there have been no signs of a return to the bargaining table.

However, the union action—which directly affects the jobs of some 80 NBC radio employees—seems to have had little impact on the day-to-day operations at the network.

After months of negotiations failed to produce a new master agreement with NBC, NABET employees walked off their jobs at 12:01 a.m. on 29 June. The walkout involves NBC radio operations in New York, Washington, Chicago and San Francisco.

Some 2,800 NABET members are employed by NBC, and approximately 80 are strictly radio people, 50 network and 30 local employees. Most are radio engineers.

A good transition

Despite the loss of its NABET-affiliated labor force, NBC is making a "good transition" in the face of the strike.

According to NBC spokesperson Dom Giofre, a number of NBC's management force have been reassigned to technical operations, positions for which they had received six months of training.

Giofre added that the management personnel have not suspended their administrative duties to take over technical operations, which he admitted was somewhat of a burden. "It's catch as catch can over here," he said.

However, although some network operations may have to accept additional burdens because of the strike, many industry insiders suggest that the walkout will have a greater impact on the television side than in radio.

A smaller number of NABET members work for NBC's radio side than in television. What's more, some sources have said that the network's radio people have less experience in NBC operations than their TV counterparts.

Part of the reason for that may be the agreement between NABET and NBC on the issue of seniority. A former employee of a NBC-owned radio station, who quit his job just prior to the strike action, explained that seniority at NBC is determined strictly by who was hired first.

NBC routinely loses technical people to other fields, such as the computer in-

dustry, the source said. Many senior maintenance and technical employees have been lured to more lucrative positions outside the network.

The source estimated that "two-thirds" of the employees who had been maintaining technical gear prior to the strike at the network had been recently hired.

Not heard on the air

The source added that the affect of the strike will not be heard on the air at the



Signs critical of NBC and ridiculing parent company GE marked a pre-strike NABET rally held late in June.

sions that (NBC) won't be able to operate." However, he pointed out, the network is operating at a "lower level of proficiency."

New master contract

At press time, NABET spokesperson John Krieger said that the walkout was "operating smoothly," with pickets in force and the membership rallying. In the nation's capital, nearly all of the city's members are on the lines, Krieger noted.



network's stations because NBC's disc jockeys have been given combo duties and now control the consoles themselves.

The walkout also seems not to have had any adverse effect on operations at stations who get news feeds from the network. Joe Morgan, news director at WRKO in Boston, said the network is "still on top of stories."

Morgan commented he has noticed only a few technical "glitches" coming from NBC, but that those problems do not show up on WRKO's newscasts because the feeds are taped and edited for later use.

The main problems, Morgan said, are in off-air advisory announcements—previews of upcoming feeds from the network.

At NBC-owned WKYS in Washington, DC, the strike has not hampered operations. According to WKYS GM Bart Walsh, the duties of the station's five NABET engineers are being covered with staff members.

Morgan said the striking employees will be "welcomed back with open arms" when the conflict is resolved, but noted their absence has "not affected WKYS to any great degree."

NABET spokesperson John Krieger acknowledged that "NABET has no illu-

NABET and NBC had been engaged in talks for a new master contract to replace a previous four-year pact, which expired 31 March. The network set a 21 April deadline for acceptance by NABET of a final contract offer, which NABET allowed to pass.

On 29 May a letter was sent to NABET employees by NBC management, stating that talks between the two groups had

reached an "impasse," and the network planned to implement its final offer.

NABET, however, maintained that there was no impasse, and that more time was needed to discuss contract terms. At the time NABET spokespersons said that work stoppage might result if NBC went ahead with its implementation plans.

An eleventh-hour attempt to avert such an action took place on the afternoon of 28 June, when NBC and NABET negotiating committee members met for a three hour session of talks, which ended with the situation unchanged.

Present during the final discussion was the regional director of the Federal Mediation and Conciliation Service, Krieger said. Representatives from the service had also intervened in a 3-day bargaining session between the two sides beginning 16 June.

No substantive changes

During the mid-June session, NBC listened to the union's proposed changes, Krieger noted. However, NBC spokespersons commented that the network had made its final offer and would not consider making "substantive changes."

NBC VP/Labor Relations Day Krolik reportedly told the NABET team he had "nothing more to say" regarding the final offer.

As talks collapsed and the strike was impending, NABET held a 25 June rally of its members outside NBC headquar-

(continued on page 10)

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NAB Board Tackles Radio Issues

by David Hughes

Washington DC . . . The NAB Board of Directors, at its annual meeting 23-25 June, voted to support expanded AM daytimer operations, as well as coming out in favor a new FM power/height classification.

On the AM side, the radio board, which along with the TV board met at the Ritz-Carlton Hotel in Washington DC, voted to back a plan that would allow Class III daytimers to operate at night on powers equivalent to the last hour of post sunset authority.

Board members also supported allowing daytimers on clear channels to operate at night under existing interference criteria on an interim basis, pending FCC review of that criteria later this year.

The Commission issued a proposal in early May that would allow daytimers on regional and even clear channel frequencies to add nighttime operations.

The board also heard a report on the implementation of NRSC AM pre/deemphasis standard and noted that "scores of stations" were installing equipment.

New FM classification

On the FM side, the radio board ordered the NAB's FM Transmission Subcommittee to examine a proposal to create a new class of FM stations, with the equivalent maximum power of 25 kW at 328'.

The new classification, the board indicated, which would be used "mainly west of the Mississippi River," could be used for drop-ins or for upgrades in areas where there are no Class

B stations.

The FM subcommittee was scheduled to examine the formation of a new intermediate class at a meeting in late July.

The radio board also instructed the NAB to oppose a plan that would allow the increased use of FM directional antennas and shortspacing of stations. (See the related article in this issue on the NAB's FM Transmission Subcommittee.)

NAB Counsel Barry Umansky said the board was "cool" to the plan because it would create an "AM-ization of the FM band."

Trafficking questions

In other, non-engineering issues, the board voted to oppose a bill in the House of Representatives bill (H.R. 1187) that would reimpose a three-year anti-trafficking rule.

The rule, which had been repealed in 1982, prohibited the sale of a station until after a three-year period after it was purchased.

The NAB indicated that board members said that the rule had "no direct bearing on (the) quality of public interest programming and other station activities and practices which prove beneficial to audiences."

The radio board indicated that "there are no hard data to show that the absence of a rule has negatively impacted broadcasters' public service offerings."

On the FCC's recent crackdown on "indecent" broadcasts, the board indicated that the NAB should plan to appeal the policy if the Commission fails to respond to an NAB request to reconsider and clarify a ruling that many in

the industry have criticized as being vague. (See related article in this issue.)

The radio board also reasserted its opposition to the Carroll Doctrine which allows a broadcaster to file against the assignment of a new station if it can demonstrate that the new signal will create economic hardship.

And the board asked the NAB Insurance Committee to examine the creation of a "super legal fund" to help stations fight license challenges.

It also asked the FCC to allow co-owned AM/FM operations to keep public files at either their studio or transmitter sites, even if the sites are located outside their city of license.

Renewal procedure

FCC Chairman Dennis Patrick told board members that there is strong support at the Commission for changes in its license renewal procedures.

Legislation to eliminate requirements for comparative renewals, including one that would replace them with stronger public service requirements, is in a bill proposed by Rep. Al Swift currently tied up in the House and Senate.

Other House and Senate bills would set-up a two-step renewal process as well as, also, establishing stricter public service obligation requirements. Legislators are working with the NAB to develop a final compromise.

Elections

The board also held elections during the three-day affair. NAB President Eddie Fritts, who was reelected, said that the NAB membership has reached new heights—with 5,011 radio members, 935 TV members and 1,470 associate members.

"The steady membership increase reflects broadcasters' desire to have a strong national organization to represent their best interests in Washington," said outgoing Radio Board Chairman Bev Brown.

Brown will be replaced by RKO Radio



FCC Chairman Dennis Patrick before the NAB Board.

President Jerry Lyman, who was elected chairman of the NAB Radio Board; he had been vice chairman. Bob Fox, of KVEN/KHAY, Ventura, CA, was elected vice chairman of the radio board.

Jefferson-Pilot Communications President Wallace Jorgenson was elected as NAB Joint Board Chairman, replacing Ted Snider of KARN/KKYK, Little Rock, AR. Jorgenson had been the NAB's TV vice chairman.

Other board events

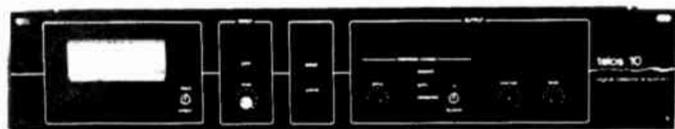
In other board news, Vice President George Bush addressed the board members. While staying away from technical issues, he indicated President Reagan's support for vetoing the Fairness Doctrine codification bill.

Senate Majority Leader Robert Byrd received an award for helping arrange radio and TV coverage of the Senate.

On budgetary matters, the NAB reported that its total income, for the fiscal year ending 31 March, was \$12.8 million, with radio dues accounting for \$3.2 million. The 1986 convention provided \$3.3 million. Expenses for the year were \$12.5 million, resulting in an overall surplus of about \$371,000.

For more information on the activities of the NAB Board contact Bob Hallahan at 202-429-5350.

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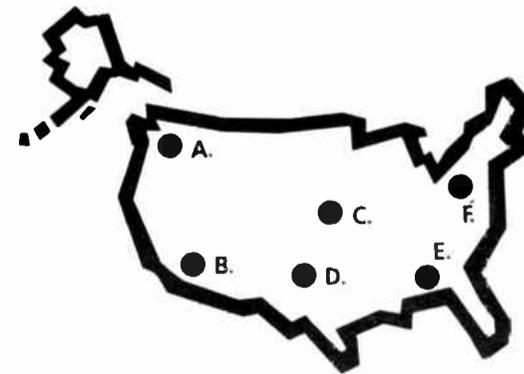
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"Business As Usual" For VOA

(continued from page 5)

virtually name his price for the extras and change orders required to conform to the original intent of the designer.

This is the stuff of which B-1 Bomber cost overruns are made.

In our opinion the IFB process may be legal and good business, but it precludes by definition participation by ethical contractors who hold the Government's best interests paramount, whenever those interests are quality oriented.

This is the basis of concern by the broadcast industry which prompted RW's coverage of the VOA story.

The winners (?)

Bid returns in response to the IFB were wide ranging. It's hard to believe that all five potential prime contractors estimated the same job, since the bids for the complete project ranged from \$9.9 million down to the \$6.6 million bid by Grunley-Walsh.

In the world of private business, the high and low bids would most likely have been rejected, with a bid of approximately \$8 million being accepted.

Short-Space Plan For FM Questioned

(continued from page 1)

find out more about the ramifications of FM directional antenna use and regulation as well as verifying the performance of all FM antennas.

"We have heard that in some cases where directional antennas are now in use, the users found out that the coverage is not what they expected," Marino said.

The subcommittee wants to improve the channels of communication between broadcasters and antenna manufacturers, he added.

Rau said that while the June meeting concentrated on the FM directional antenna proposal, other ongoing issues, including a Class A blanket power increase, the creation of improved terrain models, and the overall development of more accurate models for FM coverage patterns, were slated for discussion at a meeting scheduled 22 July in Washington DC.

For more information about the subcommittee contact Mike Rau at the NAB, 202-429-5346, or John Marino at NewCity Communications, 203-333-4800. For more information on the FM directional antenna proposal, which is covered in FCC Docket 87-121, contact Bernard Gordon at 202-632-9660.

Unfortunately, the Government's ability to reject bids which may be too low to conform to their quality standards is next to impossible to achieve.

They must establish beyond a reasonable doubt that the lowest bidders will be unable to perform the required work. In Government, that would require another year and more tax dollars.

Thus the contracting office prefers to hammer out qualification problems during the execution of the contract.

Against warnings from the industry, the USIA awarded the contract to Grunley-Walsh even before Jullien Enterprises had been chosen as broadcast sub-contractor to Dynalectric, who will

be the electrical sub-contractor to Grunley-Walsh.

Since both Grunley-Walsh and Dynalectric admit to having no broadcast expertise, VOA's action is tantamount to writing a check to a salesperson for a four wheel car, and leaving it up to him to select the make and model.

Wishful thinking

Last year our company, Northeastern Communications Concepts, Inc. (NCC) was commissioned by the largest broadcast vendor responding to the Voice of America bid request.

After a careful technical and cost analysis of the bid documents, we jointly

prepared a proposal for subcontracting all broadcast related work for seven of the potential prime contractors, five of whom returned bids to the Voice of America.

As consultants ourselves, we acknowledged the designers' efforts required in coordinating the operational features and functions of the specified equipment, with the development of an integrated system designed particularly for VOA's needs.

It took 408 pages of electronic, physical and functional descriptions, specifications and data sheets for the designer to convey his intentions.

(continued on page 14)

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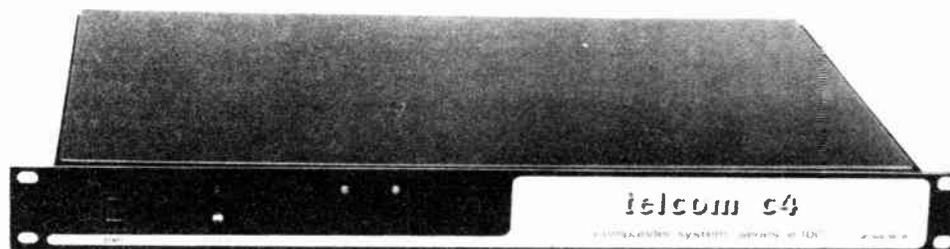
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Circle Reader Service 29 on Page 14

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Dictionary Cuts Through Jargon

The Broadcaster's Dictionary
by James R. McDonald
Wind River Books, Broomfield CO 1987

Reviewed by Ed Montgomery

Annandale VA . . . All too often it happens. You are talking to an equipment representative or a technician and in the

Ed Montgomery is a professor of Broadcast Engineering Technology at Northern Virginia Community College. He can be reached at 703-323-3248.

course of the conversation a flood of abbreviations, acronyms and jargon fill the dialogue.

You want to clarify what this individual is talking about, but it might extend the conversation four or five times longer than what you initially planned.

The Broadcaster's Dictionary fills this void with brief definitions of some of the most common usage in the field of radio and television.

This source book is particularly helpful if you have just made the big switch from working in a system that was primarily all audio to a facility that is primarily video, or vice versa.

Oftentimes the terms used in these two related, but vastly different, fields never cross paths. This book will help.

Whenever something like this is published, it is easy to go through it and find what is missing. There are terms that I feel should have been included.

For instance, in the area of AM stereo, C-QUAM is not defined as to what the letters actually mean (Compatible Quadrature Modulation) and the Kahn-Hazeltine system is only defined as Kahn.

In video, the IRE standard is explained but the levels for color burst and pedestal are missing. An illustration at this lo-

cation would be most helpful.

Also the acceptable times for the horizontal interval and vertical interval with an accompanying illustration could increase the value of this book to the technician using it.

But these are issues that would not deter me from recommending this publication as a good source book.

Book Review

Texts like this do need constant updating, and perhaps future additions will contain the needed illustrations.

The three appendices contain much needed information condensed into one book.

One will find helpful information ranging from association and organization addresses to preventive maintenance ideas, schematic diagrams, circuit designs, and emergency repairs when the whole system fails and you need a logical way to start the troubleshooting procedure.

All of the information is in an abbreviated form, but it is still much more accessible here than trying to find something fast in the *NAB Manual* or similar technical publication.

The entire format of the book is utilitarian, almost appearing to be directly off the printer of a personal computer.

It is hoped that future additions will include the latest terminology, and more and better quality illustrations.

It would also be a good idea to include the names and locations of all of the communications satellites and the bands they are operating in.

At any rate, the next time someone asks you about your equivalent isotropically radiated power, Nyquist frequency, or what the differential gain is on your VITS, you will have no excuse for not knowing what these terms are.

NABET Strike

(continued from page 7)
ters in New York.

At the rally, which drew some 500 people and included statements of support from other unions, chants went up against General Electric, NBC's parent organization.

Flyers from NABET were also distributed during the event which claimed that GE and NBC planned to "bust the unions," and that the network would be "cutting back on the quality of programming."

The allegations against NBC and GE were an echoing of similar charges the union directed at all three networks in April on Capital Hill.

At a hearing by the House of Representatives' Subcommittee on Telecommunications and Finance, NABET Network Coordinator Tom Kennedy had said that network news departments were placing profits ahead of the public interest.

In separate testimony, the news chiefs from each network refuted the contention, maintaining that the quality of the news was not being sacrificed for financial considerations.

For additional information, contact Dom Giofre at NBC: 212-664-2540, or John Krieger at NABET: 301-657-8420.

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"The automatic equalization and gently gain riding were just what we were looking for. And thank you for making your updates retrofittable."
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World Radio History

Scrounging Around For Parts

by John "Q" Shepler

Rockford IL . . . If parts are expensive, tools and test equipment are even worse.

It seems that nowadays little ten-cent capacitors are going for a couple of bucks, final amps are in the hundreds, and the mandatory test equipment needed to keep everything running starts in the kilobuck range.

These days if you're feeling the financial pinch caused by corporate mergermania or just like to be frugal, it pays to shop around.

Some of your best sources for tools and parts may be those you've never even thought of.

Every town has at least one general electronics distributor. Sometimes they're called parts jobbers.

Originally, these guys catered to the TV repair industry. They'd locate in a rundown building in some obscure location and put a big sign on the door: "Wholesale Only."

Woe unto any member of the general public who happened to cross the threshold looking for a TV antenna or parts to build a science fair project.

The icy glare of the guy behind the counter was guaranteed to scare off strangers, youngsters and anyone else who wasn't known to be a certified member of the television service profession good for at least several hundred dollars a month.

You need a couple of resistors to get your radio station back on the air? Well, maybe.

Times have changed. Now many of the distributors have big welcome signs out front and are quite happy to take anybody's money.

Some have gone so far as to sell home entertainment equipment—on display, no less! Most distributors still cater to the repair services and local industry. They also welcome radio station engineers.

It is worth your while to get set up with the local wholesale parts house. The best way is to establish a charge account so you can sign for what you need.

Once the counter guys get to know you, they'll go out of their way to be helpful. They'll take you behind the scenes so you can dip into the racks and pick out what you need.

They'll also special order whatever you want from tubes to connectors to special ICs.

The advantage of dealing with a local distributor is that the distributor maintains hundreds of thousands of dollars worth of stock within

minutes of your location at no carrying charge to you.

For infrequently used parts, it makes sense to let someone else pay the costs of inventory.

Engineering Manager

The disadvantage is the price you pay for the parts and tools. Most distributors carry only top grade components and

charge a premium for putting them at your fingertips.

It's easy to get carried away by the excitement of all that stuff available for just a signature. You wind up buying a little of this, and some of those, and in no time you're dropping \$500 a month.

I've never quibbled about whatever it took to get the board humming again or a dead transmitter back on the air. However, for general experimenting or stocks of frequently used parts, such as diodes, it probably makes sense to look further.

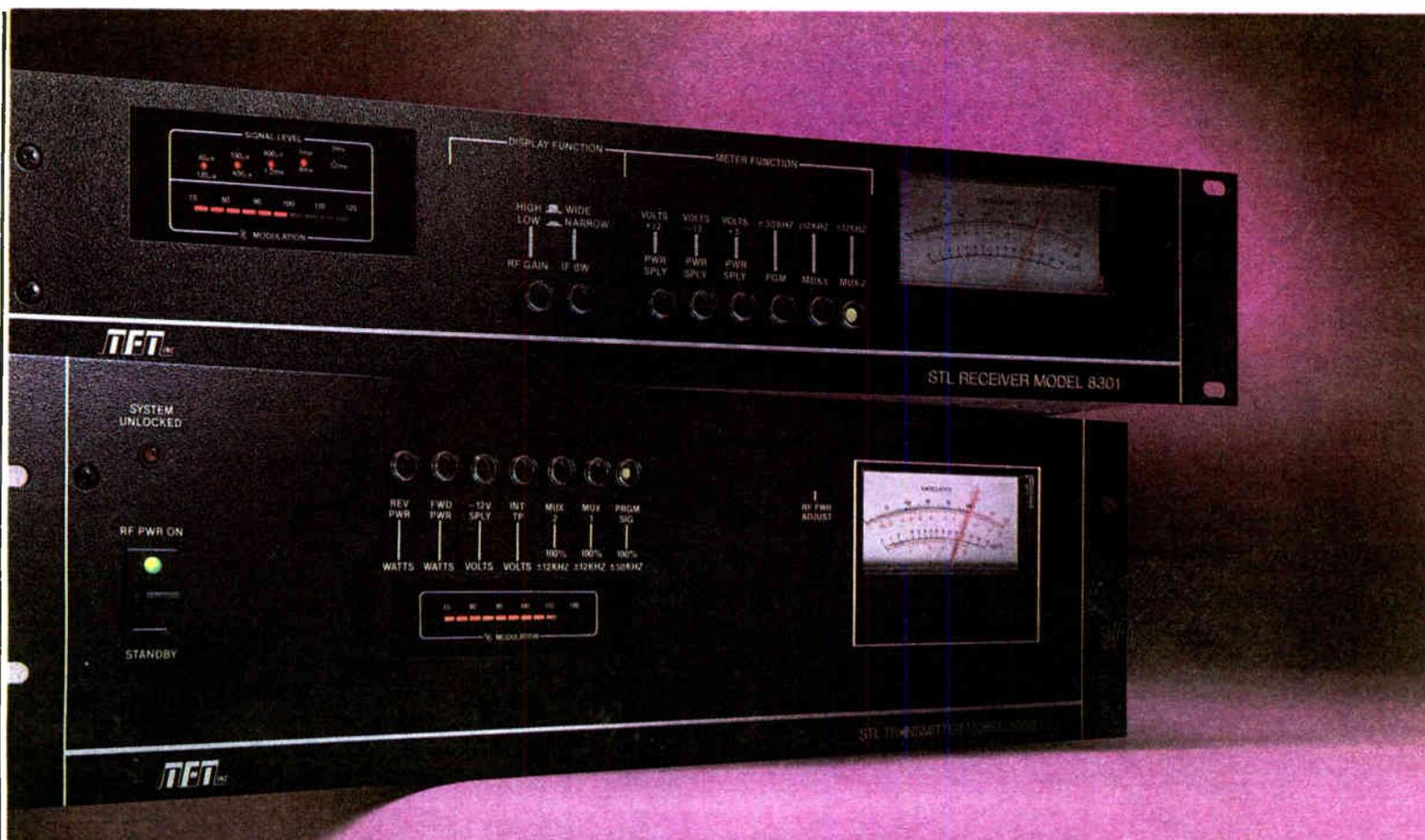
The mail order business has more than its share of schlocks, so you need to be a little choosy.

Even the best houses will save you money, though. Often that justifies the wait of a few days to a few weeks for your order to arrive.

There are several ways to go in mail order. The big industrial outfits like Newark and Pioneer offer thick catalogs and stock most of the parts in them.

Don't expect bargain basement prices, though. In the kind of quantities a radio station buys cost breaks don't apply.

You will probably save something over **(continued on page 20)**



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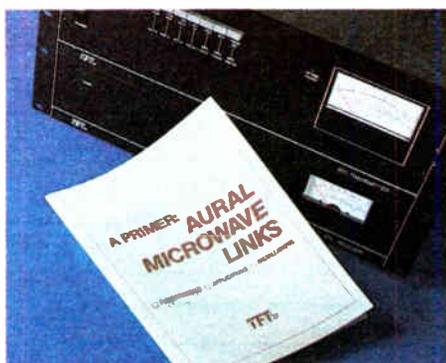
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John Shepler is a broadcast consultant, teacher, writer, former CE and regular RW columnist. He can be reached after 8 PM at 815-654-0145.

Custom Tailor Your In-House Training

by Tim McCartney

Boise ID ... Engineers can join the ranks of training specialists with little difficulty.

Businesses see the rapidly growing field of training as a solution to higher productivity and efficiency demands.

What is training? It's learning for the

Tim McCartney, a regular contributor to RW, is CE of KBSU, Boise State University, Boise, ID. He is an SBE Broadcast Engineer, has a masters degree in human resources development, and is a former GM. He can be reached at 208-385-3760.

job you now have. This can involve coping with new technologies, or simply doing a better job with your current responsibilities.

The new training experts typically are more process-oriented than subject matter experts. Their processes can help you design your own in-house training programs.

Production training

For example, you have just installed a brand new production studio, complete with dozens of operational procedures new to the production staff.

It's your job to train current and future

production personnel in the use of the facility.

If you spend considerable effort up front in the design end of your training sessions, the final result is far more likely to be effective than simply "winging it."

An instructional design model, typical of those used by training experts, is shown in Figure 1.

This model, used to design training of many kinds, is followed by developing

the training sessions for the production staff on the new studio.

The model

Identify the problem. What's needed? The eight person production staff doesn't know how to use the new equipment.

Analyze the setting. Who is the audience? Five experienced and three in-
(continued on next page)

Figure 1.

Instructional Design Model

STAGE I: DEFINE

1. Identify Problem
2. Analyze Setting
3. Organize Management

STAGE II: DEVELOP

1. Identify Objectives
2. Specify Methods
3. Construct Prototypes

STAGE III: EVALUATE

1. Test Prototypes
2. Analyze Results
3. Implement/Recycle

Figure 2.

Course Outline

Session #1

Equipment Overview:
Inputs and distribution amplifiers routing
Turning Announcer Microphone On:
The four effects: audio in console, warning lights, muting of monitors and cue system
Feedback:
Feedback through a tape machine
Recording:
Carts, cassettes, reel-to-reel decks, setting levels

Session #2

Cassettes:
Tape type, noise reduction
Carts:
Secondary and tertiary tones
Advanced Tape Deck Features:
Timer Memory
Review:
Both sessions

Figure 3.

Evaluation Questions

1. Explain why the four effects occur when the announcer microphone is turned on.
2. What's the surest way to get feedback?
3. What happens if you forget to set the levels before recording a cart?
4. Which kind of noise reduction is used on a cassette tape sent out to a station listener?
5. Why would secondary and tertiary tones be added to a cart?
6. When will the timer memory features of the tape decks be useful?

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Developing A Training Model

(continued from previous page)

experienced production personnel (as well as all future production personnel).

Organize management. What planning needs to be done? The design must be completed in three days and the engineer has the entire job alone.

Identify objectives

What is the learner expected to be able to do after the training?

- Draw a block diagram of where the outputs of the distribution amplifiers are routed.
- Explain the four results of turning the announcer microphone on.
- Demonstrate the problems of feedback.
- Record audio on carts, reels and cassettes from a minimum of three input sources.
- Determine how to set the cassette deck for tape type and noise reduction.
- Properly record secondary and tertiary tones on a recorded cart.
- Demonstrate the advanced features of the tape decks, including those of timer memory.

The next step is to get specific about your methods. Which strategies and resources will maximize learning for each objective?

Accepted adult education approaches can be used, combining personal involvement and hands-on demonstrations.

The first objective will be taught using a simple flow chart, while the remaining objectives will involve hands-on in-

struction.

The next step is to construct a prototype, a roughed-out version of the training outline, responding to the points discussed thus far (see Figure 2).

Decide how to evaluate the training session: an exam? A questionnaire? An oral exam delivered by you to the learners after the final session?

In this case I chose the last suggestion (see Figure 3).

Testing it out

You will then want to test out your training prototype. Find one person from the group of learners to go through the trial runs of both prototypes.

Then you analyze the results by com-

paring the findings with the objectives.

Finally, you incorporate the findings from the trial runs by working through the various stages of this model and making all appropriate changes.

If you think all of this seems greatly overdone on the process side, your reaction is completely normal.

But, using bits and pieces of this model will help you to focus on those objectives selected by you to solve some very real problems.

And, don't forget the evaluation; even a meager effort at this stage can net worthwhile results.

With all of this work done, the course can be repeatedly presented over many

years with only minor additional revision.

Compare the advantages of always being able to provide new production personnel first-hand training rather than allowing others to relay your intentions.

Totaling costs

The top management of companies in the US spend \$100 billion a year on training.

Training educators cite the following statistics:

American businesses spend 20 to 30 billion dollars annually on formalized training (IBM alone spends \$500 million)

If on-the-job, informal training is added to the total, the estimate is 100 billion dollars a year.

Following the model to customize your training can save dollars, and it helps you do your job as an engineer.

