

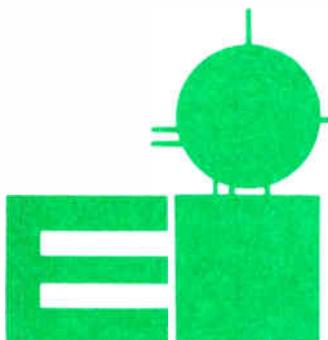
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June 1988

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A MONTHLY NEWSLETTER FOR BROADCASTERS

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### Big FM Translator Changes Ahead - Applications Frozen FCC Institutes Actions on A Wide Range of Translator Issues

The FCC will soon deal with a variety of FM translator and low power FM station issues. To keep its options open for new rules changes, the FCC has imposed a freeze upon the acceptance of new FM applications in the commercial FM band, but not to applications in the non-commercial portion. By Notice of Inquiry, the FCC has responded to requests from the National Association of Broadcasters and other groups which have urged reevaluation of the role of FM translators in the radio broadcasting service. Current proposals on the table include amendments to the rules ranging from more restrictions on the operation of FM translators, to authorizing unrestricted program origination by such stations. In its NOL, the FCC seeks information to help it in evaluating the role of FM translators, the effects of such stations on full power FM stations, and the impact of possible changes to FM translator rules on FCC resources and enforcement activities. It also seeks comment on whether it would be appropriate to retain, strengthen, relax, or eliminate the current restrictions on the operation of FM translators. The freeze is expected to persist for the duration of the inquiry and subsequent rulemaking, which could be as much as several years. However, presently pending applications competing applications filed on future cut-offs, and certain

non-commercial educational translator applications will continue to be