Daytimer Preference

(continued from page 6)

the credit saying that they "have operated their facilities in the public interest in an environment with serious limitations."

"The court agreed with the FCC that the daytimer enhancement credit could be seen as an incentive to encourage broadcasters who bear a difficult burden, such as the daytime-only restriction, to provide excellent service in the hope that the FCC would reward them in the future with an FM facility," the FCC added.

NBMC counsel Honig commented that while the NBMC would have rather won the decision, he was not unhappy with the court ruling.

He said that the fact that the court maintained that the daytimer preference would *balance* the minority preference is ample reason for the FCC not to abandon the minority preference in the future.

If the FCC were to remove the minority preference it would have to also remove the daytimer preference, Honig said. That would be very unlikely, he added.

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

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RADIO Classics

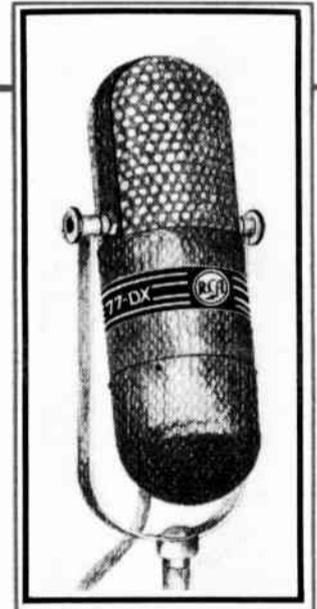
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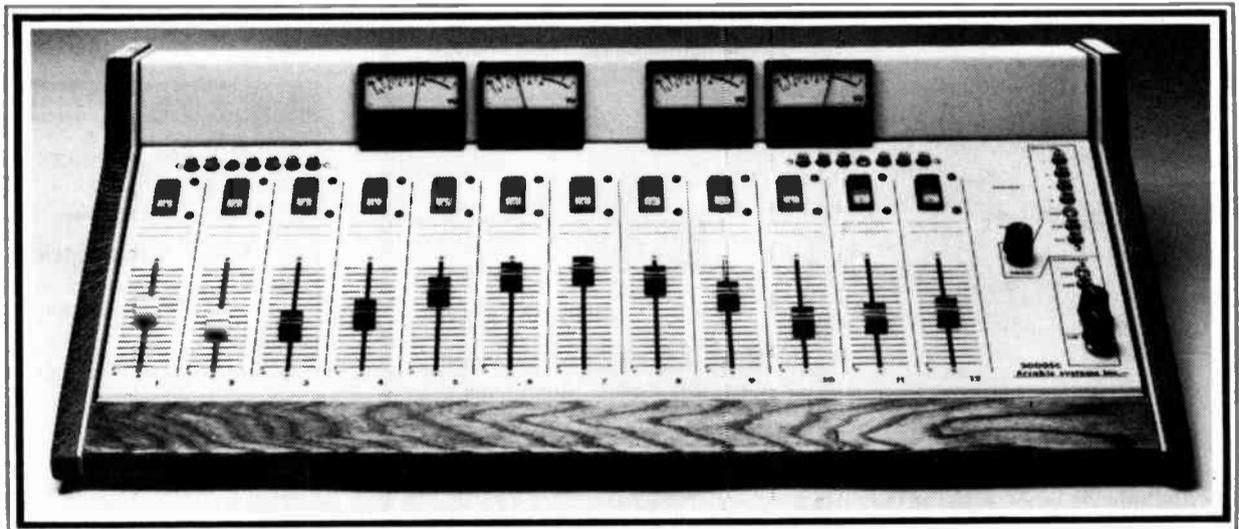


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Government Business as Usual

(continued from page 9)

Government IFB provisions, however, reduce the cost and effort of producing these documents to producing a mere wish list.

Apparently justifying the cost and effort is not a VOA concern. As everyone knows, there's an unlimited supply of tax dollars.

Appreciating the fact that VOA had paid almost a half million dollars for the renovation design which had been arrived at through months of consultations between VOA engineers and National Teleconsultants, we analyzed the costs based on the specific requirements set forth in the design documents for all broadcast related work.

As of January 1987 procurement costs

by no more than 20%, Jullien must still add hundreds of man-hours of pre-wiring, customizing and installation costs to this figure, at minimum rates where specified by the Government.

This is in addition to costs for project management, producing shop drawings, travel, shipping, insurance, testing, any bonding required by Dynaletric, general overhead, profit and the increased expenses of keeping the Government bureaucracy satiated with paperwork.

Underbid projects

Numerous events may overtake the security which VOA currently has in its renovation project.

Requiring performance bonds of its prime contractor, and levying liquidated

damages for project delays is no guarantee that VOA will arrive at the end of the project for the bid cost, or on the date it anticipates.

Since the FAR prohibits the restriction of free trade and competition, Government agencies usually employ brand names only for convenience.

While Jullien VP Mike Hoover suffers from the delusion that he can sell the Government any broadcast item that meets the contract specifications without regard to brand name, (see 15 July RW) all submissions remain subject to Government acceptance and testing requirements, regardless of the labels they carry.

In Government contracts, if its back is to the financial wall, it is not uncommon for a contractor to force delays while numerous substituted items are submitted for agency approval.

In defense, the agency must maintain an efficient team of inspectors to compare the substitution with the contract specifications on a case by case basis in order to reject any work or material.

If an item is rejected, the contractor may submit other substitutions ad nauseam.

Finally, the agency may submit to the pressure to terminate the delays and finish the project by accepting sub-standard work or products.

Meanwhile, the contractor may file financial claims against the Government for the project delays incurred because of the approval process.

And so proceeds another Government project riddled with sub-standard work and materials, plagued with delays and cost overruns—performance bonds and liquidated damages notwithstanding.

Accountability
Toward the end of the project, along come the critics and investigative journalists. What do they find?

A Government mess in which everyone did his job by the book. The engineers did a competent design. The contracting office attempted to get the job done for the absolute lowest cost. The management approved the logistics of their subordinates. Everyone did what was politically expedient.

Once again, a faceless bureaucratic system is blamed for a botched job. But there are alternatives. Alternatives which do not substitute protection for accountability.

IFB's are fine for procuring paper clips and rubber bands, or for painting Air Force hangars.

But a complex project, whether for broadcasting or defense, is diametrically opposed to the achievement of high quality standards if given to the lowest bidder.

The VOA standards set by their own specifications are high. Succumbing to the ostrich complex, VOA passed the accountability for the project through two contractors with no broadcast expertise.

Finally the buck lands at Jullien's door, with their VP already considering substitutions not intended by the designers.

As a Government agency VOA should appreciate that specifications cannot be substituted for industry expertise.

The FAR recognizes such considerations by providing procurement methods which are not based on the lowest bid price.

At the expense of political pressures, VOA had the option to issue a Request for Proposals (RFP) instead of the IFB.

A separate RFP could have been issued to each trade in the project, with their consulting engineers and designers retained as overall project managers.

An RFP would have reduced the documentation efforts (and fee) required by National Teleconsultants to write airtight specifications which could hopefully withstand the scrutiny of the lowest bidder.

Unlike the IFB, the RFP solicits more than a price from potential contractors. As its name implies, it can require a detailed technical proposal from each prospective bidder, in addition to a bid price for the project.

The proposals thus solicited would have included company profiles and achievements, in addition to the specific equipment and quality of work each company intended to provide.

A VOA decision weighing the technical proposal against the bid prices would have separated the Hewlett-Packards from the K-Marts, and lifted their heads out of the sand at the outset.

What's needed is a mechanism for the Government to state exactly what it wants, and then pay a fair market price for it . . . without the contract games.

Ironically, a properly administered RFP can produce these results. All it requires is professionalism and accountability, but Washington has been out of stock in these traits for a very long time.

It's difficult to conceive that VOA would pass up the opportunity to know as much as possible about the firms rebuilding the heart of their multi-million dollar studio facility, or that they could allow a sub-sub-contractor to be the final arbiter of a half million dollar design.

But they did . . . perhaps because Jack Anderson wrote a self-fulfilling prophecy, perhaps out of indifference and lethargy, or perhaps because there are a lot of cozy places to hide within the system.

Caveat Emptor.

A complex project . . . is diametrically opposed to the achievement of high quality standards if given to the lowest bidder.

for both stock and custom broadcast equipment, telephones, supplies, cable and other hardware specifically recommended by VOA's consultants—and 100% in compliance with their first choice makes and models—was \$4,145,649.

Since almost all of the equipment was estimated with distributor discounts, this figure represents the fixed cost that any broadcast installer would initially encounter.

As a result, it appears mathematically impossible to speculate on how the broadcast portion of the VOA project can be competently fulfilled for \$3.2 million by Jullien Enterprises through Dynaletric.

Assuming that VOA will accept cheaper equipment substitutions which could reduce our procurement estimate

damages for project delays is no guarantee that VOA will arrive at the end of the project for the bid cost, or on the date it anticipates.

Since the FAR prohibits the restriction of free trade and competition, Government agencies usually employ brand names only for convenience.

While Jullien VP Mike Hoover suffers from the delusion that he can sell the Government any broadcast item that meets the contract specifications without regard to brand name, (see 15 July RW) all submissions remain subject to Government acceptance and testing requirements, regardless of the labels they carry.

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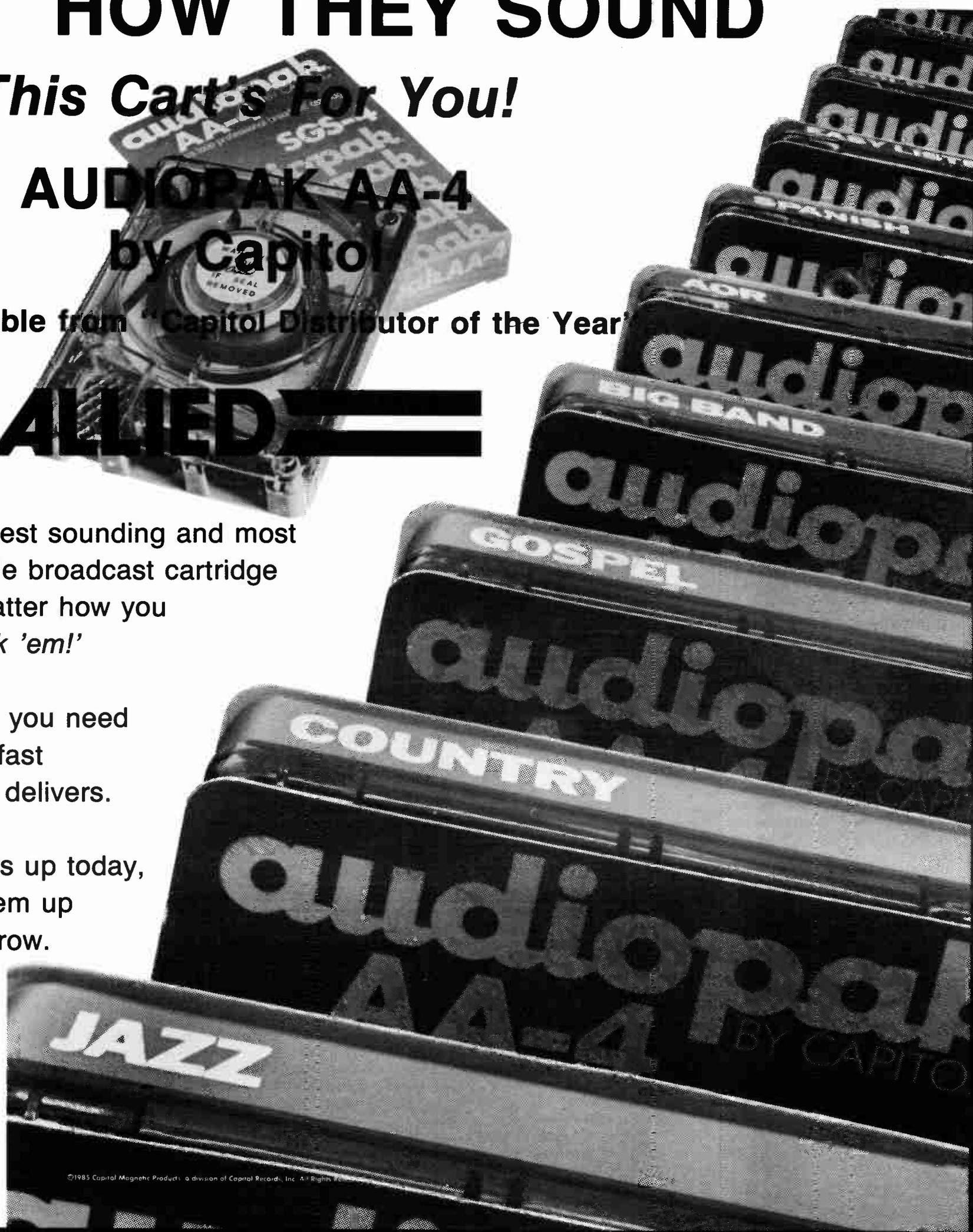
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by Tom Osenkowsky

Brookfield CT ... Minor DA tune-up, when one or more monitor points goes out of tolerance, can usually be accomplished without too much fuss if you start the job properly prepared.

The key question is, "Which control(s) do I adjust and by how much?" I've written two computer programs to answer these questions.

MATRIX, shown in Figure 1, shows an actual array in New England. For each azimuth the user inputs, a variation in phase angle and field ratio occurs.

The default amount is $\pm 5\%$ ratio and $\pm 3^\circ$ phase. For each variation the effect in radiated field on each azimuth can be seen.

The user can input the value of K (the pattern constant, which defaults to 100) and the amount of variations desired.

From the printout, it can easily be seen which phasor controls do what and by how much.

The variation in field is given in both mV/m and percent. In this approach, the K value is kept constant.

The programs' functions

The MATRIX program is designed to closely emulate a vector analysis, however the need to have a mathematics background is removed due to the user-friendliness of the program.

In some cases, it is desirable to recalculate real RMS for each variation of parameters.

It may also be desirable to look at the azimuth $\pm 5^\circ$ of the minima to see which way the minima may be shifting.

FIELDTAB, shown in Figure 2, can perform a real RMS calculation for each iteration and outputs results for each central azimuth and $\pm 5^\circ$.

This is most helpful for armchair phasor cranking.

FIELDTAB asks the user for new phasing and field ratio on each element for each iteration. Using FIELDTAB, exact manipulations in field are possible, even on the first try.

Tom Osenkowsky is a radio engineering consultant and president of MASTER Software, and a regular RW columnist. He can be reached at 203-775-3060.

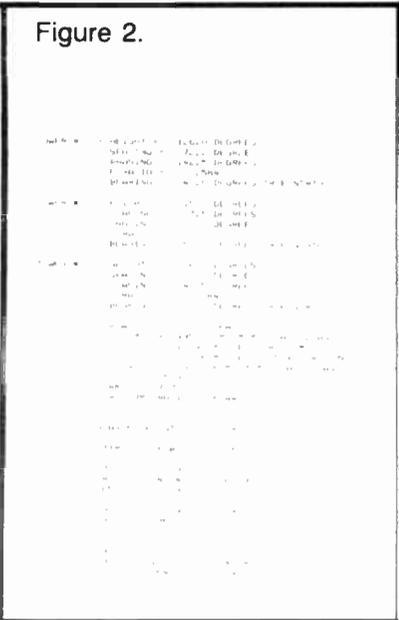
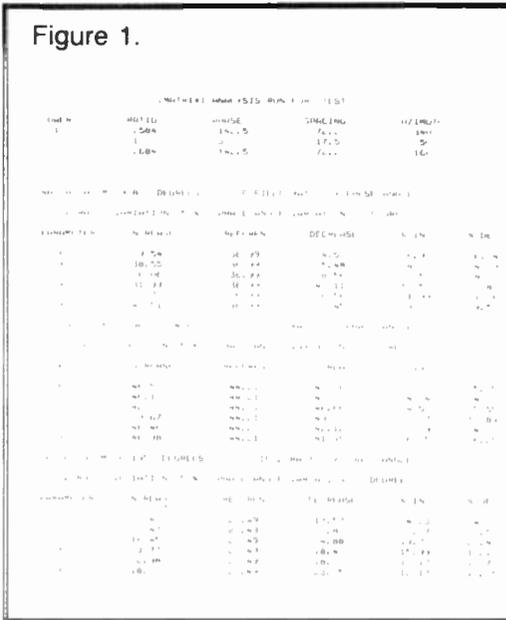
It is important to be well prepared prior to making any phasor adjustments.

The most obvious preparation would be to determine why a monitor point(s) has changed value if parameters remain unchanged.

Environmental changes, such as recent construction, usually account for a monitor point change.

Prior to performing adjustments in the phasor, every attempt should be made to identify and correct the local MP problem first, instead of reaching for the phasor.

(continued on page 23)





Ever Wonder Why We Paint QEI FM Transmitter Cabinets Red?



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Clarification

In the 15 June RW, Tom Osenkowsky's article on the start up of directional arrays unfortunately contained some incorrect number values.

A sentence on sample loops located at the current loop which read "approximately 10° down from the top of each tower" should have specified "80° down."

A sentence which said to "match all lines for close to 10 ohms to start" should have read "50 ohms."

In the section on "Talking down nulls," the instruction to crank the phasor for zero stating it was "usually 100-200 mV in the real world" should have read "100-200 μ V."

RW regrets any inconvenience caused by these errors.

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Multitrack Has Cost Benefits

by W.C. Alexander

Part III

Dallas TX . . . In the last installment we examined how all the pieces of equipment in our new production room could be interconnected to provide for efficient, easy operation,

In doing so we had to abandon some thinking that has carried over from the old days of radio.

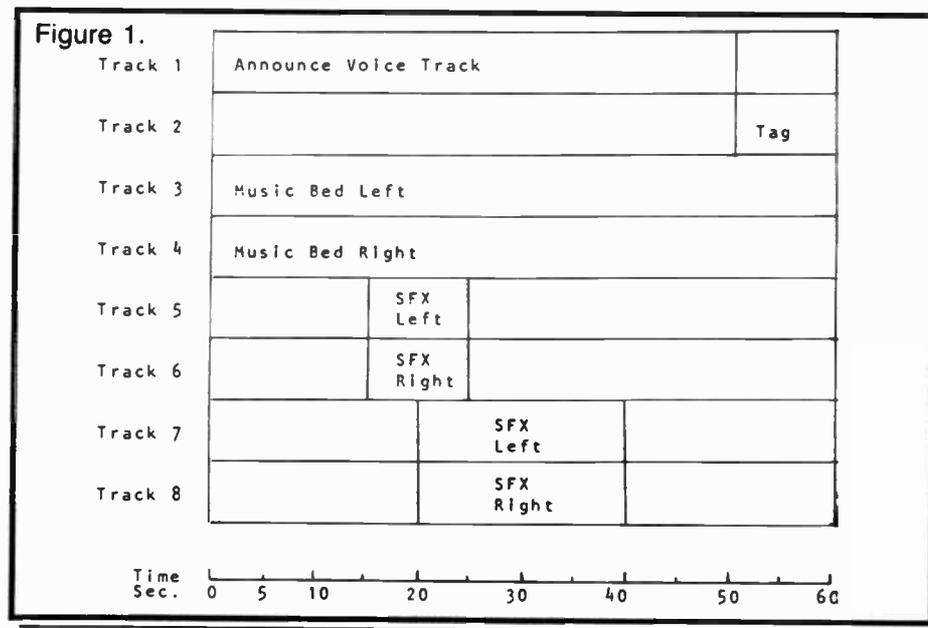
The new way of looking at audio loads and sources and their impedances untied our hands to economically tie our equipment together without using cumbersome distribution amplifiers and pads.

Of course, as with anything, there is a limit to how many loads can be tied to a source, and that limit is directly related to the source impedance and its driving capability, and the parallel load impedances cumulatively, along with their level requirements.

In this installment we'll take a look at multitrack production techniques and how they can increase the production output of your station with less equipment.

In our example, we will be using a Ramsa WR-8210 console, and an Otari

W.C. Alexander is Director of Engineering for Crawford Broadcasting Company, and an aspiring horror-fiction novelist. He can be reached at 214-445-1713.



MX5050B MKIII two- and eight-track recorders.

Up until recently, except in TV, almost all tape editing has been done with a grease pencil, razor blade and splicing block.

With the current generation of equipment it is possible to make "electronic edits" that are undetectable, and without ever touching the tape!

The Otari machines are capable of electronic assemble and insert edits. The timing must be carefully planned, but this makes a "blown" delivery a thing of the past.

To fix the piece where you blew the next to the last word in a sixty-second piece of copy, you need only put the channel on which the copy is recorded in sel-rep, have your mic on and fed to the machine, and play the faulty voice track.

The instant after the last good syllable goes by, you need only press the record button once and the machine will silently begin recording at that same exact spot.

If you are on your toes and have been reading the copy aloud into the mic along with the playback, the electronic edit you just made will match the recorded copy so that no one will ever be able to tell that it was a "pick-up."

Insert edits are also possible. The track is played back in sel-rep, and at the appropriate time, the record button is pushed.

When the exit point comes up, the play button is pushed, and the machine will silently come out of record, leaving no pops or clicks at all on the tape.

Multitrack recording

The secret of multitrack recording is that you can listen to tracks that have already been recorded at the same time that you are recording on other tracks.

The sel-rep function allows such monitoring to be done "in-time" with the material that you are recording, since in sel-rep, the record head is being used for playback, thereby eliminating the delay usually caused by the distance between record and play heads.

As a spot is produced, the various elements are recorded in time with one another, one at a time, onto the different tracks of the multitrack machine. Odd and even tracks are generally used for left and right, respectively (see Figure 1).

In our example, our voice track, consisting of copy, is recorded on channel 1. Then, while listening to the voice track on channel 1, the music bed is recorded on channels 3 and 4 and faded out at the appropriate time (the fade-out or cut can be done in the mixdown, but it lightens the mixdown workload if it is already done).

Then, while listening to a mix of the voice track and the music bed, stereo sound effects can be added at the appropriate time on tracks 5 and 6, 7 and 8. After this is done, a second voice can be recorded on track 2 for the tag.

When all the elements are assembled on the eight-track tape, they are ready

to be mixed down to two-track, cassette or cart.

It is likely that mixes will be done in each of these formats since most stations keep a master tape of all spots on two-track, the sales department will want a cassette of the spot, and the control room will need the spot on cart.

The mixdown

Mixing all the separate elements of the multitrack master onto one two-track tape is usually called the mixdown or remix.

This is essentially an easy task, with the operator needing only to watch levels, much like an air shift.

At the beginning of the mixdown, thought must be given to what is on each track of the master.

All the tracks that contain left channel information, tracks 3, 5 and 7 in our example, must be routed to output 1 of the mixing console.

This is done on the Ramsa console by selecting channels 1 and 2 on the input module for that particular track and turning the pan control all the way to the left.

Likewise tracks 4, 6 and 8 must be routed to output channel 2 of the mixer, which will contain right channel information.

Monaural sources such as voice tracks should be routed to both 1 and 2 by centering the pan controls.

Each of the first eight input modules on the console are put into the remix mode by selecting "RE-MIX" on the input switch.

The eight-track machine should be put in the "ALL REPRO" mode for mixdown. (If some of the tracks are inadvertently left in the sel-rep mode, the elements in the mixdown will be out of time with each other.)

The destination two-track recorders are started in record, and the multitrack machine is started. The operator need only ride levels at this point if the tracks are "clean" of any extraneous audio.

It is a good idea to keep these sounds off the tracks from the start, since it makes the mixdown easier. The voice tracks are usually kept at a considerably higher level in the mix than the music bed of sound effects.

Most experienced engineers (yes, you can call yourselves "recording engineers" when you get this far) do at least one rehearsal before they do the actual mix.

This allows them to set the levels on the individual tracks so that the sound is right before recording begins.

Efficiency creates speed

Unlike old production methods, where a DJ would have two records cued up, three sound effects or tags on cart, and the copy on the copy stand, it is not necessary to be an octopus to do top-of-the-line production in a multitrack room.

If you make a mistake, no big deal, just do it again. Since you are only doing one thing at a time, mistakes become few and far between.

But even when a mistake is made, you can record over it without disturbing any of the other material on the tape.

Along with multitrack flexibility, this allows complex production to be done *second generation* with only one turntable, one cart deck and one two-track, and in a fraction of the time!



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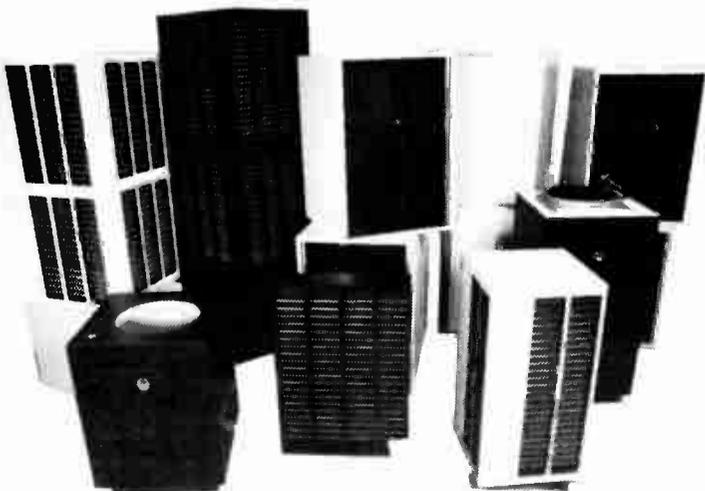


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Building A Temporary Tower

by William Weeks

Newburgh NY . . . During the course of the summer of 1986, I had the rare privilege of doing the field work for several AM site surveys.

I say "rare" because I had never done one before, and "privilege" because I was paid for it.

These jobs involved building a temporary tower, laying a temporary ground system, connecting a temporary transmitter, taking the required field measurements, then taking it all apart again.

The object of the exercise was to determine the actual soil conductivity at proposed AM transmitter locations.

The measured conductivity is then used in designing as economically as possible an antenna system for the optimum coverage area, while still maintaining protection to existing stations.

For example, results from one site survey last summer allowed a station to construct three towers instead of four.

Results from the other were instrumental in allowing the proposed daytime power for a new station to be increased from 1 kW to 10 kW.

Choosing a tower

I suppose that all radio towers are temporary. Some, however, are considerably more temporary than others.

The design criterion here was for a tower that could be easily put up and

William Weeks runs Hungry Wolf Electronics which specializes in field engineering and station contracting. He can be reached at 914-564-5837.

Readers' Forum

(continued from page 5)

tally integrated system, we are able to implement a more comprehensive and complete system than is possible with add-on remotes.

The system monitors important parameters such as critical temperatures in the transmitter and the building, tower lights, line voltage, transmitter building security and fire alarms.

Should any parameter become critical, the system will send the information to the dedicated studio remote unit, plus one or more dial-up terminals (including your home-based PC) over standard phone lines.

The system includes a dedicated studio unit, assuring the CE (and the FCC) that the operator remains in the loop and in control.

The dial-up module can be located at either the studio or transmitter. If located at the studio, the transmitter can be controlled by STL, eliminating the need and expense to have any phone line at the transmitter.

The system allows for automatic transmitter control, including automatic modulation control with complete operator monitoring and supervisory control via the remote.

This is a far cry from the days of pre-microprocessor ATS.

William Hoelzel, Senior VP
QEI, Inc.
Williamstown, NJ

conveniently taken down. The intervening vertical status would only need to be maintained for a matter of weeks.

The consulting engineer for both of these projects was Clarence Beverage, of Communications Technologies, Inc. He was interested in a radiator about 100' high.

The Rohn 25G tower was a natural choice for this application. It is relatively easy to work with, structurally adequate, easily available and fairly inexpensive.

Rohn specifies its 25G tower for up to 200' in Zone A wind load conditions. Rohn also specifies a concrete base pier, concrete guy anchors and 3/16" EHS steel guy wires.

However, we did not consider any of these refinements to fit in with our idea of "temporary."

We arbitrarily decided that 30' of tower was a good compromise, with a 19' collapsible mast bringing the electrical height of the tower to 100'.

Plexiglass sandwich

The base insulator also had to be adequate for the purpose, available and relatively inexpensive. Surprisingly enough, a solution required some thought.

For our "temporary" purpose, we decided that a good solution was a sandwich of about 10 layers of 1/4" plexiglass sheet between the bottom of the regular

rectangular Rohn baseplate and a couple of pieces of 2x10" lumber.

The sandwich was held together by bolts going just over half way through the plexiglass, then through the lumber or the baseplate, with the bolts staggered so that none were close together.

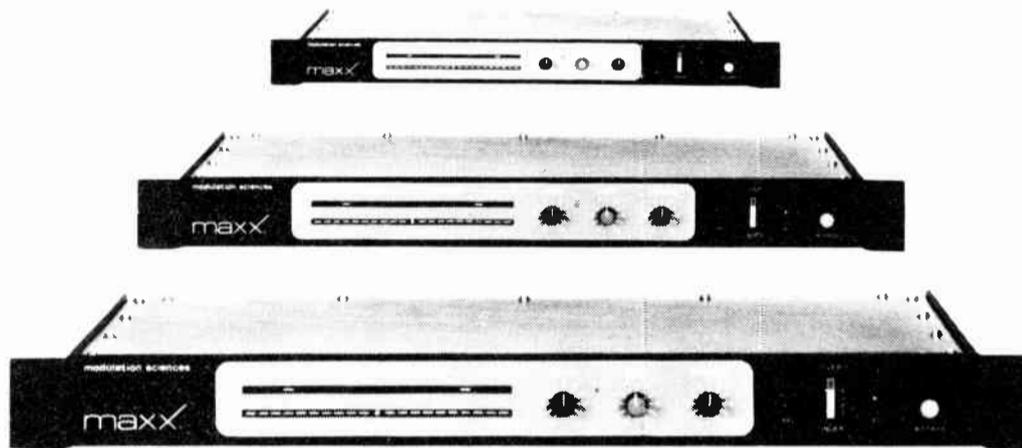
The wood was to protect the plexiglass from the abuse of the ground. Plexiglass has great compression strength, but it will easily crack, gouge and otherwise deteriorate.

We used 8" diameter screw anchors for the guy anchors. These are fairly inexpensive and are available from tower suppliers, TV equipment suppliers and
(continued on page 22)

BSW

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Scrounging Up Parts

(continued from page 11)

what the same parts cost locally, though you'll need a fairly good sized order. You need to meet the minimum order requirement and cover the cost of shipping.

Another way to go is with the upscale parts houses that cater to hobbyists. I put Digi-Key (PO Box 677, Thief River Falls, MN) and Advanced Computer Products (PO Box 17329, Irvine, CA 92713) into that category.

The emphasis is on computer chips and accessories but there are still a lot of pages of integrated circuits, resistors, capacitors and transistors.

You'll also find a lot more Japanese components instead of just the familiar

Sprague and C-D.

A third niche is filled by the smaller mail order parts houses. Usually they just put out flyers printed on newspaper.

Selection is limited to a few specials that the buyer got a good deal on. Even so, if you collect enough of these catalogs and pour through them when, say, you need a 8P2T 36 V relay, you'll come up with some real bargains.

You might pay several bucks for a miniature toggle switch downtown. From the right mail order source an equivalent switch may only run you 75 cents. When you need 100 switches for a project, that adds up.

Where do you locate these sources? Go

to the nearest news stand and start at the back of the hobby electronics magazines.

Most of the time, all you'll have to do is circle numbers on a bingo card and wait a month. The catalogs will pour in.

Many mail order outfits are not 100% in the new parts business. You have to look carefully.

One tip-off is the phrase "removed from new equipment." That's almost the same as *used*. Don't expect a warranty.

Used and surplus electronic components run the full range of quality. I've bought plastic bags of parts that must have been swept off the floor. The dirt in the bottom of the bag was a free gift.

On the other hand, you can get unused industrial grade switches and quiet cooling fans for a fraction of what they cost new. Oddball motors, transformers and connectors can also be had for a song.

As anyone not consumed by greed would expect, the better the bargain looks, the closer you have to look.

A portion of what looks good in catalogs is pure unadulterated junk. Don't be afraid to send this stuff back if you get stung. You're only out the shipping charge in most cases.

If you have more time than money and if you like treasure hunts, get your hands on every catalog printed and memorize them. I used to have Allied and B&A burned into my brain. You'll do the same with your favorites.

Ham radio operators, like hobbyists, are tremendous scroungers. They have to make their few available bucks count.

If you didn't get into the business via a ham ticket, you might not be familiar with ham radio flea markets or "ham-fests" as they are called.

These get-togethers generally pop up in the spring and summer and you should be able to find a half dozen within a day's drive.

It costs a couple of bucks to get in and even that gets recycled into door prizes.

Once inside the typical fairgrounds location, all you can see are tables with parts and equipment stretching to the horizon. Beautiful.

Try to keep from salivating on the equipment and bring heavy duty shopping bags and lots of cash. Also bring some common sense.

Before you blow the station's wad for the next year, make a list of what you'll reasonably need this season. Nobody needs 10,000 wirewound pots, even if they are new for 10 cents each.

The best approach is to make a detailed list of everything you want before you leave home. Then stick to it.

Okay, so you didn't remember freeze spray till you saw the guy with a trunk full of cans. Buy a couple of freeze sprays. Just don't get nuts and buy every car radio antenna in sight because they're cheap.

It's also important to check for quality. Not all pushbuttons are created equal. Some can handle 10 amps, some the same size can't.

Make sure those edge connectors really have gold contacts if that's what they'll be replacing in the control board.

Be especially wary of parts jumbled in a big cardboard box. Most of these were probably snipped out of old radios by the ham's 10-year old son.

Good 'ole Radio Shack. You either love 'em or hate 'em. Parts snobs hate 'em.

I'm a little more pragmatic. If a piece of equipment is sick and only Radio Shack is open, that's where I go. They've saved me more than once.

To be fair, a lot of the parts that are blister-packed there are the very same grade as the original equipment in your board, carts, transmitter, etc.

Not everything, mind you. Some of those parts are strictly consumer grade and won't take broadcast duty. It's up to you to be the judge.

You're probably getting the idea that there is a certain risk factor involved in saving money. You bet there is.

Any time you don't buy an exact duplicate direct from the manufacturer, you run the risk that you're going to be sorry.

One good way to determine if it is worth taking a chance on bargains is to ask yourself: "What's the worst that could happen if this part blew?"

The other good question is: "How much risk is it worth to be able to do every project I want this year on my meager available budget?"

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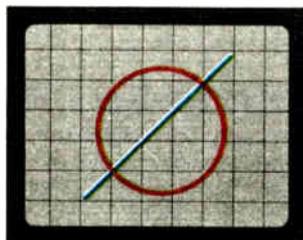
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Tuning In On a Country Ride

by Barry Mishkind

Tucson AZ . . . After attending the NAB convention in Dallas this spring, it would be easy for an observer to reflect on the quantity and quality of the state of the art equipment available to broadcasters and conclude that today's radio stations should sound better than ever.

"That would be wrong RF breath!" comes the quick reply. Overall, radio audio has improved in recent years, but there is still a lot of audio being dispatched into the ether that can bring tears to the eyes (and ears?) of a professional.

Just because state of the art equipment is available does not mean a given station will buy it, or if they do, whether they will put it to good use.

A good example is the audio heard during a short trip I recently took to the northeast corner of the country.

During my trip, I kept the radio in my rental car moving from frequency to frequency, seeking to find ideas to improve my stations by analyzing what was being done by the engineers in the northeast.

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

First off, let me point out that I was not trying to critique the various formats and disc jockeys of each station.

Rather, I was interested in the technical quality of the stations, as well as the problems that seemed to afflict many of them.

Crowded airwaves

Coming from the relatively widely-spaced Southwest, the number of AM facilities I heard—jammed so close together—was rather startling.

Thus, the efforts each station made to make itself "stand out" were quite interesting to hear.

After listening carefully, I feel much more positive about the benefits that would accompany widespread adoption of the NRSC pre-emphasis standard.

The sideband hash really made it a chore to listen to some of the signals.

If conscientious engineers everywhere learn about and implement the standard, we all will benefit both from the reduced hash, and from the improved receivers to come if the manufacturers live up to their promises to us.

The good, the bad and the mono

As one would expect, there were a number of fine stations to be heard: cleanly modulated and without excessive pumping or crunching. It was a

pleasure to listen to them.

The engineers who run these facilities should be applauded for their efforts.

On the other hand, there were some stations that seemed almost sadistic in their approach to audio.

Another thing I noticed was that while some were running AM stereo, it was disappointing to see how many stations have failed to invest in this important feature.

Stereo and the NRSC curve will be two of the most valuable assets an AM station can have in trying to combat the continuing audience drain to FM.

What's that on the air?

With that in mind, let's start with a blatant example of an AM station that seems to want to chase people to FM. This facility was broadcasting a call-in cooking show.

Regardless of how you might feel about listening to someone fielding calls about recipe variations, if I tell you that there was about 30% hum under everything, you immediately know how unpleasant that sounds.

Unfortunately for the local listeners of that station, every time I checked in, over a two hour span, the buzz was as obnoxious as before.

Times are tight for a lot of stations, especially on AM, but how can a self-

respecting engineer (or manager) let that kind of crud on the air be the aural signature of his craft?

Or, what shall we say of another AMer that threw a dead carrier for an hour and a half on Saturday morning, treating those listeners that were silly enough to wait patiently to a symphony of FSK tones bleeding over from the sub-carrier in the STL.

Later, I noticed that the FSK was audible even with program . . . I wonder if they have any idea what their injection level is?

Of course, there were also a good number of stations that were clean and crisp, including a talk station that came in from the midwest.

It was loud, clean, and free of most of the breathing and pumping effects that afflict many talk stations these days.

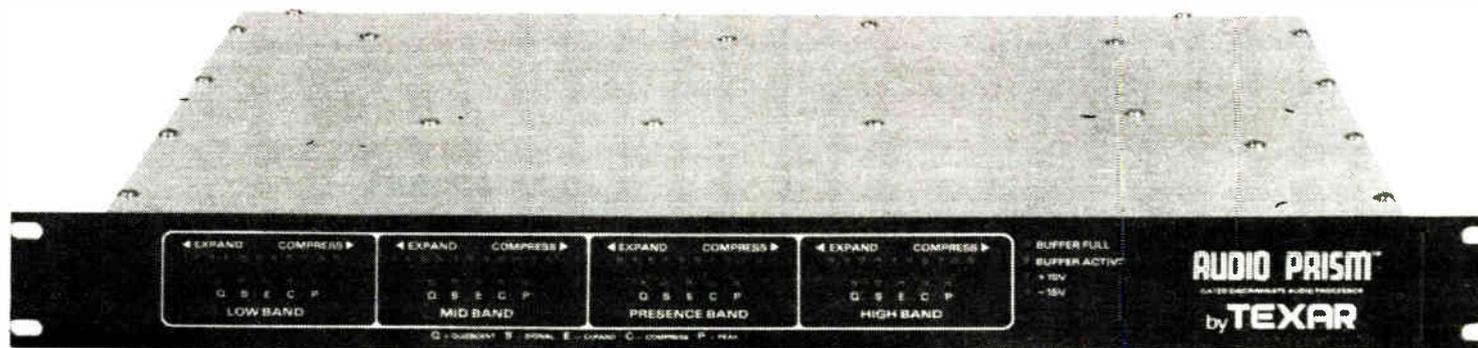
War games

Modulation was place a real burden upon the engineer, as he is forced to come to some compromise between clean audio and loudness.

Fortunately, the quality of most modern transmitters and audio processors makes getting a reasonably high level of modulation fairly easy.

Perhaps the operative word is "modern," for here too I was surprised, not **(continued on page 23)**

ALL CD BY THE END OF THE YEAR!



That's the goal that many stations have set for themselves: to generate 100% of their music programming from CDs by the end of 1987. Using copyrighted station identifiers like "Lazer 104," broadcasters are able to position themselves in the listeners' minds as the high-quality music source. One promoted slogan is "Declare your independence from vinyl on July 4th 1987!" Surprisingly, it's not necessarily the big chain stations in major markets that are leading the charge. Medium and small market stations have shown themselves just as likely, if not more likely, to become leaders in their market.

Many of the early hurdles to on-air use of CDs have been removed. While early CD players were difficult to cue to music, making it impossible to run a tight air show, and were user-unfriendly, this has changed. Today's CD players (such as the Technics SLP-1200 and the Studer A725) feature instant start and incremental cueing, making it possible to cue exactly to any desired point in the music.

Many stations also questioned whether sufficient material, both oldies and current, existed on CD format to support all-CD operations. Oldies have come a very long way in the past few months. Several of the Beatles' albums have been released in CD format in just the past

few weeks, with more to follow shortly. And literally thousands of oldies titles are available on CD from Century 21 Programming in Dallas, Texas (214/934-2121). Each disc contains cuts from many different artists, so you don't pay for the album cuts that weren't hits. Each cut is a hit.

And more and more of the new release hits are being made available as a single-title CD. Under intense pressure from stations and also from influential program consulting firms like Burkhart/Abrahms/Douglas/Elliott, record firms are putting new emphasis on making hit releases immediately available on CD. Some record companies are getting the message slower than others, and are also finding themselves at a disadvantage when trying to get airplay for their new releases. Some stations simply won't add a title that is not on CD.

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Temporary Tower Construction

(continued from page 19)

sometimes from electrical supply houses.

Rohn specifies two guy levels for an 80' tower in Zone A, with both going to one anchor. For Zone C at the same height they specify four guy levels.

Since we were not going to use concrete anchors, and since our base insulator was designed only for compression strength and not for horizontal stability, we decided to use four guy levels (20, 40, 60, and 80') going to two anchors (about 30 and 60' out from the base of the tower).

Which guy is best?

Steel guy material, with the necessary insulators for AM use, seemed like too much trouble for a temporary installation.

Phillystran is very little trouble, but relatively expensive for temporary use.

Polypropylene rope is considerably cheaper, and is available in adequate working loads.

But the problem with poly rope, or nearly any other rope, is that it deteriorates from exposure to the elements, particularly including ultraviolet radiation. However, it does not unduly deteriorate in two weeks.

Break strength of 3/16 EHS steel strand is about 4,000 lbs. Break strength of 1/2" poly rope is 3,780 lbs.

Steel guys are normally tensioned to 10% of break strength; working strength of 1/2" poly rope is 420 lbs. The poly rope seemed a natural choice.

The best price that we found for 1/2" poly rope was at a cable TV equipment

supplier, in 600' lengths, two of which were about right.

Tensioning techniques

The other problem with poly rope is that it is extremely elastic compared to steel strand. We found that traditional guy tensioning techniques didn't work at all.

Steel strand (or Phillystran) is normally tensioned with a chain jack attached to the guy anchor and to the strand with a cable grip.

You have to use steel strand tails on Phillystran guys because the cable grip can damage the plastic jacket of the Phillystran.

Steel strand stretches about 0.1% of its length when it is tensioned to 10% of its break strength.

Polypropylene rope under the same conditions stretches about 2.5%—or 2 1/2 feet for our top guy level. That does not count the short term loss of tension from using knots instead of dead-ends.

We found that we could not tension the rope with cable grips and chain jacks because we lost the tension in the knot and the two or three feet of rope below the cable grip.

We also found that after we did get sufficient initial tension on the rope guys, there was more stretch over the course of a week than could be taken up with 10" turnbuckles.

Muscle stretching

The method that finally worked well for us was to tie the rope off at a length determined by experiment, stretch it by muscle power and hook it on to

something.

Toward that end, we attached 3' lengths of 5/16 coil chain to each guy anchor, tied the rope to "quick links," stretched the rope and hooked the "quick links" into the appropriate link of the chain.

This method has the fringe benefit of being cheaper than turnbuckles.

We found that we did not have to adjust guy tension, once the tower was plumb, until it was time to take it back down.

We then stretched the rope out for a few more links of chain so the tower would be less mobile under foot.

Aside from these few dozen minor problems, erecting the tower went as usual.

Finishing the job

We happen to use a homemade gin pole vaguely similar in design to Rohn's. 1/4" rope is quite adequate for hoisting 25G sections (section weight is 40 lbs).

Two people can put up an 80' tower as outlined here, after the guy anchors are in, in little more than an hour.

A normal naked AM tower becomes increasingly capacitatively reactive as it gets shorter than about 0.2 wavelengths.

Resistance drops from about 50 ohms near 0.25 wavelength to about 10 ohms near 0.175 wavelength, which is about as short as most AM towers are measured.

Below about 0.16 wavelengths, the resistance of a tower is probably all ground losses, rather than actual radiation resistance. At 1540 kHz, our 99' tower was 0.155 wavelengths.

The first time that we tried this, we used about 45 ground radials 100' long, and found that the measured base resistance changed considerably from morning to evening with varying dew conditions (the reactance varied much less).

Under the circumstances that suggests an inadequate ground.

The second time, we used about 90 ground radials, and the measured impedance was quite stable.

The ground radials were stretched over the surface of the ground. The first time, we held them down with tent pegs at the perimeter. That was okay, but overkill. Nails are cheaper and adequate.

We formed a loop of copper plumbing pipe around the base of the tower and wrapped the radials around it.

It seems that the quickest way to make a good electrical connection is with a hot torch (oxy-acetylene).

If you have that much heat available, you might as well use a low percentage silver solder (5%). That won't cost much, and it is a lot stronger than soft solder.

While the torch is out, the connection to the tower leg is better silver soldered than clamped. Measured impedance of the tower as installed was about 11-j170 ohms.

When the time came for disassembly, we simply cut the ground wires close to the loop of pipe and threw away the pipe.

If the radial wires were anchored less firmly than with tent pegs, they could mostly be pulled in and coiled up from the tower end.

AM fast food

The impedance matching network was of "open panel" construction on a piece of plywood.

We used about 100' of RG8 to keep the operating position off of the ground system and out of the extreme fields near the tower.

It is a good idea to provide some sort of shelter for at least the equipment, if not the operator.

We found the hard way that it is advisable to post a 24 hour guard when such an installation goes up in an isolated area where no such structure has been before.

Three reasonably active people can erect the tower, install the ground system and tuning unit, adjust the tuning unit, install the transmitter and measure the base impedance in one day.

Then they take it all apart again in half that. With care, the whole mess will fit in one mini-sized pickup truck.

Think of it as the fast food of AM radio stations.

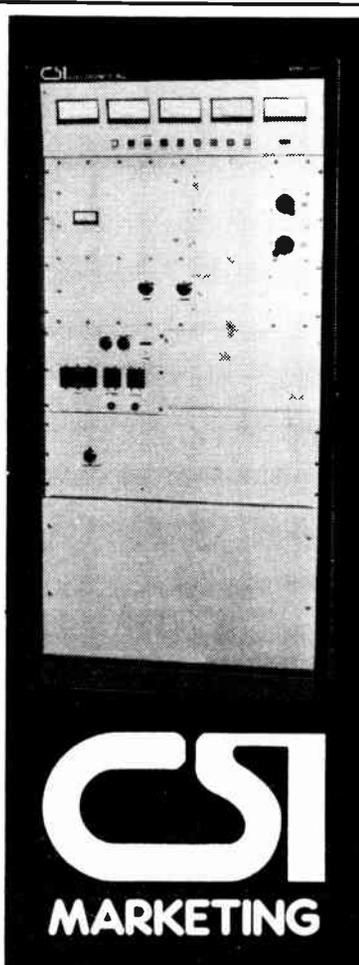
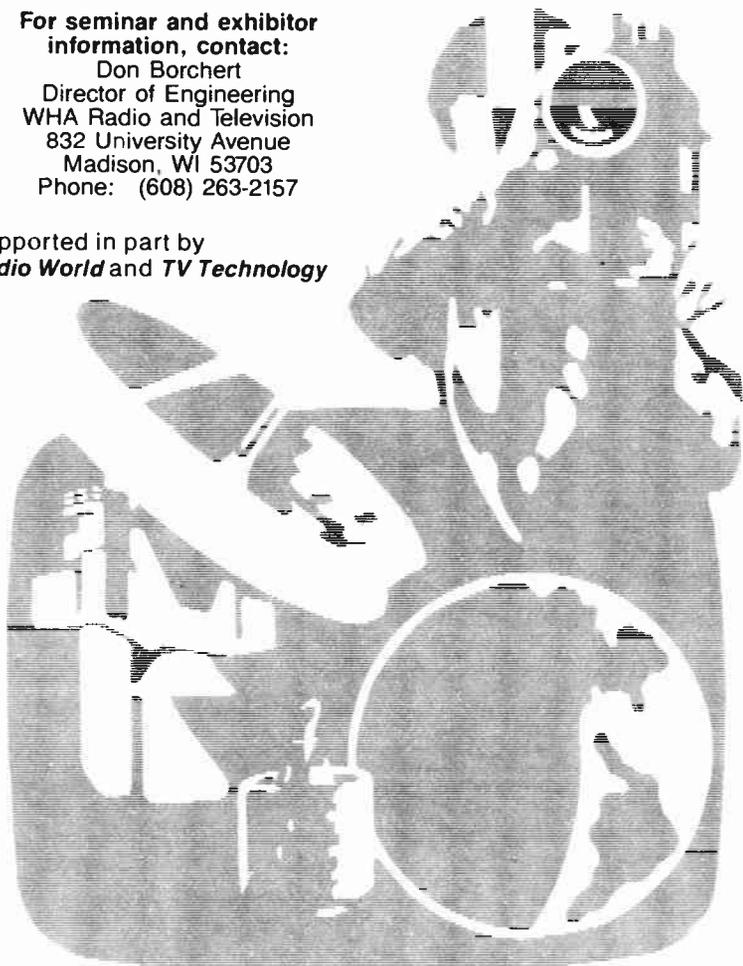
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Country Ride Tunes in Radio

(continued from page 21)
only by the different directions taken in processing the station audio, but also in the modulation levels themselves.

Far from there being a "general" level which the hottest stations would rise above with extra "smash," there were dramatic changes in levels.

Such was the case on one pair of stations, just 40 kHz apart, running the same baseball game.

One was clean, crisp and loud; the other sounded soft, and as if there was a graphic equalizer in front of the processor, purposely rolling off the high end.

There were overmodulated signals as well, splattering their way around the dial.

One 50 kW AM station running in stereo was cranked up so hot that the overmod destroyed any stereo effect there was, as well as producing the telltale barking audio from the main channel.

FM problems

Over on the FM band, there was also a wide range of audio, from great to abysmal.

As we might expect, things were pretty much the same as on the AM band, although it was easier to hear some of the problems created in poor studio set-ups.

For instance, low level hum or tape hiss often stands out more clearly on FM than it does on AM. So does excessive use of mic compressors.

Many stations have decided the best way to tackle part of the problem is the use of CDs. Listening to a great cut with a wide dynamic range and without having modulated hiss intrude is wonderful.

What is not wonderful, is having a CD followed by a poor quality cart, with a lot of hiss suddenly jumping out from the radio. Unfortunately, this happens too often!

As on AM, FM modulation level is a compromise with the PD—the eternal fight over dynamic range versus RMS level.

One station I heard apparently feels

overmodulation is the answer to the modulation wars.

It was overmodulating heavily, with the exciter responding unevenly; the signal being heard, albeit distorted, two channels away on one side.

Overdone bass

Several other FMs apparently have program directors that love a heavy bass thud.

Unfortunately, with their processors

accentuating the bass so much, the typical car radio can't play it loud without going into distortion.

The signal may sound great at home or in the studio, but if it can't be turned up loud in a car, the loudness war is lost for sure!

There were some other surprises, including a mono FM station. (There are not too many of them left!)

Occasionally, there were AM-FM simulcasts, giving insight into different

processing philosophies with plant. And, it was also interesting to hear the various microphone EQs in, as each station sought an unique sound for itself.

By the way, you may have noticed that no call letters were used in this article. That was not just because I wish to avoid grenades in my shorts, but also because all of us have had bad days and breakdowns.

I only hope that if you know of any stations dumping garbage on the airwaves, you will think of the benefit to the industry as a whole and encourage them to clean up their act.

Two Programs for Minor DA Tune Up

(continued from page 16)

If the sample system has been disturbed, or you are converting to standard pattern, then it may be necessary to readjust the pattern.

Pattern conversion

What is this standard pattern conversion? For one thing, it may mean higher monitor point limits.

Back in the '70s, every DA station received a standard pattern conversion sheet depicting their "standard pattern."

The MEOV's, or Maximum Expected Operating Values were discarded.

Many patterns were "augmented" as well, that is refined to reflect previously measured IDF's.

Some stations received higher limits on protection radials, others stayed the same or received lower limits.

Old vs. new

In addition to the standard pattern was the Commission's adoption of the direct ratio basis for determining monitor point limits.

Under the old method, supposing your CP specified an IDF limit of 75 mV/m on the 138° radial. The 138° MP had a limit of 13.5 mV/m and the measured radial IDF was 55 mV/m.

Perhaps the proof-of-performance MP reading was 11.5 mV/m. The 13.5 mV/m

limit was determined by the FCC using internal methods which were not uniform across-the-board procedures.

By the direct ratio method, (Estd ÷ Emeas) × Emp, the new maximum limit on the monitor point would be 15.7 mV/m.

The value of 15.7 would indicate the 138° radial has reached its standard pattern limit of 75 mV/m.

It is of the utmost importance to remember that the purpose of a monitor point is a spot-check of the inverse distance field on the particular radial.

Usually this radial is on a bearing towards a station to be protected. Adjusting your phasor to accommodate a single monitor point is not a good idea.

Other checkpoints

Several other points on the radial should be checked as well, and compared with the latest full proof-of-performance.

If all monitor points have increased and the parameters and base currents have remained constant, check a few points in the major lobe for change as well.

An overall pattern RMS increase can usually be attributed to summer-winter affect, that is, higher fields in the winter time.

If your monitor points exceed the maximums during the winter, and you are operating on the direct ratio basis, I recommend you document readings at the MP's along with several major lobe readings and non-D readings and ratios if possible.

In the event you are inspected by the FCC during the winter, you will be able to demonstrate the natural effect on your system and discount the need to crank the phasor on a seasonal basis.

In our next installment we will examine error-vectors and how to measure them and use them.

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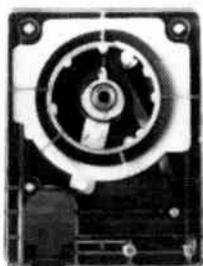


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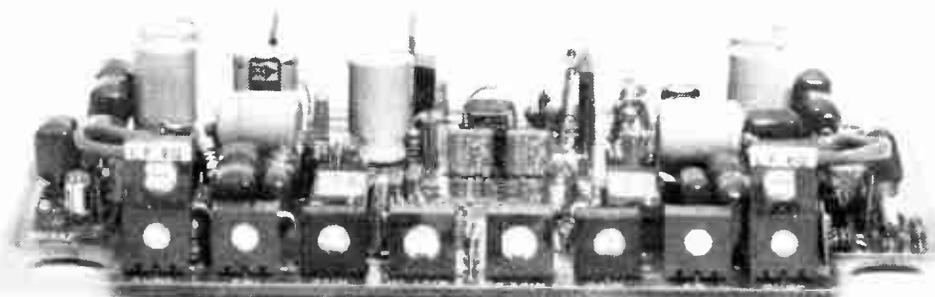
	SWA 3DRP Stereo	SWA 3DRP Mono	Audio-metrics	ITC
Passive NAB EQ	Yes	Yes	No	No
125 Hz Bump EQ	Yes	Yes	No	No
15 kHz Trim	Yes	Yes	No	No
50 Hz LF EQ	Yes	Yes	No	No
Film Caps In				
All Ground Paths	Yes	Yes	No	No
Ground Plane for RF	Yes	Yes	No	No
Stereo Matrix				
Optional	Yes	No	No	No
Balanced Input	Yes	Yes	No	No
Bill Sacks Design	Yes	Yes	No	No
Direct Factory Toll				
Free Tech Help	Yes	Yes	No	Yes
Warranty	Lifetime	Lifetime	1 Yr	90 day
Wins A/B Tests	Always	Always	Never	Never
250 kHz RF present at output	No	No	Yes	No



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A Closer Look At Dial-Up Rules

by Harold Hallikainen

San Luis Obispo CA . . . This is the first of a series of articles discussing the FCC Rules and Regulations regarding the technical operation of radio broadcast stations.

Since it is to be a discussion, I'll look forward to hearing from readers regarding their interpretation of the rules.

In an effort to understand the Commission's intent, we'll refer to the current regulations, the previous regulations, the Federal Register, the Communications Act of 1934, correspondence and discussions with FCC staff and others.

I'll try to list my sources so that readers may do further research.

Dial-up remote

RW has just completed a series of articles regarding dial up remote control. Let's start by looking at each of the remote control rules in detail. This month, we'll look at 73.1410(a).

73.1410 remote control operation states:

(a) Broadcast stations operated by remote control must provide at remote control points sufficient control and operating parameter monitoring capability to allow technical operation in compliance with the Rules applicable to that station and the terms of the station authorization.

AM stations that are required to change modes of operation during the broadcast day must provide sufficient redundancy to assure that such mode changes actually occur.

This rule brings two questions to mind. What is sufficient control? What is sufficient operating parameter monitoring capability?

Traditionally, remote transmitter control has included the following functions: carrier on/off, mode change and power trim.

The carrier on/off requirement is still present, since an operator is required to

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.

shut the transmitter down should an out of tolerance condition be detected, or should the station cause harmful interference.

The mode change control would still be required of those stations that are required to change mode (i.e., change power or pattern), unless those changes are handled by some other means.

They could, for example, be handled by a timer. The station must, however, provide sufficient redundancy to insure that the mode changes actually occur.

Insight on Rules

Since a mode change will generally result in a new set of parameter limits, a routine set of meter readings would detect whether the required mode change actually occurred, providing the required redundancy.

Should the required mode change not occur, and this lack of mode change could cause interference (failure to decrease power could cause interference, failure to increase power would not), and the mode change cannot be completed by some other means (like a function on the remote control), then the station must be shut down.

What about power trim?

Checking my old rules (1980), I find no requirement that the power trim function appear on a remote control, yet each FCC inspection I've been through has checked the operation of the power trim.

The old transmitter requirements (for example, 73.40(a)(8) in my 1980 book) did specify that the transmitter itself would have a means of adjusting the power to compensate for power line fluctuations and other factors.

This requirement does not appear in the current rules.

It would, however, prove useful to have power trim remoted so that you would not have to shut the station down upon finding that high line voltage is causing you to operate at 106% of

authorized power.

Summarizing, you need to be able to turn the transmitter on and off at all times.

If indicated parameters show that you are operating out of licensed limits and such out of limits operation could cause interference and you cannot adjust back within limits by remote control (i.e., power trim or mode change), then you need to shut the station down.

The more control you have at the remote location, the more likely you will be able to bring the transmitter back to a non-interfering condition without shutting it down.

Sufficient metering

The old rules (prior to November 19, 1984) specified various parameters that could be used to determine the final RF amplifier input power, the antenna input power and, for directional AM stations, the tower sample current phases and ratios.

These requirements still exist for extension meter operation (73.1550).

The justification for periodic monitoring (and perhaps logging) of these parameters is that power and DA pattern are licensed parameters and significant deviation from these parameters could cause interference to other stations.

RF amplifier input power is not a licensed parameter and significant deviation of this from normal (assuming output power stays within limits) will not cause interference.

But a comparison between input and output power provides a method to detect failures in the output power measuring circuitry.

Little observation required

There are other transmitter parameters that are limited by the rules and the station license, but have not traditionally required frequent operator observation.

These include measured directional array radiated fields, operating frequency, spurious radiation and occupied bandwidth.

The current rules, however, give little

guidance and apparently little requirement for remote metering.

The Commission appears to have said, "Do what it takes to keep the transmitter inside all required limits."

The conclusions of Rule Making, Federal Register volume 49, number 236, page 47606, Thursday, December 6, 1984, paragraph 9 state:

"The Communications Act requires that a licensed operator have supervisory control over the station's transmitter during all periods of operation.

"However, that operator need only be able to terminate the station's operation should it be the source of harmful interference or be operating inconsistently with law or treaty.

"Meters, alarms or automatic controls could be used to facilitate this supervisory control. Therefore, the amended rules are devoid of 'how to' or methodology provisions.

"Rather, the rules place responsibility on each licensee to assure compliance with the station authorization."

Frequent vs. less frequent

No distinction is made between those requirements that have traditionally required frequent observation and those that have required less frequent observation.

A letter of 6 February 1987 from the Policy and Rules Division of the Mass Media Bureau further stated "the Rules only require that the operator be able to detect that the station is operating within critical parameters.

"For most stations, that is the operating power, defined by whichever method the licensee is using. For AM directional stations, indications that operation is within the directional antenna tolerances must also be available.

"These indications can be either in the form of alarmed limits or actual antenna monitor values."

The letter continues with a desire to give stations some leeway.

"... the Commission wishes to allow broadcast licensees more flexibility in how they choose to monitor certain critical parameters and whenever they are out of tolerance, how and when transmitter operation, for example, should be terminated.

"This lack of specificity permits each broadcaster to decide the means for fail-safe operation and how to configure its system to accomplish this.

"I stress, however, that the Commission holds broadcasters to strict accountability for the maintenance of operating parameters, particularly those which are essential to the protection of other telecommunications systems.

"Consequently, the Commission is less inclined than before to accept deficiencies in technique, equipment or personnel as justification for operating out of tolerance."

This letter adequately spells out what metering (or alarm indication) is expected. It is unfortunate that the Rules do not reflect this.

Tower light observation

Finally, although not a part of the remote control rules, recall that 1747(a)(1) requires an observation of tower light operation at least once each 24 hours.

For many stations, the tower lights are not visible from the control point, so a remote indicator is utilized.

This indicator is to be designed to register the failure of any required lights. For these stations, a remote sample of tower light current is typically required.

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BROADCAST COMPUTING

Distance and Bearing Programs

by Peter Burk

Harvard MA ... Computer programs that can calculate the distance and bearing between two points on earth make light work of many engineering problems—AM and FM spacing, directional array design, STL antenna orientation, etc.

Peter Burk is president of Advanced Micro-Dynamics and a long-time computer user. He can be reached at 617-456-3570, or via the bulletin board at 317-935-0531.

Just plug in the coordinates for the points of interest and see how far and in what direction one is from the other.

It's simple enough, until you try two different programs and get two different answers. Which one is right?

Ben Umberger at WNLT/WHBO in Clearwater, FL wrote about this frustration and provided us with several more distance and bearing programs to add to the growing collection.

We've run some comparisons between several of these programs, and found most of them to work well with reasona-

ble coordinates, but you do have to be careful. Here are some things to watch out for.

Great circle vs flat earth

Distance and Bearing programs are either written to do great circle calculations or FCC "Flat Earth" calculations.

Short distances work nicely with the FCC method. But when the points are more than about 300 miles apart, the FCC method deteriorates rather rapidly.

Where the FCC method is specified or where the distance is short, this calcu-

lation can be done with confidence.

Results from one computer to another will compare closely, and most of the programs behave even with the special cases where coordinates are either parallel or perpendicular to the equator.

Great circle calculations compute the shortest distance between two points, taking into account that Columbus was right.

If you haven't used great circle bearings before, you may be surprised to find that the bearing to a point will not be the reciprocal of the bearing from the point.

If the distance is substantial, there will be a significant change in the bearing, always towards the pole.

Pilots have to deal with this on long flights, making heading changes frequently to approximate the great circle route.

Program problems

Most programs for computing the great circle route between two points produce reasonably accurate results, but are prone to errors in the special cases we mentioned.

One program failed on North-South paths, and another blew up if you aimed at the North Pole from anywhere.

Another let you point north, but wouldn't permit entering the pole or equator as a starting point. Not a major problem, I guess, unless you happen to be an explorer.

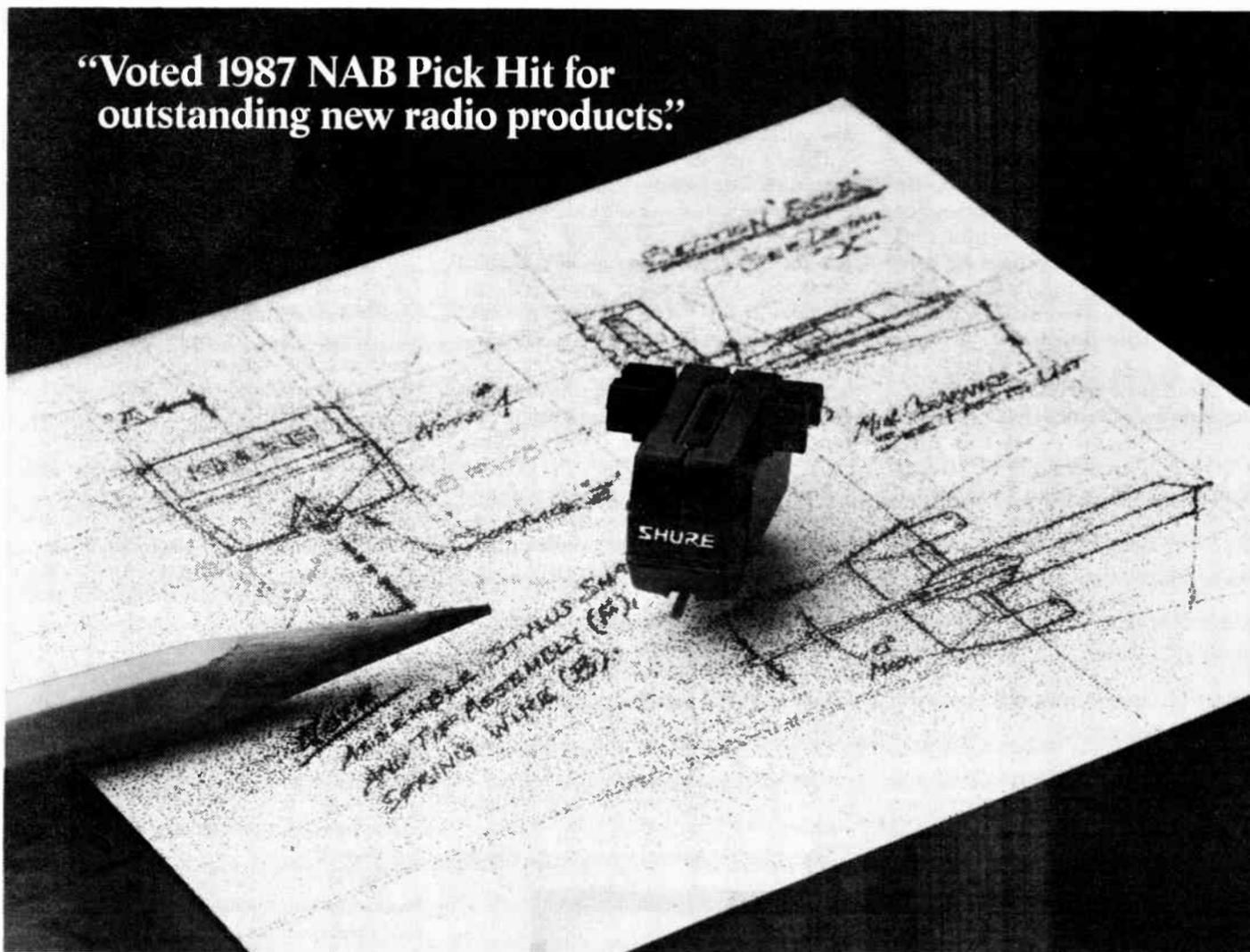
One reason some of these programs have a problem with special cases is that division by zero is undefined.

When a trig function goes to zero or infinity, the computer program has to deal with the problem in some non-mathematical way.

As any hacker will tell you, the easy way out is to report DIVIDE BY ZERO and wait patiently for the operator to suggest different values. There are better ways.

A few extra lines in the program can check for trivial cases and substitute a different calculation as appropriate, or a

(continued on next page)



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Circle Reader Service 17 on Page 14

BROADCAST COMPUTING

Point To Point Computations

(continued from previous page) slight offset can be added to all coordinates to prevent any answer from being exactly zero or infinity.

The latter solution is only appropriate where surplus precision is available. The offset has to be one tenth of a second or less, so that it can be safely ignored in the answer.

The answer should, in fact, round off to some value less precise than this offset.

Assuring accuracy

Which brings us to a point that Umberger makes.

The accuracy and limitations of the algorithms used by such a program should be stated so that the user can have confidence in the results.

The program should display a banner at the beginning of the program or at the very least, contain a set of REM statements with this explanation. Unfortunately, none that we are aware of does this.

This month's offering is a short great

circle program of unknown origin provided by Umberger. Listing 1 shows the simplicity of the program.

Many features can, and perhaps should, be added to a program of this type to make it truly useful, but the actual formulas used sometimes become obscured in the elegant code.

Most notably, the program works in decimal degrees, which is very awkward.

It could, however, become the basis for a fully-featured tool, with fancy input and output handling and trapping for the special cases mentioned earlier. A trial run of the program is included as Listing 2.

Comparing the programs

In the comparison that follows, the accuracy of this program compares favorably with the other programs using a few test points.

A more rigorous analysis should be made before committing significant resources to results obtained through this program.

The comparison in Listing 3 includes

both great circle and FCC methods.

It should be obvious that the FCC method is not appropriate for long distances, but the consistency of the different programs of the same method is comforting.

If you should find a computer that produces substantially different results for the program provided here, tell us so we can let others know.

We'd also like to present a more rigor-

ous proof of the validity of these methods. If anyone is aware of a well established bench-mark, let us know.

Additional distance and bearing programs are available free on the Radio World/Allied computer bulletin board (see box below).

You are encouraged to call and download the programs you'd like to try. As always, we're interested in your solutions to common problems.

If you have a program that you think would be of general interest, send it to us, preferably on disk, or via the computer bulletin board.

Listing 3. Results from five different distance and bearing programs. The listed program is "C".

Point 1: Lat	45.00	30.00	45.00	45.00
Long	90.00	60.00	90.00	90.00
Point 2: Lat	46.00	45.00	45.00	40.00
Long	91.00	120.00	95.00	90.00
Great Circle:				
Program A	135.95	5423.50	393.52	556.61
Program B	135.86	5437.20	394.43	0.00
Program C*	135.60	5413.24	392.72	555.51
FCC Method:				
Program D	135.84	5559.50	394.16	555.29
Program E	135.86	5561.36	394.24	555.65
Great Circle:				
Program A	325.33	305.43	271.77	180.00
Program B	325.23	299.53	271.77	0.00
Program C*	325.38	305.43	271.77	180.00
FCC Method:				
Program D	324.88	287.42	270.00	180.00
Program E	324.88	287.44	270.00	180.00

Listing 1. Great Circle Distance and Bearing Program.

```

150 DEFDBL A,B,C,D,E,L,M
160 D=1:K=111.11:M=57.29577951308238#:N=60:S=69.041:V$="#####.###"
170 INPUT "LAT1";A:A=A/M
180 INPUT "LONG1";L1
190 INPUT "LAT2";B:B=B/M
200 INPUT "LONG2";L2
250 L=(L1-L2)/M
260 E=SIN(A)*SIN(B)+COS(A)*COS(B)*COS(L)
270 D=-ATN(E/SQR(1-E*E))+1.57079
280 C=(SIN(B)-SIN(A)*E)/(COS(A)*SIN(D))
290 IF C>=1 THEN C=0:GOTO 310 ELSE IF C<=-1 THEN C=180/M:GOTO 310
300 C=-ATN(C/SQR(1-C*C))+1.57079
310 C=C*M
320 IF SIN(L)<=0 THEN C=360-C
330 PRINT USING "THE BEARING IS #####.###";C;:PRINT " DEGREES"
340 PRINT USING "GREAT CIRCLE DISTANCE IS #####.###";K*D*M;
:PRINT " KILOMETERS"
350 PRINT USING "GREAT CIRCLE DISTANCE IS #####.###";N*D*M;
:PRINT " NAUT. MILES"
360 PRINT USING "GREAT CIRCLE DISTANCE IS #####.###";S*D*M;
:PRINT " STAT. MILES"
    
```

Listing 2. A trial run of the Great Circle program.

```

LAT1? 45
LONG1? 85
LAT2? 47
LONG2? 87
THE BEARING IS 325.95 DEGREES
GREAT CIRCLE DISTANCE IS 270.50 KILOMETERS
GREAT CIRCLE DISTANCE IS 146.07 NAUT. MILES
GREAT CIRCLE DISTANCE IS 168.08 STAT. MILES
Ok
    
```

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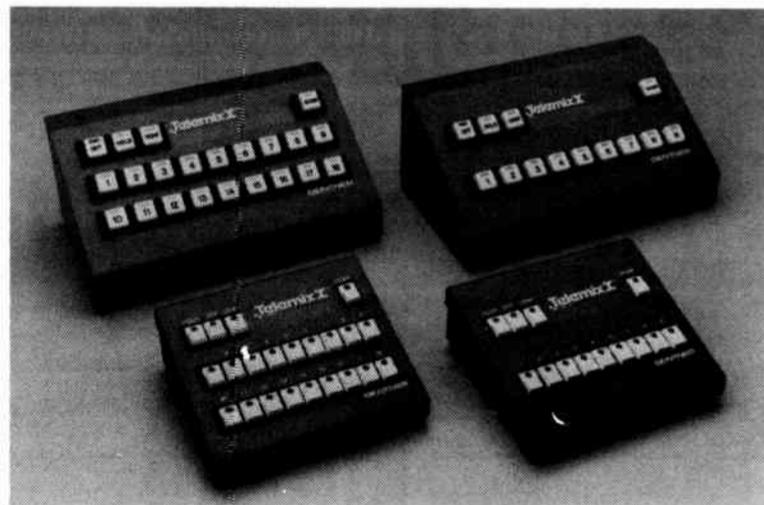
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AMPLIFIERS

Want to Sell

Ultra Audio 5 x 5 audio dist amp w/VU metering, rackmount. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Shure M64 phono preamp, needs minor repair. BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Crown D-150, \$400. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

Amps: McIntosh MC-30, \$125; (2) Quad II tube amps, \$125; (2) Dyna MK III, \$95; Dyna Stereo 70, \$125; Futterman H-3AA tube. BO over \$495. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Altec 1569A pwr amps, mono, 80-100 W (15), \$125 ea. Ampex 3200/custom PB 3200 transpors, handle 1/4 & 1/2" tape, 4/3/2/1 trk heads, customized Ampex PB cards, \$500 ea. RCA BA21A(2), BA23A(3), BA33A(4) preamps, line amps, etc plug-in trays, etc. \$750. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Pulse Com 1671-4L1 switch gain amp. vgc. \$50. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

McIntosh 222 stereo tube, \$200; MC 110 FM/AM tuner, \$150; MC 2105 stereo, \$500. SA Cister, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Dynaco PAT 5 stereo preamp w/assoc Dynaco stereo 120 power amp, assembled from kit by station personnel w/manuals. B Mins, WTSU, Troy St Univ, Troy AL 36082. 205-566-3000.

RCA MI-9377 rack mt, theatre amp, 50 W, working, gd cond, (6), \$75 ea; Dukane 100 W rack mt, tube PA amp, working, gd cond, (3), \$45; HH Scott LK-72 stereo tube amp, \$40. N Carlson, Mobile Snd Group, 721 W Melrose, Chicago IL 60657. 312-871-7459.

McMartin MS-75 (2), great cond, \$100 ea. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Ampex speaker amp, matches Ampex 601 style, not working, \$50. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Mirage D-24 RF power amp, brand new, ham type, \$150. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Marantz 140 \$190/BO. B Van Prooyen, 2111 Shangri-la Dr SE, Grand Rapids MI 49508. 616-243-2026.

Gray Research 602C phono preamp, mono. A Bendix, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

Pioneer SA-5200 power amp, \$75. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Radio Shack MPA-20 AC/DC 20 W audio power amp, \$35. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Gates 994-6690-001 solid state mono TT amps (2), \$80/pair. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Radio Shack PA amp, 35 W w/priority page, \$50. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Want to Buy

Fisher 90-A amp, any cond. J MacLane, The Plate Voltage Club, 1740 N Gramercy Pl, Hollywood CA 90028. 213-465-1762.

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.

McMartin 2500B tube type RF amp, also need schematic. B Coleman, WIST, POB 460, Lobelville TN 37097. 615-593-2294.

McIntosh C4 preamp w/EQ switches, any cond. SA Cister, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Ampex AA620 speaker amp in case. SA Cister, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

ANTENNAS & TOWERS

Want to Sell

Cablewave, 480' of 3" coax, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Strobes: Brighter Idea, medium/low intensity. Retrofit your existing 300mm beacon. Self-contained unit, no extra wiring or rigging of tower required. Broadcast Communications, 6 Round Hill Circle, Madison WI 53717. 608-833-3977.

Phelps Dodge 10 bay FM w/dividers, 380' of 3-1/8" line w/connectors, \$3000. D Overbye, Overbye Tower Erection, 229 E Johnson St, River Falls WI 54022. 715-425-5421.

Phelps Dodge, 3-1/8" rigid line, (12) 20' sections plus (3) 20' sections of 6" line, new, sell all or part. G Smith, WDUN, POB 10, Gainesville GA 30503. 404-532-9921.

LI 42" base, 480' tubular tower, welded, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Potomac 4 tower digital phase monitor. T Jordan, WFNC, POB 35297, Fayetteville NC 28303. 919-864-5222.

Pirod tower, 700' tapered, excel cond, BO. D Sloatman, Metroplex WJYO, 2001 N Mercury Dr, Orlando FL 32808. 305-298-5510.

RCA 51.5 ohm transmission lines (5) MI 19313, 30 used full length lines & 5 short sections, 11 flanged elbows stored inside, BO. J Wright, WBOY, 912 W Pike St, Clarksburg WV 26301. 304-623-3311.

Cablewave xmsn line, 115', 3", new w/o fittings. BO. T Pace, KEKB, POB 68, Fruita CO 81521. 303-858-3699.

Rohn 65G 370' incl guy wires, dismantled, you ship, \$13,000. A Crain, WWEE, POB 157, Collierville TN 38017. 901-853-4735.

Gates/ERI FMS-2A, 2 bay CP antenna w/factory de-ice & tower-leg stand-off mounting brackets, 1-5/8" interbay, tuned to 103.9 MHz, \$1200/BO. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

Tower, 980' solid leg, zone A, w/guy wire on ground, call for price. L Dupree, KQID, POB 7057, Alexandria LA 71301. 318-445-1234.

Gentner SPH4, 1 yr old, mint cond, w/manual, BO. J McKee, Boutwell Stds, 720 23rd St S, Birmingham AL 35233. 205-251-8889.

Elgin ERC-19645-4, gd cond, will record or play from line, will also answer for listen line. (2), \$60 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Orban 111B/1 spring reverb, mint cond, \$400. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

Eventide BD955 digital delay, \$1300/BO. Studer telephone hybrid, dual, \$995/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Sparta-Cetec AS3013 push button style, 2 tables, Stanton cart, remote console w/legs, Spotmaster mono R/P cart machine, low hrs, \$1500. J Gardner, The Way, 2 Maria Hotchkiss Rd, Prospect CT 06712. 203-758-4769.

Gentner VRC-1000 w/failsafe, punch B/K, service manual, extra connector, all access, BO. T Berry, WKRR, POB 36070, Greensboro NC 27416. 919-274-8042.

Orban Stereo synthesizer, \$175. B Kramer, WQXO, Box 3176, Longwood FL 32779. 305-682-5463.

Gates GE-3, working in 1/87 when removed, \$700. BJ Hunsinger, WNTT, Box 84 South Hall, Mansfield Univ, Mansfield PA 16933. 717-662-4650.

Telex CS91 sports bdctrs headsets w/broom mic (5) in need of repair, \$195/all. CJ Pringle, Trinity Entrp, Box 831, Webster City IA 50595. 515-832-1263.

Eventide RD 780 (2) Monstarmat matrix encode-decode, \$200 ea. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Inovonics 355 w/power supplies (900 Series), BO. T Low, Foster Communications, 115 W First, San Angelo TX 76903. 915-653-3387.

Shure M267 mixer, near new cond, \$260. CJ Pringle, Trinity Entrp, Box 831, Webster City IA 50595. 515-832-1263.

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Sontec, Pultec or APIEQ's. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Color weather radar weather system, hard or software. S Voros, WLZR, 1537 S 81st, Milwaukee WI 53214. 414-475-6200.

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SMC 521 dual play, \$700. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

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Jampro 6 bay FM at 95.5 MHz, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Trusscon 270' self supporting tower, solid, still standing in Pella IA, BO. J Hansen, KFMD 515-282-1033.

Scala FMVH-4 CP 4 bay w/divider network & all cables, excel cond, \$700 plus ship. S Lawson, KAK-FM, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055 aft 6 PM PST.

Bird 8572-115-6 dummy load, air cooled 25 kW, 5 hrs daily use, \$3000. J Keyes, WAITKG, POB 645, Yellville AR 72687. 501-449-4147.

Rohn 65 370', w/many access, \$13,000. A Crain, Box 157, Collierville TN 38017. 901-895-6483.

Tower, 370', 4' face, Windcharger type, guy wires, dismantled, you ship, \$19,000. A Crain, WWEE, POB 157, Collierville TN 38017. 901-853-4735.

Windcharger, 370', \$19,000/BO or may take 1 kW AM xmit trade & 2 tower phaser. A Crain, Box 157, Collierville TN 38017. 601-895-6483.

Kintronics 7.5 isocoupler, like new, \$750. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Continental/ERI 12 bay, CP, 93.1 MHz. L Dupree, KQID, POB 7057, Alexandria LA 71301. 318-445-1234.

RCA 6-1/2" transmission line, 75 ohm, 900', \$600/20' section. B Richert, WPCB, Signal Hill Dr, Wall PA 15148. 412-824-3930.

TFU 30J chan 48 RCA antenna, \$40,000. B Richert, WPCB, Signal Hill Dr, Wall PA 15148. 412-824-3930.

ERI 6 bay HP antenna, 104.3 MHz, BO. C Schipper, KQKS, 9191 Sheridan #205, Westminster CO 80030. 303-427-7700.

Steel guy cable, 5/16", (3) 200' sections, BO, (2) 50' sections 3/8" Phyllystran guy cable w/connectors, \$100; (2) new Andrew 1062-3 90° mitre elbows, \$75 ea; Bird 51.5 ohm in-line wattmeter w/25 kW element, BO over \$50; Andrew 6710 coaxial switch, 3PST for parts, w/drawings, BO. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Want to Buy

Helix 1-5/8" or 3" line, also need matching connectors. J Powley, WIIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Bogner UHF TV antenna, B4U, B8U, B16U, any chan incl old translator band 70-83, low to medium power input series. J Powley, WIIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

ATU & base insulator for 1 kW AM 1400 & 1490 kHz stations. B Dodge, WTIJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

Tower sections (4), either Rohn #80 or Stainless G-36, new or used. J Powley, WIIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Diplexer for FM station, send details. R. Gold, Suwebe Bdcg, 19355 NE 36th Ct Ste 11J, Miami FL 33180.

AUDIO PRODUCTION OTHER

Want to Sell

Symetrix T1101, in new cond, telephone hybrid interface, \$295. T Johnson, KEST, 1231 Market St, San Francisco CA 94103. 415-626-5585.

Telefunken C4-DM NR cards, (2) brand new, \$395. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Shure M675 prod master for use w/M67, \$250/BO; Shure M68 mic mixer, \$125/BO; Shure M62V Levelock, \$75. K Smith, WIGY, POB 329, Bath ME 04530. 207-443-6671.

ITC 850 R/P, excel, BO; Orban 111B stereo reverb, gd cond, BO; DAP 310's, fair cond, BO. M Guthrie, 540 Reo St, Tampa FL 33609. 813-855-5642.

Orban Stereo Synthesizer, converts mono into psuedo stereo, gd cond, \$125. D Doelitzsch, WDDD, 1 Broadcast Ctr, Marion IL 62959. 618-997-8123.

MXR 1/3 octave (2) 31 band graphic EQ's, \$75 ea; Orban 536A, 2 chan de-esser, like new, \$350; Aphex aural exciter Type C, \$250. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

dbx 142 NR unit (2) encoder/decoder. J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

dbx 150X, new in box, \$195 free ship. J Shep-rd, Globe Prod, 539 Westminster Ln, Salem VA 24153. 703-389-1670.

Shure 610 feedback controller, mint, \$90; Shure SE30 compressor mixer, \$100; EV XEQ2 crossover (2), \$120 ea; Accessit Noise Gates 3 chans w/PS, mint, \$175. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Panasonic SE-405H CD-4 system disc demodulator, w/cartridge, test disc, etc, \$100. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Comex Bleepmate 675 3 or 6 sec digital delay, \$700. S Bush, KTKK, 3595 S 1300 West, Salt Lake City UT 84119. 801-264-8250.

Telefunken C4D Telcom NR cards (8), \$300 ea; (2) dbx K9-22 NR cards, \$250 ea; BTX 4100, 4500 & 4010 SMPTE gen & reader, \$2000 package. E Sanders, 7th St Snd, 688 S Santa Fe #105, LA CA 90021. 213-627-5392.

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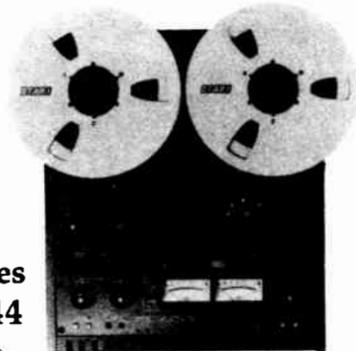
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OTARI MARK III-2



OTARI MX5050 B-II



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Broadcast Equipment Exchange

AUTO . . . WTS

SM Carousels, (2) Series 350 RS, (3) Series 352 RSB, best serious offer. R McKay, KXRB, 3205 S Meadow, Sioux Falls SD. 605-361-0300.

TAC-1 time announce controller, \$350. W Houston, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

SMC 452 Carousels (3), stereo, Audionics 10M-915 video display, PDC-4X clock, SMC ESP-1 programmer, 2 racks, TSB-3 power control, DS-20A digital switcher, 2 Otari R-R reproducers & all manuals, well maintained, \$20K plus ship. C Larsen, KAMI, 835 Meridian, Cozad NE 69130. 308-784-1580.

Schafer system, assume lease, small down, w/controller, 48-tray Audiofile, 3 ITC R-R decks, 903 logging card w/Extel printer, studio/network I-O card, time announce package, 2 racks. E Routt, KCKL, Box 489, Malakoff TX 75148. 214-489-1238.

Control Design CD25G tone gen, BO. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5332.

Harris System 90, excel cond, \$4500. D Robertson, WQXY, 100 St James Ste 100, Baton Rouge LA 70802. 504-383-4411.

IGM 250 mono seq Carousel, working, \$200. L Buller, KSDB, 104 Kedzie KS STU, Manhattan KS 66502. 913-532-7645.

SMC TS25 dual 25 Hz sensor, \$250. M Persons, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

Harris 9000, (4) single deck ITC carts w/Harris interfaces, (4) Scully 270 R-R PB, (5) SMC Carousels w/Harris interfaces, 1 logging printer, TI-840 RO, (2) Tec-70 terminals, Harris brain & switcher w/Tec 70, spare pinch rollers, heads, etc for Carousels, spare cables, all equip housed in 19" racks (5), terminal completely operational, \$60,000. GM, KYSD, 21 S Chadbourn, San Angelo TX 76903. 915-655-1340.

BE Control 16 Automation System: (4) Otari ARS1000DC decks, (2) ITC 770 decks, (4) IGM Go-Carts, ITC 3D cart deck, (2) ITC RP decks, (5) racks, (3) CRTs, (2) control stations, battery backup & charger, auto logging, cart encoder. D White, WYBR, Box 7180, Rockford IL 61126. 815-874-7861.

SMC satellite automation MSP 10 channel w/3 stereo Carousels, 4 stereo singles plays, Brain, rack, wired, mint cond, bargain at \$10,000. B Kramer, WQXO, Box 3176, Longwood FL 32779. 305-682-5463.

SMC DP1 digital programmer w/5 Carousels, several single play deck encoder/decoder & other misc automation equip, call for price. D Mackenzie, WJBR, 2617 Ebright Rd, Wilmington DE 19810. 302-475-4000.

Model 20A (250) Carousels, (4), \$600 plus frt. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Harris System 90, (4) R-R's, IGM Go-Cart 48, (2) cart decks w/logger, \$7600. D Tarum, KRZ, 2402 E 37th No, Wichita KS 67219. 316-832-9600.

Schafer 800F complete system, call for details, complete or components, \$10,500/BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Control Design Corp, CD-28AS w/12 source stereo switcher, sequential programmer & 8 event clock & manuals, BO. J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

Control Design Corp CD-24R stereo random access cart Carousel w/manual. J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

Schafer 901 system w/IGM 48 cart stereo Insta-Cart, (2) Sono-mag 250 Carousels, Sono-mag 350 Carousel, Extel printer, A Bendix, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

SMC w/DP1 digital programmer w/fixed 24 cart Carousels, 3 Scully SLJ10 R-R's, you take out, ready now, \$8000 cash. T Graham, WKAA, 106 4th St, Ocala GA 31774. 912-468-9898.

Want to Buy

RCA-15A instruction manual wanted. JB Crawley, WLBK, POB 185, Campbellsville KY 42718. 502-465-8884.

IGM Instacart, 48 tray stereo in gd to excel cond, for non-profit educ station. J Tocknell, Cedarville College (WCDD), POB 601, Cedarville OH 45314. 513-766-5595.

Cetec 7000 automation system. D Williams, KLCB, POB 730, Libby MT. 406-293-6234.

IGM 364J program logger-printer, for parts. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

CAMERAS (VIDEO)

Want to Sell

Remote control camera cable w/push buttons, to trade for tripod. J Baltar, Maine Rec Comms, 67 Green St, Augusta ME 04330. 207-762-1941.

RCA TK42 camera & parts; also RCA pedestals & parts. Bruce Cooke, GBC Electronics, Rt 2 Box 310, Blountville TN 37617. 615-323-2976.

JVC KY1900, w/AC adapter-charger, battery & case, excel cond, \$3000. R Larsen, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-848-3172.

Norelco PC 70 cameras (7), most need plumbs, \$5000 for package. Nigel, Technichrome, 701 Desert Ln, Las Vegas NV 89106. 702-386-2844.

Hitachi GP7U single tube w/AC power, \$600. G Sive, Your Video Connection, POB 239, Bonsall CA 92003. 619-729-7662.

Want to Buy

Panasonic Recam B-100 system cameras; AK-100, extension board, AC adaptor, batteries & chargers, power supply & any/all access. B Briggs, KCAM, 827 Meridian St, Nashville TN 37207. 615-226-1122.

CART MACHINES

Want to Sell

ITC R/P mono fresh Beau motors, excel cond (2), \$1595. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

Beaucart 22-143-001, gd cond, many features, \$900. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Beaucart Type-20 R/P, 3 cue tones, motorized azimuth adjust, \$2500. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Twin Tape 642E-1 (2) PB mono, \$150 ea. M Maluis, WSSA, POB 831, Morrow GA 30260. 404-361-8843.

Beaucart 11-123-001, gd cond, (3) \$500 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

BE 5304-B triple deck stereo, 1 yr old, 3 tones, like new cond, \$3300. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

ITC PB mono w/fresh Beau motor, excel cond, wide play unit, \$995. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

ITC SP excel cond, \$850. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

BE Spotmaster 505CR rack mount player, \$200; 500CR rack mount recorder, \$250. M Persons, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

Sparta Sparkomatic, gd cond, \$100/BO; Gates ATC, fair cond, \$125/BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Spotmaster BE 5300B 3 deck, gd cond, \$1200. M Daley, Daley & Assoc, 311 S Clauster, Tupelo MS 38801. 601-841-1506.

ITC 3D triple stack machine w/rec amp & heads, 3 tones, 1 yr old, \$3400. V White, 4600 E Herndon #244, Clovis CA 93612. 209-298-2373.

Hams R/P, R Sanchez, KUCV, Lincoln NE. 402-486-2520.

ITC Premium stereo play w/SWA elec, BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

BE 4300RPS R/P stereo, excel cond, \$895. B Anthony, Anthony Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

ITC RP (2), one excel, one cracked VU & missing case, works, \$850/both. G Sive, Your Video Connection, POB 239, Bonsall CA 92003. 619-729-7662.

Gates Criterion, R/P, stereo, \$500/BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Revox PR99 (2) w/tones, PB only, mint cond, \$850/BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Teapester PB, \$200. C Mandel, KAMP, Box 1018, El Centro CA 92244. 619-352-2277.

Teapester 700RP (2) 2 tones on ea, gd cond, \$250 ea. S Bush, KTKK, 3595 S 1300 West, Salt Lake City UT 84119. 801-264-8250.

ITC Premium line, new stereo PB elec, new motor, 3 tone, \$2000. J Rosso, WCZE, 869 Church Rd, Elmhurst IL 60126. 312-834-6474.

Gates R/P, works well, \$350. S Angram, WTMX, 317-545-8100.

Teapester 700P (6) well maintained/gd cond, \$200 ea. S Bush, KTKK, 3595 S 1300 West, Salt Lake City UT 84119. 801-264-8250.

ITC ESLY eraser splice locator, \$400. J Rosso, WCZE, 869 Church Rd, Elmhurst IL 60126. 312-834-6474.

RCA mono PB (3) all work, \$200 ea; RCA mono reproduce, gd working cond, \$300. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

BE 200PS w/30 blank cartridges, \$250. S Angram, WTMX, 317-545-8100.

Spotmaster 400A record/play mono, works, \$95. Spotmaster 405A play only mono, needs pullup solenoid, \$40; Teapester 700P (2) mono playback, working, \$60 ea. M Byrnes, WAMU, 4400 Mass Ave NW, Wash DC 20016. 202-885-1030.

Lauderdale Labs Splicemaster MK2 splicefinder, fair cond, \$75. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

BE 3000, excel cond, just off air, play, mono, \$500. P Remaker, WOHs, 3905 Spruce St, Phila PA 19104. 215-898-9553.

Spotmaster 5304 stereo 3-spot PB deck, complete w/all three cue tones & manual, spare motor, vgc, \$725. M Byrnes, WAMU, 4400 Mass Ave NW, Wash DC 20016. 202-885-1030.

Teapester 700 R/P fair cond, \$250. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Spotmaster 505 mono cart deck; BE cart re-winder. A Bendix, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

McCarta 510 cart machines (2), BO. L Olsen, Koss Comm, 4824 Fir Ln NW, Gig Harbor WA 98335. 206-858-7312.

ITC RP excel cond, 3 tones, like new, \$2000. H Buttermore, WHYT, 2100 Fisher Bldg, Detroit MI 48202. 313-435-3932.

Want to Buy

BE 5300B PB triple deck or equiv; BE 3200RP R/P or equiv. C Lamb, U of North Iowa, Cedar Falls IA 50614. 319-273-2774.

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 or Criterion, G Miller, PA Network, 260 S Broad, Phila PA 19102. 215-732-7100.

Rapid Cue, any cond, mono PB. J Breiter, Breiter Assoc, 7 S Monroe St, Monroe MI 48161. 313-242-6600.

WRA record amp for ITC triple decker. J Vieklich, Metro Recgd, 4551 Flag Ave N, Minneapolis MN 55428. 612-537-1431.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

NEC 3/4" time lapse VCR, \$400 plus UPS. J Baltar, Maine Rec Comm, 207-623-1941.

Revox A77, fair cond, 2 trk, 3.75-7.5, \$400. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Nagra QHP handle, \$25; Nagra QHTP case for IV-S, \$69; Nagra QHTP-C top cover of 7" cover, \$49; Nagra record amp circuit board for IV-S, \$395. C Richardson, Richardson Recgd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Nagra QSL synchronizer for Nagra IV-S, \$295; Ampex MR-70-4 4 chan, in near mint cond, BO over \$2500. C Richardson, Richardson Recgd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ampex 350 elect w/PS, \$25. G Falk, Falk Recgd, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

King 680 cassette loader, gd cond, w/spares & manual, \$4000. G Falk, Falk Recgd, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Alpha 21, 16:1, hi-speed, mono cass dupl, one copy/pass, one side or both sides simul, man or auto rewind, vgc, \$700. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

VSC Soundpacer, C-4 var-speed, vari-pitch, speech compression cass rec, AC/DC w/throughput to use w/xt vari-speed rec, new cond, \$125. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Superscope RBC-2, 5 V, 4 C-cells, NiCad battery pack, gd for Sony TX-142 & similar recorders, \$12. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

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Ampex parts, 351 transport, no capstan motor or heads, \$100; 7.5 3.75 ips motor, 15 & 7.5 ips motor, \$75 ea; AG-350 2 trk elect, \$150 for pair; some Ampex heads, inquire; (2) HB wood rec console w/overbridge for 7" of elect, \$50 ea. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Scully 280, 2 trk, gd cond, wood console avail at no extra charge, \$600/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Revox A77, \$350. B Surrott, WINA, 501 E Main St, Charlottesville VA 22901. 804-977-3030.

Sony TC 142 mono portable cassette R/P, fair working cond, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Tandberg TCD 310 cassette stereo R/P, fair, needs work, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Otari ARS-1000 PB w/25 Hz detector. T Jordan, WFNC, POB 35297, Fayetteville NC 28303. 919-864-5222.

Revox B-77, gd cond, recently overhauled at Revox, 2 trk, 3-3/4-7-1/2, \$750. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Inovonics 370 excel cond, \$250. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

Scully 270 PB 3-3/4-7-1/2 ips (7), \$150 ea. A Tallman, Visual Magic, POB 1789, Pacifica CA 94044. 415-359-4036.

Revox A77 HS, \$400. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

Pioneer RT 2022 stereo 2 trk R/P, used, one chan not recording, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Dictaphone 4000 recording & logging system, (2) w/controller, 10 chan, phone interface, \$2500. L Buller, KSDB, 104 Kedzie KS STU, Manhattan KS 66502. 913-532-7645.

ITC 750 stereo PB, gd cond, 10-1/2" reel, for automation or prod use, \$350. D Doelitzsch, WDDD, 1 Broadcast Ctr, Marion IL 62959. 618-997-8123.

Ampex AG440C 4 trk 1/2" deck, mint cond, DC motors remote, \$3500. J Block, The Production Block, 906 E 5th St, Austin TX 78702. 512-472-8975.

Scully 284-8 8 trk, 1" w/sync master, \$2200. F Hellerman, Honeywind Prod, 83 Goodhill Rd, Weston CT 06883. 203-226-5729.

Ampex 960 2 trk stereo portable, \$175; Ampex AG-440-C FT mono in console w/servo motor, \$995; Ampex AG-440-C 2 trk stereo in console w/servo motor, \$1395; Nagra QGB 10-1/4 reel adapter w/hub adapters, \$1100; Nagra QSQC parallel connecting unit, \$100. C Richardson, Richardson Recgd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ampex 601-2, \$185; Ampex AG350, \$2500; Ampex 4 trk, \$1000; 3 trk \$750, or both \$1700; Ampex 2 trk (2), \$725 & \$775 or both \$1400; Ampex 350 FT console cab, \$550; Ampex 8 trk AG350, \$3500. L Oliver, 212-874-0274/7660 (PM).

Scully 10" PB great cond, \$400. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Ampex 351 2 trk, \$250. E Luciani, Natl Recgd, 460 W 42nd, NY NY 10036. 212-279-2000.

Sony ACG1 power supply for TCD5 & TCM5000, \$15. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Teac 7030SL (2) w/remotes, overhauled, excel cond, \$600 ea or \$1100/both. R Ashmore, S Front Range Bldg, POB 421, Colorado City CO 81019. 303-676-3588 eves.

Teapester X700P, (2) just overhauled, excel cond, \$275 ea or both \$500. R Ashmore, S Front Range Bldg, POB 421, Colorado City CO 81019. 303-676-3588 eves.

Nagra III R-R, w/sync-pilot hd, 3-3/4-7-1/2-15 IPS, 5 or 7" reels, excel oper & phys cons, w/manual, \$1100 ea/BO. JG Von Vleck, Vtech, 2844 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Ampex AD-15, \$4500; Concertone CR-90L, \$250; Electrosound 100-48/200, \$750; Ampex 3200/custom PB, \$500 ea. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Ampex AG500 mono, mint, \$499 in case, (4) no case \$300 ea; Logging recorder, Magna Sync TR 720, 24 hrs on 1/2" tape, rack cabinet, time code controller, manual, w/24 reels tape, \$500 plus ship. SA Cisler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Revox PR99 (2) play only w/tone detect, set for automation, \$850 ea. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Friedly 280-8 1" 8 trk w/remote, \$2900. L Fried, West Bank Sound, 1413 Washing Ave S, Minneapolis MN 55454. 612-370-0098.

Revox A-77</



Broadcast Equipment Exchange

CASSETTES . . . WTS

Magnecord PT-6, w/options PT6-AH, amp & record sections PT6-J, PT6-M, R Elm, WWJC, 1120 E McCuen St, Duluth MN 55808. 218-626-2738.

3M Mincom, one 2 trk & one 2 or 4 trk, old, big, but restorable, call for info. M Wiist, WAUS, Andrews Univ, Berrien Springs MI 49104. 616-471-3400.

Infonics cassette dup equip, (2) systems avail w/open reel masters, 1 w/cassette master also, 8 slaves ea, call for info. M Wiist, WAUS, Andrews Univ, Berrien Springs MI 49104. 616-471-3400.

Teac 3300S 1/4 trk stereo, rack mounted, vgc, \$150/BO; Ampex 350-2 elect only master & slave, R/P elects for Ampex 350, power supply, gd cond, rack mount, \$40/pr; Technics 676 stereo cassette, rack mount, gd cond, \$75; Akai GX-6300 1/4 trk stereo, \$400. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

Otari MKII-4 excel cond, 1/2" 4 trk, BO; Nakamichi 550 batt oper, excel cond, BO; Eumig FL-1000 cass deck, excel cond, BO. R Kaufman, Solid Gold Time Machine, POB 29804, Atlanta GA 30359, 404-636-9911.

Otari ARS-1000 10" R-R w/25 Hz detector, 75-15 ips, \$800, you ship. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-677-5592.

Ampex 602 stereo R/P elects only for 600 series, rack mounted, vgc, \$45; Scully 280 TM 4-chan 280 series PB only elects w/4-VU meters, level & EQ controls, rack mounted, vgc, \$95/BO; Ampex 351/300 (4) multi-chan R/P elects complete, tube type, gd cond, \$45 ea. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

3M M64 2 trk stereo, 14", console mounted, vgc, \$600; 3M M64/23 2 trk stereo PB only, 14". Lang console mounted, gd cond, \$250; Ampex 300 series 2 trk stereo, 1/2" PB only, Incronics 376 dual PB elect, console mounted, vgc, \$350. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

Nagra IV-L Type L-3, w/single preamp & sync, mint cond w/manual, \$2600. R Sumner, CAVU Corp, 3351 Contessa Ct, Annandale VA 22003. 703-560-0233.

MCI JH10 16 trk w/opt 8 trk head stack & rollers, \$6000 or will trade for mixer. G Bishop, Reel Time Recording, 3205 E Bessemer, Greensboro NC 27405. 919-378-1034.

3M M23 4 trk, \$1250; Ampex transports, power supplies, top plates, parts, etc, also Scully parts. J Price, Price's Rcdg Svcs, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Teac A3300SX 2 trk 7.5-15 ips, \$400 plus frt. J Shepard, Globe Prod, 539 Westminster Ln, Salem VA 24153. 703-389-1670.

Teac 80-8 w/dbx 8 NR, \$1850. G Bishop, Reel Time Recording, 3205 E Bessemer, Greensboro NC 27405. 919-378-1034.

Want to Buy

ITC 750 for automation, record not necessary, must have rack mount. C McCarthy, KNCC, 2551 Park Marina Ste F, Redding CA 96001. 916-244-9700.

Remote control for A77 & Ampex ATR 700's. G Hale, Tag Prods, Box 52, Pratts VA 22731. 703-948-6459.

8/16/24 trk recorder, any cond, also mixer 8/16/24 lines out, any cond. J Price, Price Rcdg Std, 2651 Globe, Dallas TX 75228. 214-321-6576.

Teac A-3300SX-2T or similar, units needing repairs will be considered, will also consider Revox A-77, prefer 7.5/3.75 ips versions, pay or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

RCA RT21 manual or photo copy, also parts & pieces, units working or not. M Salvaggio, MFS Prod Svcs, 417 Lauback St, Hellertown PA 18055. 215-838-9274.

Revox A-77 R-R's, don't mind one that needs repairs. F Vobbe, 706 MacKenzie, Lima OH 45805. 419-224-1335.

Pioneer RT707 1/4 trk reversible. J Viekelich, Metro Recdg, 4551 Flag Ave N, Minneapolis MN 55428. 612-537-1431.

MCI/Sony capstan & reel motors, any cond., recdg heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St, No. 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

CATV-MATV EQUIP.

Want to Sell

Catel FMS cable modulator, like new, \$1000. W Vos, KYJR, POB 79, Wenatchee WA 98801. 509-663-5186.

CONSOLES

Want to Sell

McMartin 5 ch mono mixer, very clean, \$250. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

LPB S13 Signature II, 3 mic, 5 line inputs, meets all specs, excel cond, BO. B Geilhaus, WDVTV, New Market 900, Phila PA 19147. 215-238-3905.

Teac Model 2 6 pot stereo mixer, used in fair cond, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Quantum 12P stereo 12 chan, \$5000. K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

Sparta AS-30B 5 pot, 9 inputs, stereo/mono switch, works good, \$400. G Corey, Morning Show Prod, 3253 Foxcroft Ste 215, Miramar FL 33025. 305-432-6006.

Radio Systems ESA10, new, BO. R Larson, 7560 Hollywood Blvd Ste 306, Hollywood CA 90046. 213-851-4445.

Tascam M30, excel cond, \$650. D Parrott, Water Gutch Prod, 1334 Ironsides, Bremerton WA 98310. 206-377-7687.

Shure M267 mixer, brand new, \$275. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ramsa WRB20 16x16 monitors, almost new in teakwood, w/meter bridge & patchbay, photos avail, \$6500. J Block, The Production Block, 906 E 5th St, Austin TX 78702. 512-472-8975.

Tascam 512 12x8 mixer, brand new under warranty w/SRC manual, \$2750. F Wyatt, BTM Studios, Box 928, Burnsville NC 28714. 704-675-5685.

Spotmaster 4BEM50, vgc, must sell, BO. D Lilling, 1301 20th St NW Ste 202, Wash DC 20036. 202-331-3833.

API 28x8x24 w/16 echo returns, avail w/ro w/Optimix automation. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Optimix console automation system, has 32 VCAs, floppy disc storage, expandable. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

LPB S-13B/8 8 pot stereo, used, gd cond, needs some work, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Ampex M135 (3), \$275 ea; Sigma 4 chan (3), \$100 ea; Altec portable mixers/meter 4 chan/master on 1567A (2), \$275 ea/both \$525. L Oliver, 212-874-0274/7660 (PM).

Ramko 8 chan stereo console, new pots, \$999. B Kramer, WQXO, Box 3176, Longwood FL 32779. 305-682-5463.

RCA BC-7 wired for stereo, gd cond, \$2000/BO. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Bogan LOM-5 mic mixer, gd cond, \$75/BO/trade. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Yamaha PM1000 32 input, \$6000 FOB. J Damien, Sheraton Wash Hotel, 2660 Woodley Rd NW, Wash DC 20008. 202-328-2000 X2693.

Teac 15 16 in 8 out tape remotes, \$3000/BO. D Marcum, Thin Man Prod, 3204 Bruce, Austin TX 78735. 512-892-4433.

Sunn audio control board, 24-chan, like new w/custom Nashville road case, \$1800. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

Gates Yard power supplies & monitor amps (4), two rebuilt & in excel cond w/tubes, \$75 ea plus ship & two need minor work w/o tubes, \$30 ea plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Harris Micromac 16 ch, 32 input, stereo, 3 mixdown busses, \$3200. D Tarum, KRZ, 2402 E 37th No, Wichita KS 67219. 316-832-9600.

GE BC-1A power supply, gd cond but needs minor work, \$30 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

BE 55150 5-chan stereo, gd cond, \$1300. S Angram, WTMX, 317-545-8100.

Gates Yard misc parts, some new, some used, call for details. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

LPB 8 chan stereo, gd cond, \$1000; UREI 1/3 octave mono EQ, needs work, \$100. C Ocean, WZD, POB 1047, Daphne AL 36526. 205-626-9600.

BE 8S150 8 chan stereo, 1 yr old, used for prod only, \$2000. V White, 4600 E Herndon #244, Clovis CA 93612. 209-298-2373.

MCI JH416, 16 chan, \$3K/BO. M Fiedler, Mahoney Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0018.

Collins 212J-1 PA mixer; Gates Studioette mixer, tube type; Howe 7012 stereo 12 chan mixer rotary; Howe 7512 stereo, 12 chan side; Ampro Microtouch 5 chan stereo mixer. A Bendix, KGWY, POB 1179, Gillette WY 82716. 307-686-2242.

Ramko BC8-M mono, 8 chan, full docs, needs work, \$400 plus ship. P Remaker, WQHF, 3905 Spruce St, Phila PA 19104. 215-898-9553.

Collins, 50's vintage tube type console, \$200. C Ratliffe, WADE, POB 1210, Wadsworth NC 28170. 704-694-2175.

Custom recording console, 16x16, w/Spectronics components, Orban 111B w/dual reverb, 2 Gates 3-speed TT's & EV Sentry 100, \$1500/all. G Bender, Commercial Features, 3650 Washington, Indianapolis IN 46705. 317-926-5570.

Gates Stereo 80 w/manual, missing 1 meter, working when removed, \$800. R Lane, KTYD, 5360 Hellister, Santa Barbara CA 93111. 805-967-4511.

Electrodyn 16 in 16 out, 144 patch, full 16 trk monitor, includes 16 trk Scully M-100 R/P 2" machine w/remote, excel cond, \$12K for both. Mr. York, Jewel Recdg, POB 31078, Cincinnati OH 45231. 513-522-9336.

McMartin B502 mint cond, custom snake & breakout box, \$1000. B Mounjioy, Custom AV Svcs, POB G1240, Elizabethton TN 37644. 615-543-5849.

QRK Futura 10S stereo w/10 pots complete w/back-up console, circuit cards & new pots, BO; Harris Stereo 5, 5 pot, BO. T Low, Foster Comm, 115 W First Ave, San Angelo TX 76903. 915-653-3387.

Gates M-5526 Yard, mono w/pwr supply, gd cond, in service, \$225. D Sparano, WVCR, Rt 9, Loudonville NY 12211. 518-783-2990, call & leave message.

BE 8M 200 mono dual buss console, mint cond, Daven step attenuators, \$2500. B Mountjoy, Custom AV Svcs, POB G1240, Elizabethton TN 37644. 615-543-5849.

Collins 212T-1 audio control system, mint cond, w/manual, \$1200. R Sumner, CAVU Corp, 3351 Contessa Ct, Annandale VA 22003. 703-560-0233.

Tascam M-35 studio console, 8 inputs, talk-back, slate, cue, slate tone, 8 band EQ, separate controls for control room, studio, headphones, ideal for prod room or 8 trk facility, \$1250/BO. Mr. York, Jewel Recdg, POB 31078, Cincinnati OH 45231. 513-522-9336.

Want to Buy

Stereo prod board, 8 or 10 chan, gd cond, must be transparent. C Lamb, U of North Iowa, Cedar Falls IA 50614. 319-273-2774.

Tascam 15 or 16 modules. H Henson, Henson Prod, 4569 Havencrest Rd, Winston-Salem NC 27106. 919-924-8717.

Gates President, Executive or Diplomat. J Alexander, KARV, Box 190, Russellville AR 72801. 501-968-1184.

DISCO & SOUND EQUIP.

Want to Sell

Misc Items: Rek-O-Kut S-320 12" tone arm, \$10; AR mdl XB TT, \$30; Bogen SCW-80 sound column speaker, \$195; Denon PCC-1000 crosstalk canceller, \$195; (2) Quad full range electrostatic speakers, \$295. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Orban 111B stereo dual spring reverb, like new. Tommy Brown, Showtown USA, 7001 Mottie Rd, Gibsonton FL 33534. 800-367-7951.

Vanco MM-7, stereo/mono audio prod/disco mixer, 2 mic inputs w/pan, 2 TT inputs, 2 line-tape inputs, cue buss, \$100. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

E-V 12TRXB 3 way speaker, \$50. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40226. 502-239-1010.

Lexicon 224 wall programs loaded, \$2990. R Martens, Solid Sound, 1289 Dixboro, Ann Arbor MI 48105. 313-662-0667.

Misc Items: Shure SR-110 mon mixer, \$175; (2) Shure A102A 70 V xfrm, \$20; Ampex 503 AM/FM tuner, \$50; Ampex portable case for PR-10 & MX-10, \$55; Fisher MPX-200 multiplex adapter, \$25; Garrard Model T Mark II manual TT, \$15. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

dbx mdl 21, brand new, swap for KLH, Burwen, or SAE noise filter, working or not. E O'Brien, Outhouse Recdg, 3041 Crawford St, Terre Haute IN 47803. 812-238-9312.

Pye stereo compressor, discrete transistor design, late 60s vintage, spare parts, w/service manual. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Eventide flanger. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Masterroom reverbs mdl MR II, MR III, excel cond, \$250 & \$350. J Von Vleck, Vtech, 2833 Beechtree La, Woodbridge VA 22191. 703-221-6984.

BGW 10, mono 2-way electronic crossover, rack mount, EC w/manual, \$150. S Hofmann, Cameron Univ Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

ARP Odessey keyboard synthesizer, recently removed from service in gd cond, BO or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

Mobile disco w/Superscope mixer, BSR TTs, 800 W Heathkit amp, custom corner speakers, mirrored ball, black light, pin spots & color wheel, \$1500. J Lipski, Ind Engr, POB 1456, Lompoc CA 93438. 805-733-2726.

DX-8 mint, \$500; dbx 155 mint, \$300; MXR digital delay, \$250; Ursa Major digital reverb & echo, mint, \$850; Delta Lab DL-2 stereo delay & effects, mint, \$600. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Tapco amp, 260 W, Tapco 4400 reverb. Enter Sound PRV1 reverb, 6" eq rack on rollers, cheap, BO. D Marcum, Thin Man Prod, 3204 Bruce, Austin TX 78735. 512-892-4433.

6-chan snakes, 100' (2), \$1500/both. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

Lang PEQ 2 EQ's (2), \$1000 ea. A Pothemus, Excalibur Snd, 750 8th Ave, NY NY 10036. 212-302-9010.

Detalab 1024 ADM digital delay, \$175. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

dbx 150 NR unit, rack mounted, \$100. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

EMT 140 plate reverb system, solid-state w/on-board mdl 262 amps, w/manual, excel cond, \$1750/BO. JG Von Vleck, V-Tech, 2844 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Pultec EQP1A, \$2250. L Oliver, 212-874-0274/7660 (PM).

Quantec room simulator, like new, \$8000. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Lexicon M93 Prime Time digital delay, \$350/BO. M Fiedler, Mahoney Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0018.

EMT 140 stereo tube plate, \$3000/BO. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

AKG BX20E reverb, mint cond plus second unit for parts, \$990 firm. K Heyne, German Masterworks, 1301 45 Ave, San Fran CA 94122. 415-664-0163.

Quantum QM12P mixer, MicMix Super C. BO. L Olsen, Koss Comm, 4824 Fir Ln NW, Gig Harbor WA 98335. 206-858-7312.

MXR pitch & digital display transposer, like new, \$550. J Price, Price's Rcdg Svcs, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Master Room reverb units (2), one MR11, \$225 & one MR11, \$325. J VonVleck, V-Tech, 2844 Beechtree Ln, Woodbridge VA 22191. 703-221-6984.

Want to Buy

Klark Teknik DM360, any onboard equip. J Price, Price Rcdg Std, 2651 Globe, Dallas TX 75228. 214-321-6576.

McMartin B-910 or later models, also xmtrs, consoles. Charles Goodrich, Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

LIMITERS

Want to Sell

RCA tube type limiter, \$75. M Celenza, WROK, 64 Belmont Ave, Plainview NY 11803. 516-681-9535.

(Continued on page 36)

Distributor Directory

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

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EQUIPMENT EXCHANGE

SCRATCH & DENT

\$\$\$ SALE \$\$\$

ECHOES FROM THE BASEMENT

Greetings. The Allied Used Equipment Division is located in the basement of our former building in Richmond, Indiana, thus the title of this column. The response to our re-entry into the used equipment business has been gratifying, both from the availability standpoint and from the sales of what we hope is good used equipment at a fair price. We appreciate your interest and support, and remind you that we are here to assist you. If we don't have what you want we may be able to refer you to someone who does. We will try to help you locate any items we don't have. Remember also, we are your Allied source of service manuals and parts.

There are a number of items that we simply cannot purchase due to size or limited need. These include large transmitters and automation systems. However, we are interested in helping you move these items and welcome your listings and inquiries. We have been able to bring buyer and seller together in several cases to the satisfaction of both. There is no commission or charge for this service since we will expect to help both parties with other items in the future. So let us know what you have to dispose of and if we cannot take it off your hands, we may be able to help you move it on to other users.

Our general terms and conditions of sale remain as in the past. Our intent is to evaluate your used equipment, buy it at a fair price, and sell it at a small margin of profit. Call us for appraisals too, as we can help you determine a value for tax purposes, etc. You can also trade used for used, so call and let's talk it over. The direct line to the Used Equipment Exchange is **317-962-1471**.

We have an interest in buying or trading for the following items:

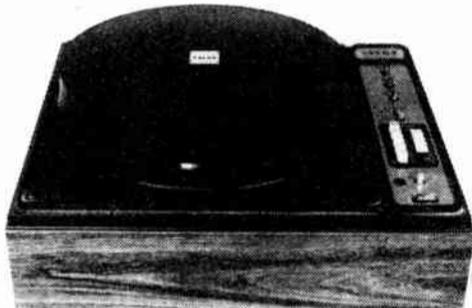
- Texar Audio Prisms
- Stereo consoles, especially 8 channels and up, solid-state
- Professional cassette decks such as Teac 122B, etc.
- Stereo cart machines of all types
- Mono cart machines of the Tapecaster and early Spotmaster variety
- Crown power amplifiers or equivalent
- FM transmitters, 1kw, 3kw, 10-15kw. We will try to bring buyer and seller together and may not buy directly but have people interested in these items.
- AM and FM Optimods
- Solid-state AM and FM modulation monitors
- STL systems, both mono and stereo
- Stereo reel recorders similar to Tascam, Otari, Revox
- Remote control systems, late model
- FM transmitters including a 20 or 30kw unit for a customer, needed in 6 months or so.
- Western Electric consoles, amplifiers, mixers, and other professional audio equipment. We cannot use transmitters but need the older audio items. Advise what you have and we will help turn this into cash for you.

AMPLIFIERS

DESCRIPTION	LIST	SALE
Bell 2418 Stereo Tube Amplifier, old, looks OK		15.00
BGW 320B Power Amp, excellent, slight bend on rack ears	979.00	595.00
Fisher 50C3 Mono Preamp, tube type, from 1950s vintage HiFi, fair condition		20.00

BACKGROUND MUSIC

Tape-Athon Motor for background music player, new	100.00	60.00
Turner-Muzak 450M Push-to-Talk Mic, new in box, 200 ohms, coil cord		15.00



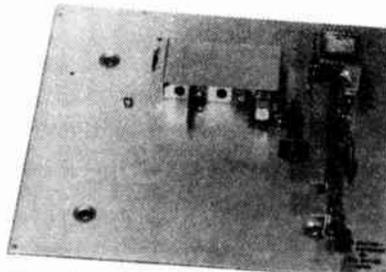
Telex 8-Track Changer, holds 12 cartridges, condition unknown 25.00

CARTRIDGE RECORDERS AND PLAYBACKS

Audicord TDS-1 Mono Twin Playback Deck, demo, no manual. Reduced	1499.00	995.00
Broadcast Electronics Cart Winder w/timer, works fine. 2 available	500.00	275.00ea.
Broadcast Electronics 505 Mono Playback Deck		395.00
Broadcast Electronics Cart Rack Pedestal for 8 wire rack stringers		35.00
Broadcast Electronics Rack Panels, 1 pair. Reduced	20.00ea.	10.00both
Broadcast Electronics Cart Labels:		
1000 sheets brown 900 sheets orange		
50 sheets purple 600 sheets yellow	per sheet	.15

Cartridge Equipment cont'd.

DESCRIPTION	LIST	SALE
Broadcast Electronics 303 Triple Mono Cart Deck, noisy motor, stop cue only, no side panels, o/w OK		495.00
Broadcast Electronics Cart Playback with manuals		895.00
Broadcast Electronics 505 Mono Cart Playback		295.00
Broadcast Electronics 505S Stereo Cart Playback		495.00
Assortment of Capitol Cart Parts:		
80 corner guide posts		
200 female screw sockets		
1 pkg. pad material	all for	3.00
Gates Criterion I Mono Cart Recorder with amplifier		595.00
ITC ESL-IV Splice Locator/Eraser		495.00
ITC 99BRPME Mono Record Play w/splice finder, new, discontinued. Reduced	4425.00	3750.00
Sonomag 792 Stereo Cart Recorder with manual		695.00
SMC 352 Stereo Carousel w/manual, less head assembly	3350.00	1495.00
Tapecaster X700RP, checked out, mono recorder		495.00
Tapecaster 700P Mono Playback, checked out		395.00
Telex Stereo Cart Recorder w/amp. Looks good, may need some work. No manual		395.00
Sparta Cart Playback, desk-top unit, looks OK		295.00



Viking 38 Mono Cart Playback Deck, new in box, for background music or similar use. Similar to Tapecaster deck or BE 500 Series deck, only 6 available 60.00ea

CASSETTE EQUIPMENT

DESCRIPTION	LIST	SALE
JVC CB4E Case for CD1636		10.00
Marantz CBC104/5 Case for C1-4 and C105 decks, new	25.00	7.00
NAD RC61 Remote Control, 4 available	60.00	10.00ea
Revox B710 Cassette Deck, new in factory box. Reduced, 2 available		1195.00ea



Tascam 234 Syncaset 4-track, 4-channel, 3/4 ips, as new w/manual	950.00	395.00
Technics RP9646 Cassette Machine Case		10.00
Technics RSB100 Cassette Deck, new in factory box w/book & warranty. Minor cosmetic damage, slight cracks in corners of display window & dent under cassette door. Replacement parts not available	850.00	495.00
Technics RSB100 Cassette Deck, warranty repaired, factory box	850.00	495.00

COMPACT DISC EQUIP.

Straight Wire CD-Que CD Player, working condition		495.00
Technics SL-P1200, new, factory repaired, minor cosmetic blemishes	1295.00	795.00
Technics SL-P10 CD Player, new in box, discontinued model	1000.00	695.00
Technics SL-P10 CD Player in box, may need work	1000.00	495.00

FURNITURE

Arrakis 4H x 5W Cart Rack, new. Reduced	81.00	50.00
MicroTrak L90 Cart Rack, new, 8 available. Reduced	94.50	50.00ea
Wire Rack Carousels for 500 carts, on floor base, 2 available		75.00ea

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OR
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EQUIPMENT EXCHANGE

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HEADSETS

DESCRIPTION	LIST	SALE
AKG K40 Headband, 3 available	5.00	3.00ea
AKG K140S Ear Cushions, new, 1 pair. Reduced		2.00pr
Beyer DT920.7 Conference Headset w/straight cord/plug, 2 pr. Reduced		30.00ea
Beyer WK100-5 5-ft. Coiled Cord w/connectors, new		15.00
Nurmark HM7000 Stereo Headset w/boom mic. Used by Allied salesman on the phone. Has a bad cord on one earpiece, o/w good condition	45.00	19.00
R Columbia C3H Mono Headset, 150 ohm, new in box	65.95	25.00
Sennheiser HZL26-3 Headset Cord less plug		6.00

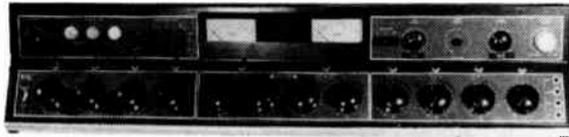
MICROPHONES AND ACCESSORIES

AKG D130E Mic, new dynamic omni w/stand adapter, warranty, instructions, no cable		50.00
AKG parts: 1 SA12-a 3 SA20-1 2 SA30 1 SA31	12.00ea	4.00ea
Atlas L02B Lock-On Connector, new, 7 available	12.20	6.50ea
Atlas PB2X Mic Boom, new, 2 available. Reduced	35.00ea	12.00ea
Audiotechnica AT803S Subminiature Condenser Lavalier Mic, new w/tie clip, pop filter, battery, instructions & warranty		55.00
Calrad 10-17 Hi-Z Mic on EV 423 stand, looks OK		12.00
EV 315A Windscreen, new, 2 available		7.00ea
EV 355A Windscreen, new		7.00
EV 360 Windscreen, new, 3 available		13.00ea
EV 423A Desk Stand, used, in box	17.80	10.00
EV RE16 Mic in case w/stand adapter, needs cleaning	296.00	150.00
EV C094 Lavalier Mic, new	153.60	175.00
Lafayette Ultra Miniature Electret Lavalier Condenser Mic w/case, instructions & accessories. Dual impedance		45.00
OCW Triple Mic Arm, missing parts	250.00	75.00
OCW M2MDRU 3-Section Arm, damaged, some bent braces, missing springs		20.00
OCW Triple Mic Arm, scratched, 3 available	250.00	100.00ea
OCW Clamp Base, gray, old style, scratched, 8 available		1.00ea
Realistic FM Wireless Mic Receiver only, looks OK, no mic. Frequency 48.83 MHz		12.00
Sescom MC325 Electret Lavalier Mic w/tie clip, looks OK, condition unknown		20.00
Shure 15' Mic Cable, XLR female to stripped & tinned, new		5.00
Shure 430 Commando Mic, no stand adapter or cable		12.00
Shure 450 Paging Mic, used, looks good	83.00	50.00
Shure 450 Paging Mic, new	83.00	60.00
Shure 570S Lavalier Mic in box w/accessories, used, looks OK	145.00	75.00
Shure 579SB Mic w/cable, adapter, bag, box. Looks good	88.00	50.00
Shure A59WS-BR Brown Windscreen, new		5.00
Sony ECM23F w/windscreen, noisy. Reduced	130.00	25.00
Sony ECM55B Electret Mic in case & box, no instructions, battery, or tie clip. Demo	260.00	150.00
Sony WRT-57 Wireless Mic w/built-in transmitter. Frequency 950.25MHz. New in case w/book & warranty	742.50	650.00
Voice of Music Hand Mic w/cable & phone plug, looks good		5.00
Mic cable, 15' black rubber w/XLR males		10.00
Mic cable, 25' Belden 8412 w/XLR M & F. 3 available		20.00ea

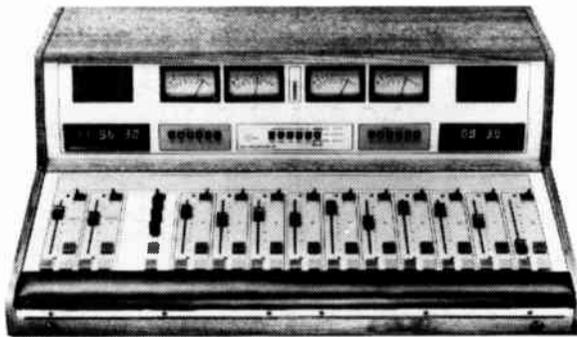
Microphones cont'd.

DESCRIPTION	LIST	SALE
Mic cable, 25' gray cable w/XLR M & F. Male damaged		10.00
Mic cable, 30' Belden 8412 w/XLR M & F installed		25.00
Mic cable, small gray cable w/XLR M & F installed		10.00
Shure SM18A Mics, used, 2 available		50.00ea

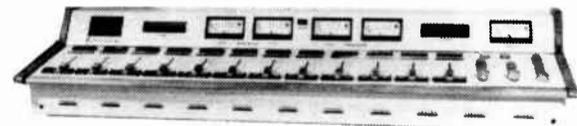
MIXERS, CONSOLES, ETC.



Altec 250T3 Console. 12-channel solid-state w/power supply. Good cond. 4 stereo channels, 8 for L-C-R. Center channel not complete. Manual missing but o/w complete. Cue amp & monitor amps not included as these are to be outboard rack mounted units. Pots & switching for cue & monitor built-in		795.00
Altec 1567A Tube Mixer w/XLRs, transformers, clean		295.00
Altec 1592A Mixer, missing parts		75.00
Altec 1592B Mixer, missing parts, 2 available		95.00ea
Altec 1599A Mixer Extenders, missing parts, 3 available		25.00ea
Altec 1603A Sequor Panel		50.00
Ampro Microtouch 5-Pot Stereo Console w/books, looks OK		695.00
Arrakis 2000SC-12S Console w/power supply, manual, box of spare parts	4695.00	3495.00
Auditronics PS-30 Power Supply, new. Reduced	800.00	450.00
Auditronics Parts:		
B14 Filler Panel, blue, 2 available	30.00	12.00ea
Meter Bezel		3.00
RY-2 Dual Relay Assembly	95.00	50.00
PEQ Module w/EQP card, new	460.00	235.00
201MLO Module, new, beige	280.00	135.00
110ACRM, loaner	584.00	295.00
110DIME Module, looks new, 2 avail.	600.00	295.00ea
Bogen CAM 4-Channel Mic Mixer		45.00
Broadcast Audio ES810 Console w/remote control. Avail. mid-July		4995.00



Howe 7512 12-Channel Slide Fader Console		3495.00
Howe 7012 12-Channel Rotary Fader Console		3495.00



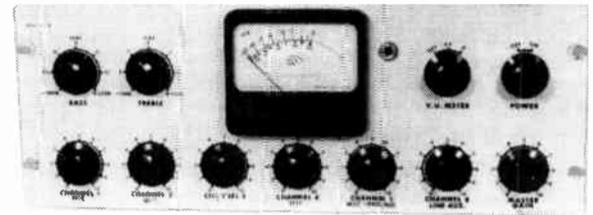
Logitek Perfectionist 12 Pot Slide Dual Stereo Console. Has timer, no clock has manual, spare parts	10,000.00	4995.00
LPB S13C Stereo 8 Pot Console		2495.00

We have accumulated a supply of receiving type tubes, condition unknown, which we can make grab bags out of. If you are operating any tube type equipment call us and order a tube bag. All grab bags are \$20.00 and we will guarantee at least \$50.00 worth of equipment or parts in this assortment. Call us and we will send a grab bag to you.

Mixers & Consoles cont'd.



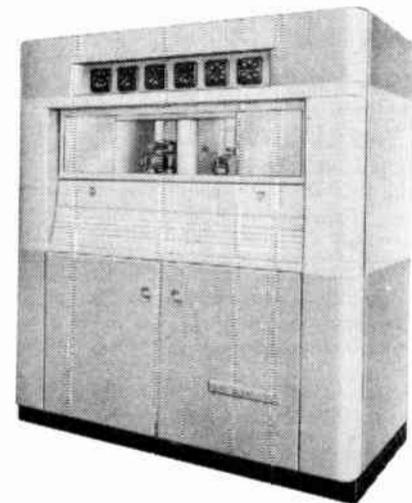
DESCRIPTION	LIST	SALE
MicroTrak Sport III Remote Amplifier, very nice		395.00
Numark DM1800 Mixers, 2 available	639.00	395.00ea
Shure FP42 Stereo Mixer w/rack mount	700.00	495.00
Shure M68 Mic Mixers, look good, 2 available		75.00ea
Sparta AS-30 5 Pot Dual Mono Console, some modifications		495.00



Grommes G5M 6-Channel Tube Type Mixer, mono w/VU meter, tone controls, 600 ohm output. Rack mount, checked out		75.00
--	--	-------

NEED SERVICE MANUALS???

Our listing last time of service manuals resulted in the sale of many of them and a large number of satisfied customers who improved their technical libraries. We can still supply a number of manuals, but don't feel it necessary to list them all this trip. Call us and we will be able to tell you what is available and what the price is. A number of folks have kindly sent us manuals for our files, and we now have a complete book on a Westinghouse FM-3 3KW FM transmitter dated September 1948. This rig had one cabinet measuring 34" deep, 66" wide and 74" high. A blue glass door in the front let the engineer see the tubes. This manual was courtesy of WRSW in Warsaw, Indiana, and it may help someone out who has one of these monsters.



We have a number of customers with automation systems and components for sale. We will be glad to review the lists with you and put you in direct contact with the owner so you can make your own deal. We ask nothing for this service other than your continued good will and hope to serve you directly in the near future. Call us for your automation needs.

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317-962-1471

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MISC. ODDS & ENDS

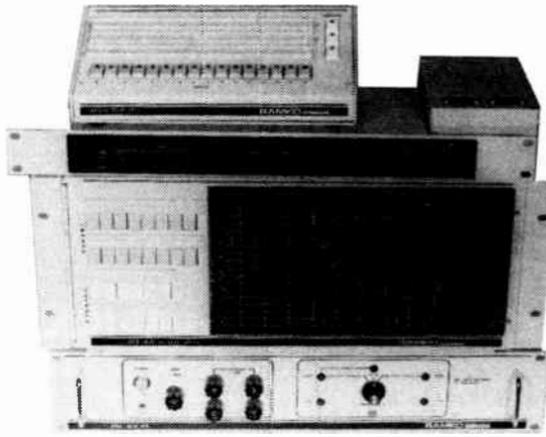
Some of this stuff has been here about long enough, so if you have any interest call 317-962-1471 and let's see if we can't get together.

DESCRIPTION	LIST	SALE
Aiphone MC3 Intercom Station, new in box	69.95	25.00
Audiscan Slide Advance Tone Generator		45.00
Belden 8228 75 ohm Coax, new:		
30 foot length	7.50	4.00
20 foot length	5.00	3.00
175 foot length	43.75	30.00
Caterpillar Diesel Generating Set, 50 kw, 170 hrs. on plant. 3-phase, 240/120 volt, excellent condition. Located in southwest Ohio		7995.00
Cornell On-Air Light, red, lettering removed, 2 available		5.00ea
DBX RM-18-2 Rack Mount, new		10.00
ESE Option D Remote Panels for 510 timer. 3 available	34.00	12.00ea
ESE ES1302 Timer Controller w/manual, new condition	1804.00	1395.00
Filmagic Head Cleaner/Lube Kit, 1/2 oz. each, 4 available		1.00ea
Filmagic Head Lube, 1/2 oz., 4 available		.50ea
General Time R621-096 15-min. Cycle Timer, new in original box, 13 avail. All for 35.00		4.00ea
Hercules/General Electric 20 kw Standby Plant, single phase, 240/120 volt. Located in southwest Ohio		3295.00
JVC BH140E Rack Handle Set		5.00
Kleinschmidt Teletype Terminals, 3 available. Reduced		25.00ea
McClure Filmstrip Projector w/disc playback system, in case, looks excellent		25.00
McPhibben Flat Wall Mount On-Air Fixture, not perfect. Lens extra, 2 avail.	66.00	25.00ea
Midland Head Demagnetizer, used		3.00
NAD MH20 Rack Mount, used	20.00	5.00
Nortronics Items:		
PF710 Height/Zenith Gauge		5.00
2010 Head	76.40	40.00
9111 Head	110.00	55.00
QK87	15.30	7.00
OK Tool ST100 Wire Stripper. Reduced		10.00
Okisoft Tiny Drafter Computer Software, new, for Apple II, 2 avail. Reduced		35.00ea
Pelco VS506 Video Sequencer, used		50.00
Potomac AT51 Test Set, almost new, factory packing		2895.00
Robins TS-71 Tape Splicer, used little, in box w/instructions		5.00
Robins Heavy Duty Tape Splicer w/spare cutter & cutter pads, well used but serviceable		5.00
Sony 7MR9 Wireless Mic Batteries, 500 available. Reduced	6.60	2.20ea
Sony SL2710 Betamax HiFi VCR in box w/cables & remote control. Looks fine, seems to work OK		295.00
Soundolier Rack, repossessed, new, scratched. Reduced	308.00	225.00
Soundolier 540-70 Side Panel. Reduced	157.00	75.00
Soundolier 542-77 Door. Reduced	203.00	95.00
Tosy TE150 Degausser, table top		12.00
Tracker I Satellite Positioner, new	695.00	495.00

Just got in a huge load of miscellaneous trash which we are still sorting out as we go to press. Looks like we have a supply of VU meters, transformers, telephone key switches, attenuators and other useful stuff. With no inventory available yet, we don't know what we have, but call with your needs. We will probably have an idea by the time you get this flyer and can help you make a decision. Prices are cheap so help us help you save money!

PATCH AND SWITCHING SYSTEMS

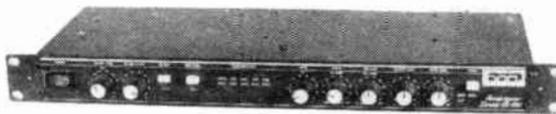
DESCRIPTION	LIST	SALE
ADC PJ731 Jack Strip less jacks, new	37.15	15.00



Ramko ARA1612 Audio Routing Switcher w/dual power supply, SSM3R metering, remote control, line filter. Good condition, has 3 output cards, others available. 16 stereo/8 mono in, 12 stereo/mono out		995.00
Ramko ARA1612 Audio Routing Switcher as above but less some accessories		895.00
Ramko ARA1612 Switcher w/power supply, 12 output cards		495.00

PROCESSING EQUIPMENT

Audio Design/Recording Complex II Compressor/Limiter/Expander, demo, 2 available	990.00	695.00ea
Aphex Studio Dominator, used, looks fine	1195.00	850.00
Aphex Compellor, stereo, used, looks fine, 2 available	1195.00	795.00ea
Aphex Aural Exciter II, 3 available in various conditions and prices	2495.00	1950.00 & down
CRL APP300 Compressor, used, XLR in/out, 2 available		250.00ea
DBX 3BX-R Remote Control	95.00	25.00



DOD Compressor/Limiter/De-esser #R825. Looks fine, has manual & schematic		250.00
Fisher Space Expander Tube/Spring Reverb, old but good		50.00
Gates Solid Statesman AGC Amplifier, 2 available		95.00ea
Gates Solid Statesman Limiter Amplifiers, 2 available		95.00ea
Gregg Labs 2530 Processors, look very good, 2 available		895.00ea
Grommes G12-T 6-Channel Bass-Treble Equalizer		50.00



Howe Dual Phase Chasers, 2 available		495.00ea
Mic-Mix XL210 Reverb, demo. Reduced	750.00	325.00
Orban 621A Equalizer, used		395.00
Orban 424A Equalizer		595.00
Orban 9100A-2 Stereo AM Optimod, Motorola system, w/day-night card		3995.00
Orban 245 Stereo Synthesizer, used, no book	399.00	295.00
Studio Technologies RCU-1	1200.00	995.00
UREI 532 Graphic Equalizer, mono, rack mount	396.00	195.00
UREI 535 Graphic Equalizer	546.00	395.00
Valley People PR2/812H Maxi-Que. Reduced	569.00	395.00
Valley People Kepex II, new	420.00	295.00

REEL-TO-REEL EQUIP.

DESCRIPTION	LIST	SALE
Ampex 354 2-Channel Tube Type Record Playback Machine, good cond.		695.00
Ampex 4590004-20 Motor for 600 Series, new	145.00	75.00
Ampex ATR700 Rack Rails, 1 pr., new	35.00	10.00
Audiotex Head Demagnetizer		15.00
Electro Sound A2 Roller Kit for Scully, 3 available		20.00ea
Electro Sound Assorted Hubs, Plates, Wrenches		2.00
Otari ARS1000DC Reproducers, checked out. Several available	1850.00	995.00ea
Otari MX5050-S Rack Mount for older machine		20.00
Otari ZA53E MTR-10 Conversion Kit, 2 available. Reduced	600.00	295.00ea
Otari MTR-10 Low Profile Conversion Kit, 2 available		100.00ea
Revox A77 Recorders, coming in. 4 available, checked out. Will sell as is for less but don't know exactly how as-is they are.		995.00
Revox B-77 Quarter Track, 2 available		1195.00ea
Revox B-77 Half Track		1195.00
Revox PR99 Half Track		1395.00
Revox PR99 Rack Brackets w/screws		5.00
Revox 34502 Portable Case for PR99, new	395.00	295.00
Revox B77 in cabinet, 3 3/4-7.5 ips, demo		1495.00
Scully 280-2 Stereo, unmounted w/manual & spare parts		695.00
Scully 280B-2 in console w/manual, excellent. Located in Minnesota		2295.00
Scully 280B-2 in console, w/manual, looks fine		1495.00



Teac 3340S 4-Track, 4-Channel, 1/4 Recorder, excellent	1100.00	695.00
Teac RM35 Rack Mount, 2 available	50.00	25.00ea
Viking 2-Channel Duplicator, 10 reel, 9 cassette slaves w/cabinets & manuals. Reduced		2500.00
Magnecord 1021 Mono Full Track Rack Mount Recorder, looks fine		295.00

REMOTE CONTROL EQUIP.

MicroControls System DCT9-DLC9. Reduced	2750.00	595.00
TFT 7630 Telemetry Expander, 20 channel		695.00

RPU & 2-WAY EQUIPMENT

Antenna Specialists ASPC1652 Trunk Lid Mobile Antenna, new, 494-512MHz	55.00	35.00
Decibel DB436 Beam Antenna, 450-470MHz, broadband, new in box	154.00	125.00
HFV110 FM Receiving Antenna, beam type, new		50.00
Marti Ring Antennas for 450MHz, 2 avail.		25.00ea

We have a huge pile of parts and junk at giveaway prices. Meters, step attenuators, tubes, switches, knobs, and so on. We can't be too selective due to the prices but if you want to restock your junk box, call us and we will make you one whale of a deal.

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RF EQUIPMENT

DESCRIPTION	LIST	SALE
BE FS30 Stereo Generator, nice cond.	2495.00	1295.00
Belar RFA1 RF Amplifier, frequency 105.1MHz. Looks excellent, no book	575.00	395.00
Belar RFA2 AM RF Amplifier, 1430kHz, with book, looks good		295.00
Bird 4712-010 Coupling Kit, new	45.00	25.00
Bird Elements, new:		
100D 100W, 200-500MHz		25.00
250-2 2.5W, 250-450MHz		35.00
3000B1 3000W, 50-125MHz		25.00
Catel FMX2100 FM Mono Cable Modulator on 101.1MHz. Has book, looks to be in fine condition. Requires outside power supply. 2 available		395.00ea
Harris MS15 Stereo Generator, looks excellent		795.00
Two Circuit Lighting Choke, looks new		150.00
Modulation Associates 2-Channel Demodulator	1500.00	695.00
Modulation Associates 1-Channel Demodulator	1000.00	495.00
Moseley SCG9 Stereo Generator, used, no manual, looks fine	2095.00	1695.00
Nems-Clarke 120E Field Strength Meter, very good condition		895.00
Potomac FIM41 Field Strength Meter with manual		1695.00
Potomac FIM71 Field Strength Meter with manual		2795.00
Potomac Telescoping Antenna for ANT11 & PA11		4.00

SPEAKERS AND ACCESSORIES, ETC.

AKG KM195 Speaker Stand, new in carton	130.00	75.00
AKG KM195 Speaker Stand out of carton, missing mounting plate	130.00	65.00
Altec 402 Driver Voice Coil/Diaphragm, new		15.00
Atlas TK1 70-25V Line Transformer, new	43.60	15.00
Audio Pulse Speaker System, walnut cabinet		25.00
EV SRB7 Rack Mount, for Sentry 100, new	25.00	15.00
EV TR30-2 25V Transformer, new in box	15.20	9.00
EV 72009 Grille for Sentry V		25.00
EV SEQ Equalizer for Sentry III, 2 available	109.00	45.00ea
EV Sentry 100A Monitor, new in box, scratched	255.00	175.00
JBL T105 Automotive Speakers, new, 4 pair available		45.00pr
JBL 2123H Driver Unit, new	150.00	100.00
JBL D16R 2440 Diaphragm/Voice Coil, 4 available	102.00	65.00ea
Klipsch AA Crossover for 3-way system		50.00
Klipsch K55 Midrange Horn Driver for La Scala system		35.00
Panasonic EAS15KM025A Speaker, 2 available		15.00ea
Panasonic EAS30PL015 Speaker, 2 available		15.00ea
Shure 90A2650 Driver Unit, new, shelfworn		10.00
University Reflex Driver Unit, condition unknown		20.00

We are trying to arrange the purchase of a large pile of equipment including several RCA solid state cart machines, ITC machines, both cart and reel, RCA consoles, RCA amplifiers, and so on. If any of this interests you, call and we will try to keep you advised. Also, we have received a batch of electronic junk from a college including test gear, tape recorders and other items at very low prices for those who like to tinker or experiment. Call for details.

TAPE, CARTRIDGES, MAGNETIC RECORDING MEDIA

DESCRIPTION	LIST	SALE
Fidelipac 140 Carts, 140 sec., new, discontinued, 18 available	5.10	3.50ea
Fidelipac 380 Carts, 140 sec., new, discontinued, 10 available	6.10	4.25ea
Quantity of slightly used Fidelipac 140 Carts, a few reloads, but clean with only 1 label on some:		
28 20 sec.; 72 40 sec.; 80 70 sec.; 9 100 sec.		
28 2.5 min.; 345 3.5 min.; 56 4.0 min.; 2 4.5 min.; 934 5.5 min.; 3 10.0 min.		
Price ea. regardless of length or quantity		1.00
Scotch 206 1/4 2500 RN, new, discontinued, 2 available		12.00ea
RCA 1.0 3600 ft. Pancakes of new tape in boxes, bulk packed, 10 hubs to a box. May be lubricated for cart use, we don't know		20.00 per box
Audiotape 2571R 2500 ft. 1 1/2 mil Mylar Tape on reels in sealed boxes, brand new		2.00ea
Gentner SPH-4 demo, no manual, in factory box	769.00	595.00
Scotch 177 1/4 3600RN, new, 10 avail.		12.00ea
Scotch 217 1/4 2500PR7 Reload Tape, 7" reel, 11 available. Reduced		8.00ea
Scotch 62 1/4 1500 White Plastic Leader Tape, 12 available. Reduced		7.50ea
Sony LC60SLH Cassette, 12 available. Reduced		.50ea
Aluminum Reel Flanges only, 42 10 1/2"		all for 20.00

TELEPHONE EQUIPMENT

Audiocom TC100 Telco Coupler with manual, looks new. Reduced	1023.00	395.00
Comrex SLX, looks new, books, demo. Reduced	3750.00	2895.00
Elgin ESC20721 1 Coupler w/connector, demo, scratched	237.00	180.00
Elgin ERC19522 21 Coupler, slightly bent cover, wiring harness needs minor repair	302.00	150.00
Gentner Telemix 9 Copy Holder, 4 avail.		5.00ea
Hy-tek Autodialer, 40 numbers, used		25.00
Rixon T150BR Passive Coupler, 2 avail.		15.00ea
Tellabs 4018A 8 out DA, 150 ohm, 11 available. Reduced		95.00ea
Western Electric Ringer w/loudness control & modular jack		7.50

TIME DELAY EQUIPMENT



Eventide BD955 Delay System, 3.2 second 15kHz, w/manual. Looks very good but not tested 3350.00 1495.00

TRANSMISSION LINE & ACCESSORIES

Andrew 12 ft. LDF450. Reduced	1.73/ft	6.00all
Andrew 12 ft. 1/2" Helix, no jacket. Reduced	1.50/ft	4.00all
Andrew 48822, 8 ft. 3/8" Helix w/PL259 connectors, new, 2 available. Reduced	35.00	12.00ea
Cablewave 412221 Burial Splice Kit	42.30	25.00
Cablewave Miscellaneous:		
920396 7/8 Hanger Kit, 6 available	42.70	30.00ea
738828 7/8 N Connector, 2 available	70.00	55.00ea
2 inch 4000 lb. gauge	11.50	7.00
Cablewave FLC1250J, 25 ft. piece	1.60	20.00all

TURNTABLES AND ACCESSORIES

DESCRIPTION	LIST	SALE
A-line Turntable Tops, walnut, cut for Technics SP15 and Audiotechnica ATP-12T. For covering holes left by older turntables. 2 available		25.00ea
Allied Charlie Base, cut for Technics SP15, not drilled for arm, new, shelfworn		20.00
Empire 208 Belt Drive Turntable, 33 1/3 rpm, missing belt. Has arm, base, stereo preamp		50.00
Euphonics PS-15 Power Source for U-15 series phone cartridges		25.00



Garrard 82 Turntable, automatic, w/Shure M55E cartridge		65.00
Gates CB77 Turntable w/Microtrak arm, looks fine, 2 available		125.00ea
GE DR-7 Stylus for VR-1000-7 cartridge, new, 8 available		4.00ea
GE VR-1000-7 Stereo Cartridge, new in box, 3 available		10.00ea
Nitty Gritty Record Cleaning Fluid, 4 oz. bottle, 2 available		.50ea
Russco Studio Pro Turntable, looks good, no arm, switch handle gone		165.00
Russco Studio Pro Turntable with Microtrak arm & Stanton cartridge. Dirty, needs cleanup but complete. Felt worn but not too bad		195.00
Shure M92E Cartridge, new, 8 available	29.95	10.00ea
Shure N44E Stylus, 1 new, 1 slight use	27.95	15.00both
Shure N77 Stylus, new, 2 available	31.95	15.00ea
Shure N91E Stylus, new	31.95	15.00
Sound Guard Stylus Care Kit, looks new, little use		2.50
Straight Wire PH2B Preamp, rack mount, no book, scratched	395.00	225.00
Technics EQA500 Arm Mounting Ring		5.00
Technics SP10MKIII Turntable, repaired under warranty	1850.00	1195.00

LATE EDITIONS

TOO LATE TO CLASSIFY PROPERLY, BUT STILL NICE BUYS

Broadcast Electronics 4M50 Console, carbon pots, nice sm. size		
McMartin B502 5-Channel Stereo with input cable bundle		
Shure M67 Professional Mixers, 2 available		
RCA WP33A Jack Panels, used, cleaned up, 2 available		
2 Ramko PR-2 Power Remote Controllers		20.00ea
McMartin B200B Phono Preamp		20.00
McMartin B-502 Console		895.00
Harris Stereo Statesman		1495.00
BE 8M250 Mono Console		1795.00
Several Shure SM67s		
BE 4M50 Console		
A couple of Tektronix type 507 Surge-Test Scopes with power supplies. Look fine, cheap at		75.00ea

We believe that we will have some nice used Telemix IX units available in about 30 days or so. These will be out of a major market station and will have remote control panels included. Pricing and exact availability not yet determined, but if interested, contact us as the quantity will be limited. We will want to put you on the list.

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Broadcast Equipment Exchange

From p. 31, LIMITERS . . . WTS

Kahn SP58-1A, Symmetra-Peak, \$95; Allison Research Kepex 500 (2) & Gain Brains (2) w/PS, \$250 per module; Outer Ear Inc processor, \$1500; Comex 675 II Bleepmate program audio dump, \$1000. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Orban 8100A FM Optimod, K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

Orban 8000A, vgc w/manual & some factory spare parts, \$1750/BO. R Scott, RSS Leasing, 1210 Crenshaw, Eugene OR 97401. 503-343-0118.

Marti CLA-40H AM/FM limiters, vgc, (2), \$200 ea or \$300/both, or BO. 203-357-7847.

Orban 9000A, \$2000. G Smith, WDUN, POB 10, Gainesville GA 30503. 404-532-9921.

UREI LA5, similar to LA4, w/rack mt, \$250. E Helvey, Ed Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Orban 8000A, \$700. R McKay, KXRB, 3205 S Meadow, Sioux Falls SD. 605-361-0300.

CRL APP400 audio prep proc, SEP400A 4 band unit, PMC300A peak mod controller, avail in Aug, in use 5 yrs, working, BO. J Hill, WPTW, 1625 Covington Ave, Piqua OH 45356. 513-773-3513.

EASY NRSC

A "post-processor" for REAL AM Improvement! Simply connect it between your existing limiter and the transmitter for "protected" pre-emphasis and overshoot-controlled lowpass filtering to NRSC specs.

Inovonics
SANTA CRUZ, CA (408) 458-0552

Harris MSP-90 AGC stereo \$900. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

CRL SMP-800 excel cond, \$1000; CRL SPP-800, excel cond, \$1000; CRL APP-400, excel cond, \$800. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Aphex Compellor, like new T Jordan, WFNC, POB 35297, Fayetteville NC 28303 919-864-5222.

UREI 1178 6 mos old, perfect cond, \$600. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Harris MSP-90 FM limiter stereo, \$900. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

Valley People rack w/(3) Gain Brains II, (1) Maxi O parametric, mint, \$1000. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Collins 26U-2 comp-lim, excel cond, \$300/BO/trade. J Schloss, KICD, 2600 Hwy Blvd, Spencer IA 51301. 712-262-1240.

CBS 4000A AM Volumax, \$200. R Lane, Mtn Prod, POB 460294, Aurora CO 80015. 303-699-7482.

Orban Optimod 9000A, \$2500/BO. R Fritsch, KDOK, POB 6340, Tyler TX 75711. 214-593-2519.

Dorrough 310 (3), \$900 ea. T Pless, PCA Comm Corp, Dundalk Prof Bldg #407, Baltimore MD 21222. 301-522-6710.

CRL SMC600A stereo/limiter w/manual, \$200; Shure MG2V Levelock, new w/manual, \$75. B Spitzer, KKLS, POB 460, Rapid City SD 57701. 605-343-6161.

CBS 411 FM Volumax tested, fully operational, excel cond, w/manual, \$300 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

EMT PDM 156 limiter, compressor, expander, \$2500. E Sanders, 7th St Snd, 688 S Santa Fe #105, LA CA 90021. 213-627-5392.

UREI LA-4 compressor/limiter, gd cond, \$450. S Angrum, WTMX. 317-545-8100.

Gates dual limiters, \$150 ea. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming WI 49509. 616-532-1168.

Inovonics MAP II, mint cond, \$650. B Kramer, WQXO, Box 3176, Longwood FL 32779. 305-682-5463.

CBS Audiomax limiter, works fine, \$200; CBS 4450A stereo Audiomax, works fine, \$400. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Altec 438A/436C compressor line amps, (2) 438A, (1) 436C, mike in, \$125 ea. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Dorrough 610 digital tri-band processor, \$2100/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

RCA BA6A tube limiter, \$500. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Optimod 9100 stereo, in service, 2 yrs old, works fine, \$5000. Eng Dept, POB 3131, Modesto CA 95353. 209-523-7756.

Fairchild Conax 600 mono, \$275; Gates Stay-Well M5167, \$250. L Oliver, 212-874-0274/7660 (PM).

Audimax 2RZ AGC, \$150. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming WI 49509. 616-532-1168.

Inovonics MAPII, \$500. W Vos, KYJR, POB 79, Wenatchee WA 98801. 509-663-5186.

Gates M6629 Solid Statesman AGC (3), \$100 ea plus ship. J Shepard, Globe Prod, 539 Westminster Ln, Salem VA 24153. 703-389-1670.

CBS Labs 410 FM Volumax & 444 FM Audiomax w/manuals, \$125 ea or \$225 for both, you ship. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

UREI LA3A (2), excel cond, BO. R Kaufman, Solid Gold Time Machine, POB 29804, Atlanta GA 30359. 404-636-9911.

Gates Solid Statesman AGC, mono, \$150; CBS Volumax 410 FM limiter, mono, \$200. R Dieterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

CBS Model 444 Audimax III, gd cond, \$125. R Sumner, CAVU Corp, 3351 Contessa Ct, Annandale VA 22003. 703-560-0233.

Want to Buy
Orban FM Optimod gd working used unit. J Young, WYTM, POB 717, Fayetteville TN 37334. 615-433-1531.

UREI/Teletronics LA-2A or Fairchild tube limiters. R Bledsoe, Bledsoe Assoc, 118 Stephanie Pl, Goodlettsville TN 37072. 615-859-4189.

Audimax CBS 4450, stereo. D Proctor, WCPE, POB 828, Wake Forest NC 27587. 919-556-5178.

RCA BA45 & BA43 manual for both units. M Salvaggio, MFS Prod Svcs, 417 Lauback St, Hellertown PA 18055. 215-838-9274.

MICROPHONES

Want to Sell
Panasonic WM1300, 1500 & 1600 series bdc-grad assortment. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.
Schoeps MK-3 (2) omnidirectional capsules, \$195; Sony ECM-989 stereo mic system, \$275; Neumann SM-69 stereo mic system, \$1695; (2) Neumann EA-47 elastic suspension for Neumann U 47let, \$85; Neumann Z-240 M-S stereo matrix xlmr, \$395/pr. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.
Shure 300 (2) ribbon bidirectional mics, \$115; Sennheiser MKH 416 P48 shotgun mic, \$525; Shure 50AC telephone coupler mic, \$20; Neumann N48K AC PS, \$250. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.
Crowm PZM (2) lavalier mics, mint cond, never used. S Pizzi, Connie Goldman Prod, 3034 M St NW, Wash DC 20007. 202-822-2483.
Superscope EC12B (6) electret condensor, lapel mics, gd cond, \$22 ea/all 6 for \$120. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.
Neumann U47, \$800. E Luciani, Natl Rec, 460 W 42nd St, NY NY 10036. 212-279-2000.
E-V RE-16 w/holder, windscreen & metal case, vgc, \$125 plus ship. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.
Neumann U47 power supply & stand, \$3250. L Oliver, 212-874-0274/7660 (PM).
E-V CO90 (5) lavaliers, BO. C Springer, KLMR, POB 890, Lamar CO 81052. 303-336-2206.
RCA 77-DX (3) in superb cond, restored to excel orig cond both cosmetically & in performance, \$375 ea plus ship. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-1370.
Altec (WE) lip stick condensers (3) w/cable & holder & amp, \$150 ea. SA Cisler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.
Altec 21B Coke Bottle tube mic w/electr complete, gd cond, not working, \$150. N Carlson, Mobile Snd Group, 721 W Melrose, Chicago IL 60657. 312-871-7459.
Senn Binaural mic. R Sanchez, KUCV, Lincoln NE. 402-486-2520.
Neumann U67 w/PS, new tube & capsule, immaculate, \$1500. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

AKG C414EB, \$450. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

E-V 635 w/stand clamp, gd cond, \$50. S Holmann, Cameron Univ Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Sennheiser binaural rec system, new, BO. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.
Turner 4500 mobile (2) never used, \$40 ea. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.
RCA 44DX cclectors item, \$200. D Gurdry, Sound Concepts, 1113 Jackson St, Alexandria LA 71301. 318-473-4170.

Want to Buy

Shure SMSB, Sennheiser 441. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Bdct mics w/station call letters or network insignia, does not have to be in working cond. N Carlson, Mobile Snd Group, 721 W Melrose, Chicago IL 60657. 312-871-7459.

Sennheiser MZA-16-P48U shotgun, plus MKH816-P48U. G Warren, Warren Tech Svcs, 3715 N Lakewood, Chicago IL 60613. 312-327-4785.

MISCELLANEOUS

Want to Sell

Trompeter J13-75 gold video jacks & other series jacks, call for list. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Wholesale battery prices to broadcasters. Duracell, Ray-O-Vac, Panasonic, etc. as low as 15¢ ea. P Plank, Phil Plank Distributing, PO Box 1401, LaWuinta CA 92253. 619-564-4065.

Gates/Harris plate transformer for BC5P2 5 kW AM xmr, sell or trade, gd cond. C Freinwald, KNBQ, POB 11000, Tacoma WA 98411. 206-383-9700.

ITT 14 phone interoffice comm system w/amps, \$475 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Patch panels (25), tip ring, sleeve, normalled top to bottom, 3 dbl rows of 12 pairs or 24 single jacks, ideal for stereo, wire wrap, \$50, solder type \$35 plus ship, all in vgc. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Radio Shack 64K color computer & TP-10 40 column printer, w/word processing program, \$150 plus ship. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Jack strip, 52 RTS, dbl closed-circuit jacks, all grounds normalled, gd cond, \$100; UTC xfmrs: A21 500/500 ohms, A22 50,200,500/50,200,500 ohms, A24 15K/500,333,200,125.50 ohm, A39 600,150/2K,500 ohms, \$20 ea/all 6 for \$100; UTC A33 20 dB magnetic shields, \$10 for both; (2) EV 502 line xfmrs, \$12.50 ea/\$20 for both; Shure AB6A line xlmr, \$12.50. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Record-A-Call 560, not remoted, vgc, \$60 ea plus ship; CC BRA telco answering unit, new, never used, \$70 plus ship. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Centronic 588 132 column printer w/serial interface & manuals, \$100 plus ship. R Kerbaway, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

ASR-33T send & receive teletype w/punch tape maker/reader, numerous rolls of paper, punch tape, ribbons, worked when removed last year; 3M Secretary, Alpha II photocopier, needs work, BO. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Elgin ERC 19522-1 telco answering machine, like new, BO. M Edwards, KSP, Box 137, Maple Glen PA 19002.

Extel AL weather reporter w/stand, Nat'l WX Svc over phone-lines, \$1200. B Surratt, Charlottesville Bdct Corp, 501 E Main, Charlottesville VA 22901. 804-977-3030.

Equip cabinet, 22" x 24" x 83" w/19" rack, rails in front & rear, complete w/rear door, \$100. R Elm, WWJC, 1120 E McCuen, Duluth MN 55808. 218-626-2585.

Elgin ERC-19522-2 telco answering unit, for PD listen line or for use w/cart machine PB, BO or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

Amertran 5 VAC CT transformer, 12 kv test, single phase, 230 VAC primary, \$25 ea. R Elm, WWJC, 1120 E McCuen, Duluth MN 55808. 218-626-2585.

EF Johnson 50 W xmr sockets, all gd cond, \$2 ea. R Elm, WWJC, 1120 E McCuen, Duluth MN 55808. 218-626-2585.

RCA transformers used to power filament to 892R xmt tubes, \$75. R Elm, WWJC, 1120 E McCuen, Duluth MN 55808. 218-626-2585.

Metrotele MT-911G telco repairman's handset, tone or pulse, new, \$150. B Spitzer, KKLS, POB 460, Rapid City SD 57701. 605-343-6161.

Tape-A-Thon Librarian background music player, w/(2) 10.5" decks, intersperser & 40 W line/monitor amp. R Wiles, 9421 Ballentine, Overland Park KS 66214. 913-541-9674.

Amperex 9500, heavy duty bulk tape eraser, handles up to 2" video, \$100 ea (2); Plastic 16mm film shipping cases in colors, \$1 for 12" or \$75 for 10" in lots of 10; Antique rare WE 3 stage audio, circa 1922, one tube, excel, \$200. SA Cisler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Rainbow equip case. R Sanchez, KUCV, Lincoln NE. 402-486-2520.

Otari 5050B MR5A021 capstan motor, w/PC board, rebuilt by Otari, \$125; Ampex 440 No. 020274-01 4 trk power supply, BO. R Rhodes, Rhodes Music, Box 1550 Radio City Sta, NY NY 10101. 212-245-5045.

Star, misc sizes of Star equip/shipping cases, BO. J Johnson, Interand Corp, 3200 W Peterson, Chicago IL 60659. 312-478-1700.

Rainbow case 2'9" x 2' x 2' insert rack mount incl, \$300/BO. R Sanchez, Lincoln Fine Arts Radio, 3800 S 48th St, Lincoln NE 68506. 402-486-2520.

Recortec tape evaluators, 1", 2" & 3/4", several of ea. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Soundolier 300-61 relay racks, (2), white, \$175 ea. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Standard Electric 60S 60-min electric timers w/mech & elect reset (2), \$30 ea; Lyrec TIM-4 high speed rewind or fast forward tape timers for Ampex or Scully recorders, gd cond (2), \$50 ea; API 361 3.5" VU meters (4), \$30 ea. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

CBS network alert receiver, \$450. B Mountjoy, Custom A/V Svcs, POB G1240, Elizabethton TN 37644. 615-543-5849.

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PO Box 1214
Falls Church VA 22041
for availabilities.
Phone 800-336-3045.

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, 13 yrs exp, AM, DA, FM, STL, automation, construction. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-1.

CE, hard working, looking for FT position w/growing company, well qual, 10 yrs exp, will consider announcer w/country station. interested in KS, CO, MO, NE, OK, TX & IA. Larry, 402-461-3528.

Seeking staff/assist eng position, 8 yrs bdct exper, FCC genrl, SBE cert, So. Cal area. Call Mark, 818-447-2544.

Former CE has motor home, will travel to your location for vacation relief, construction completion, field strength surveys, etc. B Fargo. POB 24946, Denver CO 80224-0946.

Dedicated, hard working, 10 yrs in P3, MD, OM, PD exp, degree, refs, super prod, AOR, AC, CHR, want to move up. J Turley, KDXR, Box 1478, Borger TX 79007. 806-273-7576.

CE seeks work, eng 2 college stations, NBN, HBO MDS CE NYC, CET, FCC licensed & certified, NABER, NARTE & ISCT member. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Desire position maintaining mostly xmtrs, V or U, microwave & translators, well exper, prefer West. Paul, 916-674-3532.

Good Radio CE seeks gd people to work for, NC or SC, exp w/installations, gd audio, dependable. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 7-1.

Eng, 7 yrs AM/FM, certified, West Coast only. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 6-1.

Disc Jockey, exper, 30's-60's music, will furnish. Amanda Schauburger, 2003 Aldrich Ave S, #304, Minneapolis MN 55405. 612-872-9376.

Radio CE, FCC genrl, former CE in Boston, Houston, Miami, Ft Lauderdale, non-drinker, non-smoker. M Gottesman, 3377 Solano Ave #312, Napa CA 94558. 619-352-5688.

Tech oriented person seeks bdct engr position, ISCT, CET, Genrl Amateur License, HBO MDS exper, NBN CE, exper studio repair & maint. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

HELP WANTED

KNIS-FM non-comm Christian ministry near Reno seeks FT professional to maintain station & growing FM translator network. Write: GM, 6363 Highway 50 East, Carson City NV 89701.

Rapidly expanding 15 station bdct group needs hands-on take charge licensed CE for major class B FM & FT AM in Hartford CT. Currently building new studios & 4-trk production studio. Candidate should be familiar with Harris FM 25K, STL, SCA, digital remote control, etc. Send resumes to Gerald M Lebow, EVP Sage Bdctg Corp, 1 Dock St, Stamford CT 06902. E.O.E.

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Broadcast Equipment Exchange

MISC. . . . WTB

Want to Buy

Roton 1B1 blower CX33A3G for Sintronic. G Erway, KBOG, Rt2 Box 268, Cordell OK 73632. 405-832-5332.

Vacuum caps for Raytheon RA 1000, GE VC-100-10, 100 pF at 10 kW. B Dodge, WTLJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

Gates BC1T 1240 kHz crystals, need ASAP & Gates 9131850002. C Ewing, WGRM, POB 555, Greenwood MS 38930. 601-453-1240.

MONITORS

Want to Sell

Harris 75-80 gd cond, on 92.1 w/manual, \$750/BO; Harris 7T-80 mono, gd cond, on 92.1, w/manual, \$450; Harris RF amp on 92.1, gd cond, w/manual, \$300. P Wolf, WVHG, 329 S Main St, Labelle FL 33935. 813-574-5548.

McMartin Main channel & SCA-TBM2000 factory tuned & tested, also TBM4500A stereo monitor tuned & calibrated to frequency. Charles Goodrich, Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

McMartin 2000B, gd cond, (3), \$500 ea; McMartin TBM-3000 gd cond, \$100. M Dailey, 311 S Gloster, Tupelo MS 38901. 601-841-1506.

Belar RFA-1 FM RF amp, excel cond, \$350/BO. B Mishkind, KFXK, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3797.

RCA BW66E AM mod mon, \$150 plus frt. S Bartkowski, WEDC, 4923 W 28th, Cicero IL 60650. 312-863-3090.

McMartin TBM 4500A FM stereo monitor, vgc, \$300. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

G-R Type II AM, freq monitor, 1010 kHz, w/manual & all tubes, \$30 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

H-P 335B FM monitor, tuned to 99.9 MHz, w/manual & all tubes, \$75 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Want to Buy

Stereo mod monitor in gd cond. H Haley, KATX, POB 1236, Livingston TX 77351. 409-327-8916.

McMartin TBM series monitors, also consoles. Charles Goodrich, Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

GTA 6741 Gates SCA monitor. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

MOVIE PROD. EQUIP.

Want to Sell

Auricon Pro 600 16mm film w/Angenieux 1:10 zoom lens, portable case, mint, \$750. SA Ciesler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Want to Buy

C-mount, 16mm, prime lenses, all makes 16mm Molex camera bodies, Molex underwater housing & lettering for titling. H Deans, Deans Prod, 170 Grand St, White Plains NY 10601. 914-949-5920.

RECEIVERS & TRANSCEIVERS

Want to Sell

Regency 450 MHz FM 2-way, 1 HT & 1 mobile, crystals for 450.55, vgc, \$600 for all or \$350 for HT & \$370 for mobile. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

Realistic DX-160 w/speaker, rack mounted, w/mods for audio demod & IF carrier, 150 kHz to 30 MHz, BO or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

Halicrafter 115 receiver, 32A xmtr in spotless cond, BO. G Popdavid, WHBC, 1255 Shadyside, Canton OH 44710. 216-452-2710.

Kenwood KR6170 stereo amp/receiver, \$100. C Mandel, KAMP, Box 1018, El Centro CA 92244. 619-352-2277.

Want to Buy

VHF transceiver, 145.01 MHz, crystal control pref. T Webb, WYKQ, Hc87, Box 1085, Whitesburg KY 41858. 606-633-4434.

VHF 161 MHz RPU downconverter to FM band, desire receive RPU freqs on FM rcvr, proven RF converter designs, RF converter component kits or assembled. R Malone, WCRN, Box 6336, E Rochester NH 03867. 603-335-2005.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Marti STL8 xmtr, R200-950 rcvr, dual STL, working when removed, sell or trade for any composite STL. P Rebmann, WVFM, Box 827, Lakeland FL 33802. 813-682-4191.

Moseley TRC15 in gd cond, Hallikainen & Friends digital field charge, BO. K Lincoln, WIZN, Stevens House Box 123, Vergennes VT 05491. 802-877-6800.

Micro Controls subcarrier gen tuned to 23 kHz, in service less than a year, \$500. W Stockdell, KDYG, Box 1713, Big Spring TX 79721. 915-263-7326.

MRP-1 ABC talk radio cue decoder w/print-er card, \$750. R Ericson, KMA, Box 960, Shenandoah IA 57601. 712-246-5270.

Moseley PCL505C composite STL, excel cond, \$4000. B Mishkind, KFXK, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3797.

Antenna Specialist 7 element yagi, set for 450.650 MHz, BO or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

Moseley PCL 505C STL, 951 MHz transfer panel, like new w/factory update, BO. S Callahan, WFTI, 1120 Pinellas Bay Way #103, Tierra Verde FL 33715. 813-866-2478.

GEC microwave rcvrs & xmtrs, C-band. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Want to Buy

Marti RPU wanted. CD Gray, WROX, 125 3rd St, Clarksdale MS 38714. 601-627-7343.

Wegener interface, receiver, demod LNA to receiver Transtar formats, have S-A digital rec, demod, fun cards for CBS, WBC, ABC, Mutual, will work a trade. B Hoisington, SMC Automation Southeast, POB 1776, Andalusia AL 36420. 205-222-8849 (1-6 PM).

STATIONS

Want to Sell

FM 65 kW, 1 kW daytimer in Texas 125K cash, assume note at \$800/mo. Call 806-259-3701 aft 7 PM.

AM/FM combo in North Texas, Class C FM, \$125K cash. 806-259-3701, aft 7PM.

Oklahoma Class A, single station market, beautiful town, new equip, new bldg, valuable real estate, low down to qualifier, long term payoff, retiring, \$199,000. G Erway, KBOG, Rte 2 Box 268, Cordell OK 73632. 405-832-5332/5432 aft 5 PM.

Radio station, 1 kW, 1170 AM, near major market, operation at one location, real estate, \$75,000 down pmt. A Crain, Box 157, Collierville TN 38017. 601-895-6483.

Class A FM, Cordell OK 73632, beautiful city, single station market, new bldg & new equip, \$195,000, low, low down, will finance to resp. party. G Erway, KBOG. 405-832-5332.

Want to Buy

AM or FM or combo station wanted in East or SE, positive cash flow or break even w/growth room, must finance at least 50%. L Manning, Manning Bdct Assoc, POB 81, Westhampton NY 11977.

STEREO GENERATORS

Want to Sell

Moseley SCG-9, like new, \$500. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Wilkinson stereo gen, new, not used, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Versa-Count V322 FM exciter w/built in stereo gen, excel cond, \$1800. S Angrum, WTMX. 317-545-8100.

RCA BTS-1A stereo gen, \$35/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Moseley SCG4T gd cond, \$600; Orban Optimod 8000A stereo gen, works, \$1500. M Dailey, 311 S Gloster, Tupelo MS 38901. 601-841-1506.

TAPES, CARTS REELS

Want to Sell

Capitol AA3 (22) 3.5 min carts, brand new, \$2 ea. P Christenson, WIVY, 3101 University Blvd S, Jacksonville FL 32216. 904-721-9111.

3M-Scotch 206, 208 & Ampex 632 1/4" on 5", 7" & 10 1/2" reels-repro. Also avail Ampex 406, 456, 3M 250 & Agfa 469 2" audio tape w/no splices & with one splice. Also avail Ampex 406 & 456 1" audio tape with no splices. Call for prices. Burlington Audio Tapes, 106 Matt St, Oceanside, NY 11572. 1-800-331-3191 or in NYS 516-678-4414.

Carts, clean & in gd cond, misc lengths & types, approx 600 Fids, M-C, AZ, etc, buy all or you pick, BO. B Stoehr, WQOB, POB K, Leesburg FL 32749. 904-787-1410.

Fidelipac Master carts, large selection of red & gold. M Guthrie, 540 Reo St, Tampa FL 33609. 813-855-5642.

Hundreds of gd used 7" reel tapes, BO on any quantity. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Aristocarts, 8-1/2 min, numerous, all new, BO. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

NAB reels, 10-1/2" metal, 1/4", all in gd cond (1-10) \$1.50, (10-100) \$1.25, (100 plus) \$1.00. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Nostalgic radio commercials on 5" reels, approx 100, \$100. M Kantorowitz, WPOB, 50 Knickerbocker Rd, Plainville NY 11803. 516-822-6915.

Fidelipac gray, HOLN tape (350) all w/AC stereo music various lengths, buy all or some. M Andrews, KFMD, POB 5003, Des Moines IA 50306. 515-282-1033.

Audiopak AA3 (650) near new, excel cond, all music lengths, \$1.50 ea. B Anthony, Anthony Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Scotch 1" video tape, 2100' reels, only one pass, \$3/reel. C Potori, Potori Video, 10005 Lacy Ave, Morrisville PA 19067. 215-945-3990.

Audio carts, Size A, various mfgs, cond use-able to like new, 30' ea. R Elm, WWJC, 1120 E McCuen, Duluth MN 55808. 218-626-2585.

Fidelipac grey carts, (4) boxes 28" x 14" x 14", most gd cond; also (1) box of 14" x 14" x 14" of C&W songs, oldies, BO or trade for Teac/Revox decks. F Vobbe, 706 MacKenzie, Lima OH 45805.

Fidelipac (100) 40 sec to 7.5 min, gd cond, \$1 ea. R Ashmore, S Front Range Bdct, POB 421, Colorado City CO 81019. 303-676-3588 eves.

Want to Buy

Rock and/or Country oldies from 50's & 60's record library, no cassettes, must be in gd cond. B Coleman, WIST, POB 460, Lobelville TN 37097. 615-593-2294.

Goon Shows, any format for non-broadcast use. C Koefis, Requoyssance, 2820 Raymond Ct, Falls Church VA 22042. 703-237-2590.

Old musical ET libraries, 16" arms, RCA or WE universal pickup cartridges. SA Ciesler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

TAX DEDUCT. EQUIP.

Video prod equip, esp 3/4" editors, cameras, lights. G Urban, Wholesome Prod, 314 W 52nd St, NY NY 10019.

New non-profit church station needs complete FM facility to begin bdcg, need xmtr, 5 kW or less, STL, antenna, 8100A Optimod, TTs, console, R-R's, cart machines. C Sepp, Church Life Comm, 536 Grand Ave, Schofield WI 54476. 715-555-5151.

Non comm FM seeks tax deductible donations of low power xmtrs & exciters. D Sparano, WBCR, Siena College, Loudonville NY 12211. 518-783-2990.

Heliac or hard line, 400', 1/2" or 7/8" 50 ohm for 2 meter amateur repeater. D Pichard, Oakdale Rd, McComb MS 39648. 601-684-3654.

Tax exempt foundation requires video prod equip, especially 3/4" editors, cameras, lights. Wholesome Prod, 314 W 52nd St, NY NY 10019.

TEST EQUIPMENT

Want to Sell

Heath IM-58 dist analyzer, gd cond, w/manual, \$125; Heath SG-18A audio gen, gd cond, w/manual. Heath assembled, sine/square. \$125; Ramsey CT-125 freq counter, gd cond, w/audio probe, \$150. P Wolf, Wolf Engineering, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

Elcom Eng Model 300, standard freq rec & mon sys, \$300. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.



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Free listings in Broadcast equipment exchange are offered to all United States Broadcasters AM/FM/TV and all Pro-Sound end users. BSW will accept up to three listings by telephone. For more than three listings BSW will send you an ad order sheet for your convenience. BSW will list each ad for a period of three full months.

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ACTION-GRAM

EQUIPMENT LISTINGS:

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply call 1-800-426-8434 to place your listings courtesy of Broadcast Supply West. Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an \$18/25 word basis. Call 800-336-3045 for details and complete display rates.

EMPLOYMENT SECTION:

Help Wanted

Any company or station can run "Help Wanted" ads at the flat rate of \$18 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted

Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (there will be NO invoicing). Responses will be forwarded to the listee, unopened.

Check as appropriate: Help Wanted With Box Number
 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip _____

Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041

RW

Broadcast Equipment Exchange

TEST EQUIP . . . WTS

Waveforms 452A, trans measure set, \$100; Yaesu Musen YC-355d, freq counter, nixie-tube, 35 MHz/30-200 MHz, \$100. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Heath IM-4110 freq counter, gd cond. Heath assembled, \$150. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Matec exponential gen, \$275 plus UPS; Delary 1 48 VDC power supply, \$60 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

EICO 460 scope, \$50. M Persons, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

HP DC differential voltmeter & ratio meter, \$260 plus UPS; Erdac 1200A transient recorder, \$475 plus UPS; Weston Rotek RMS DC converter, \$280 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Federal 101-C field strength meter, operates on cigarette lighter option. JB Crawley, WLBK, POB 185, Campbellsville KY 42718. 502-465-8884.

H-P 332A dist analyser, RF detector input, \$300/BO. J Groh, Howe Tech Corp, 2300 Central Ave #E, Boulder CO 80301. 303-444-4693.

Tek 514AD scope w/cart, \$500. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Tek R140 NTSC test signal gen & sync gen, new 6/78. G Boldenow, KJRG, 316-284-2535.

Datapulse 120 pulse gen, HP-3340A DVM, Eico 470 scope, BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Tek 535 scope, needs minor repair, \$150. D Gurdry, Sound Concepts, 1113 Jackson St, Alexandria LA 71301. 318-473-4170.

Vero FL-3D flutter meter, excel cond, \$350. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Sencore VA62, VC63, NT64, like new, \$2500. L Clinton, Snider Corp, 4021 W 8th, Little Rock AR 72204. 501-661-7500.

Tek 555 dual beam scope, (3) type Q vertical amps, three time base plug-ins, extra PS, w/manuals, \$350. J Lipski, Ind Engr, POB 1456, Lompoc CA 93438. 805-733-2726.

Tek 214, dual-trace storage scope, 500 kHz, excel cond, w/manuals, \$1400/BO. JG Von Vleck, Vtech, 2833 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Want to Buy

HP-331A dist analyser. S Bartkowski, WEDC, 4923 W 28th, Cicero IL 60650. 312-863-3090.

Sencore capacitor/inductor 2 meter & Sencore super cricket. J Price, Price Recdng Std, 2651 Globe, Dallas TX 75228. 214-321-6576.

TRANSMITTERS

Want to Sell

QEI 675 20 W FM exciter, excel cond. B Wood, WNEG, 100 Blvd, Toccoa GA 30577. 404-886-0032.

McMartin xmtrs, any model, any condition. Charles Goodrich, Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

Gates BC1G, 1390 AM, w/all manuals & recent proofs, replaced by '86 w/5 kW, \$2000/BO. P Fretwell, KBBO, POB 9188, Yakima WA 98909. 509-248-1390.

RCA BTA-1R, 1 kW AM, \$2500. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

LPB 5 W AM, couplers available, BO. R Furry, 3647 Tudor Way, Albany OR 97321. 503-928-4857.

Powerpak SMX-40, 40 W exciters, factory tuned & tested, fast service, brand new, \$2000 ea. J Phillips, All American Bdct, 414 Washington, Defiance OH 43512. 419-782-8591.

Harris/Gates BFE10G3 FM 10 W stereo exciter, 90.3 MHz & Gates FMC-1A single section FM antenna, \$2000. M Rahoff, WMSC, Montclair State College, Student Center Annex, Montclair NJ 07043. 718-591-0002.

Wilkinson FM 1500E FM xmtr, new, crated, BO; Gates FM 1-G FM xmtr, used, in service, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

OVER 100 AM AND FM TRANSMITTERS

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

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World leader in AM and FM transmitters.

BESCO INTERNACIONAL
5946 Club Oaks Drive
Dallas, TX 75248

214-630-3600
214-276-9725

RCA BTASH 5 kW AM, gd cond, manual & spare parts, 550 kHz. G Smith, WDUK, POB 10, Gainesville GA 30503. 404-532-9921.

Wilkinson FME-10 exciter, good cond, in use, BO; QEI 675 exciter, new, never used, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Harris FM20HZ 20 kW w/filter & PS, orig, gd shape, BO. B Wood, WNEG, 100 Blvd, Toccoa GA 30577. 404-886-0032.

Collins 300J 250 W AM, old but vgc, must move, \$400. D Doelitzsch, WDD, 1 Broadcast Ctr, Marion IL 62959. 618-997-8123.



High performance at affordable prices.

15, 30 and 80 W exciters.
100, 200, 250, 400, 500 and 1000 W solid state amplifiers.
All front panel programmable, broadband.
2, 10 and 20 W STLs.
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BEXT Inc.
739 Fifth Ave.
San Diego, CA 92101
619-239-8462
Telex 229882LJMUR

Gates Vanguard 1 for parts. M Young, KBRK, Box 97, Brookings SD 57006. 605-692-1430

RCA BTA 50F, excel cond, recently out of service, you remove & ship, \$18,000. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

BE FM30A nearly new, 93.3 MHz, BO. C Springer, KLMR, POB 890, Lamar CO 81052. 303-336-2206.

Stellatron FX2 stereo, 200 mW output, \$150. J Titus, Titus Assoc, 566 Briarcliff Rd, Pittsburgh PA 15221. 412-243-1674.

RCA BTE-10C FM exciter, \$75/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Gates/Harris BT-100H; M-6652 chan 8 100 W TV xmtr (2), clean repairable, \$6500/both. M Murphy, 11621 Valle Vista Rd, Lakeside CA 92040. 619-561-2726.

Gates BC-250GY-1 1520 kHz, gd standby xmtr, BO. P Stage, WKVI, Box 12, Knox IN 46534. 219-772-6241.

Sintronix SI-F-25 27.5 kW FM, remove from svc late June w/spare parts, BO over \$12K. G Brandenburg, WKQQ, POB 100, Lexington KY 40590. 606-252-6694.

Harris BC1H 1 kW 1450 AM, excel cond, BO. B Mishkind, KFX, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3797.

RCA BTA 5F 5 kW AM, excel cond, recently out of service, you ship & remove, \$10,000. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

GE BF2A 3 kW FM, new CSI exciter, vgc, lots of spares, BO. S Callahan, WFTI, 1120 Pinellas Bay Way #103, Tierra Verde FL 33715. 813-866-2478.

RCA BTA-5F mod transformer, new in crate, \$600 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Want to Buy

FM translator & solid state FM xmtr. R Peters, Lahaina Bdct Co, POB 10712, Lahaina HI 96761.

Late model 5 kW AM xmtr, any make. H Haley, KATX, POB 1236, Livingston TX 77351. 409-327-8916.

Carrier current equip, transmitters & couplers & RF amps. P Remaker, WQHS, 3905 Spruce, Phila PA 19104. 215-898-9553.

Spare TE3 exciter or parts. D Sparano, WBCR, Siena College, Loudonville NY 12211. 518-783-2990.

Harris MW10 AM xmtr or similar. H McDonald, KKMT, Box 710, Ennis MT 59729. 406-682-7171.

AM 1 kW prefer RCA 1MX or Collins 20V2 or 20V3, fixer uppers OK. B Dodge, WTJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

Xmtr, 1 kW, preferably use 4-400 & 5-500 tubes. R Lopez, RF Specialty Prod, 4214 San Pedro, San Antonio TX 78212. 512-736-6116.

Operating manual for an AEL 10 kW xmtr. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

High band VHF, 100 W to 5 kW, any make or model, driver to higher powered xmtr OK. J Powley, WIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

RCA TTU-2A or TTU-10A UHF, need parts of every kind for re-build of damaged xmtr; Adler or TTC UHF TV translators, old 70-83 units OK, 10-20-100 W. J Powley, WIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

TURNTABLES

Want to Sell

Harris CB1200, Micro-Trak arms, gd cond, \$150 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Russco Studio Pro Model B, 2-speed, made by QRK w/Gray Micro-Trak tone arms, no cartridges. K Deans, Rollins College, 1000 Holt Ave, Winter Park FL 32789. 305-646-2479.

Shure BC70 (2) cartridges, brand new, 3 styli with each, \$35 ea. C Daniel, KNCB, POB 1072, Vivian LA 71082. 318-375-3279.

Russco TT, gd shape, blue in color, \$75. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

QRK 3 speed, Micro-Trak 303 tonearms (2), \$140 ea. B Wolfe, WMPC, Box 104, Lapeer MI 48446. 313-664-6211.

Henry Eng remote TT controllers, (2) new cond, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Technics SL-1200 stereo TTs (2) one with one w/phono cartridge, vgc, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Scully record cutting lathe transcript model J w/Westrex model 2B recording head, amp, preamp & elect. S Barnard, Imperial Int, POB 548, Kanikakee IL 60901. 815-933-7735.

Shure M64 phono preamp, \$50. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Russco Studio Pro w/phono cartridges, gd cond, w/(2) Micro-Trak 303 tonearms, \$450. S Angrum, WTMX. 317-545-8100.

Technics SP10 MKII w/base & manual (2), \$500 ea. S Bartkowski, WEDC, 4923 W 28th, Cicero IL 60650. 312-863-3090.

Gates Solid Statesman II preamps (2) in operating cond w/manual, \$50 ea plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Technics SP15 base, Audio Technica tone arm, \$450. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Presto Disc-cutter lead screws for cutting, 224/104/106 lines, \$50 ea/all for \$135; Rek-O-Kut CVS12 speed variance w/settings. L Oliver, 212-874-0274/7660 (PM).

QRK 12C TTs w/Micro-Trak 303 tonearms (2), \$100 ea. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Shure M64 preamp, \$50. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

RCA 16" transcription TTs 33, 45, 78 vertical lateral heads & carts, you pickup, \$375/both. R Bellavia, WSBC, 4949 W Bellmont, Chicago IL 60641. 312-777-1700.

Micro-Trak 303 tonearms (2), \$25 ea. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Ramko SP-8E Stereo II preamp w/manual, less than 200 hrs, like new, \$100 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Haeco PB2TX stereo TT preamp, variable EQ & level, like new cond (2), \$25 ea; Ramko TT preamp, stereo, fair cond, \$25; disk cutting systems avail, complete turnkey disk mastering rooms, Scully Westrex systems, complete w/EQ, limiters, monitors, variable pitch & depth, call for info; Thorens TD-160C unit w/dust cover, \$35/BO. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

Technics SL-1100A quartz lock direct drive TT, needs minor repair, vgc, \$40; Dual 601 automatic TT, gd cond, \$35; Scully Lathe, complete w/Westrex 3DII cutterhead & driver amps, vgc, \$7500; Sony PS-5550 belt drive TT, needs minor repairs, gd cond, \$25. T Steele, Frankford/Wayne Mastering Labs, 1697 Broadway, NY NY 10019. 212-265-5563.

Want to Buy

Technics SL1500 in gd cond. K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

TV FILM EQUIP.

Want to Sell

RCA film chain (2) TP66 16mm projectors, TP55 film island control motorized mirror box, TP7 slide projector, TK27 color cam unit, \$9500/all, will separate. J Rubenstein, MD Pub Bdctg, 7913 Yarnwood Ct, Springfield VA 22153. 703-451-1994.

VIDEO PRODUCTION EQUIPMENT

Want to Sell

Faroudja Record 1 image processor w/comb filter & pilot tone, excel cond, \$795. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Cohu synch generator w/Modern Video Eng B&W to color adapter. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Crosspoint 6006B sync gen system, 4 independently phase adjustable pulse amps, gd cond, \$895. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Harris 690 frame sync TBC w/bit processor, corrects 1/4, 1/2 & 1", gd cond, \$5495. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Microtime 2525 TBC, \$9000/BO. B Krangle, ISL, 680 Haines NW, Albuquerque NM 87102. 505-842-1419.

BTX 4600 3 machine system, sound effects, controller sync & gen, gd cond, \$3000. J Rose, Century 3, 651 Boylston St, Boston MA 02215. 617-277-0041.

RCA tripod, dolly, & pan antenna tilt head, studio unit, \$500. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Pelco pan tilt head w/Vicon solid state pan tilt & lens control, \$125. J Baltar, Maine Reel Comm, 207-623-1941.

Panasonic CT700M 7" color portable monitor w/audio. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Telestrator 600, effects gen, operational other than cracked grid plate, gd for parts or refurb, w/manuals, \$600/BO. JG Von Vleck, Vtech, 2833 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Grass Valley 900 series rack w/904A vid proc, 962 color lock, 950W sync gen, 906A AGC video amp, 900 dual power, \$500. SA Cisher, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

CMX 1 squares for VR1200, VPR2, Sony 2860, MM1200, Grass Valley 1600, etc, BO. N Macrae, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

KTV KCT-5003 4" color TV, \$125. K Retzer, KGRZ, POB 4106, Missoula MT 59806. 406-728-1450.

Ampex Mark 10X video tape head newly refurbished, \$500. B Richert, WPCB, Signal Hill Dr, Wall PA 15148. 412-824-3930.

Knox 128B/Mod 8 character gen, blink, roll, crawl, multiple fonts & sizes w/manual, perfect, recent factory record, \$1500. RPC, 827 Meridian St, Nashville TN 37207. 615-226-1122.

Want to Buy

Transfer service for old A-format 1" video reel to VHS, originally recorded on Ampex 7000. W Watrous, Watrous Prod, 1038 Citrus Ave, Sarasota FL 33577. 813-955-4000.

Editing system with 3/4 to 1" capability, prefer computerized but not necessary. J Harsh, On Spot Prod, 170 Hwy 83, Oakly KS 67748. 913-672-3428.

Panasonic Recam B-100 system, any & all equip, cameras, recorders, edit controllers, cables, access, manuals, etc. B Briggs, KCAM, 827 Meridian St, Nashville TN 37207. 615-226-1122.

VIDEO TAPE RECORDERS

Want to Sell

Panasonic NW9500 3/4" record reproduce, \$900 plus UPS. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

JVC 5000U 3/4" player, new in sealed box, never used, \$750. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Sony SLP-300 Betamax video PB decks (2) w/RM-300 auto search remote control, like new, \$150 ea plus ship. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

JVC 3/4" 606V VCR, vgc, w/manual, original box, \$800. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

IVC 1" portable VCR, \$400 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

WORLD VIDEO STANDARDS CONVERSION
Digital PAL/SECAM/NTSC Chroma, Luminance, Error Correction given careful set-up for broadcast quality at budget price. VHS, BETA, 3/4", \$45/hr. Quantity discount.

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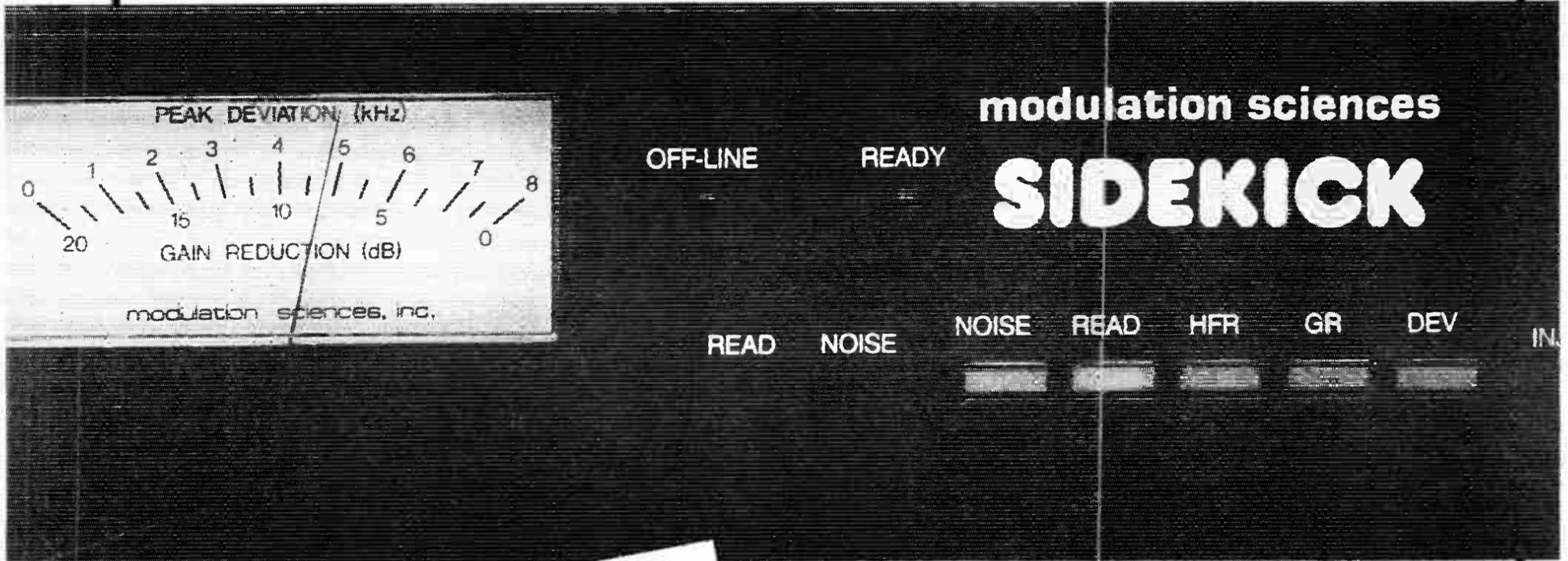
Sony VO 3800 3/4" port, \$350. JVC, Panasonic, Sony 3/4" for repairs, \$150 ea. SA Cisher, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Panasonic NV9500 & NVA950 editor & controller, \$2000. R Larsen, Metropolis Video, 316 S Maple, Oakpark IL 60302. 312-848-3172.

Sony 3800 portable R/P, 3/4" w/AC color adaptor & manuals, \$500. G Sive, Your Video Connection, POB 239, Bonsall CA 92003. 619-729-7662.

Tascam Series 30 reel motor, new, trade for Sony 850 Series headblock. E O'Brien, Out-house Recdgs, 3041 Crawford St, Terre Haute IN 47803. 812-238-9312.

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."

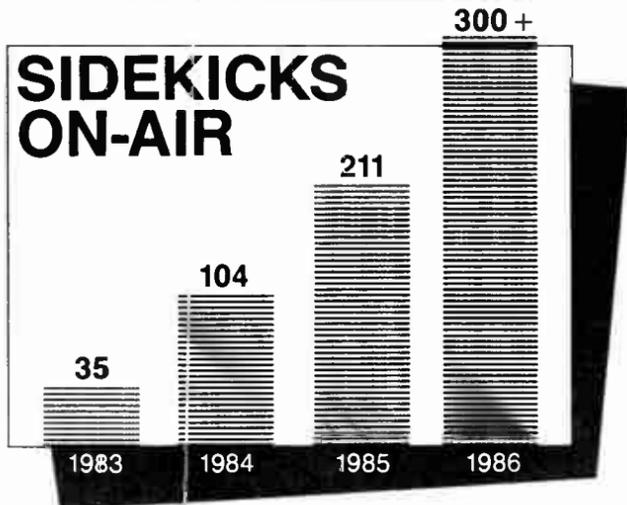
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**30-Market Survey Results:
SIDEKICK IS THE
#1 CHOICE OF MUSIC
SCA OPERATORS.**

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.

Call Toll-Free (800) 826-2603

And Get Sidekick Working For You.



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-500α 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-500α 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-500α is a step ahead. While specifications don't say it all, ruler flat frequency response, 0.03% 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
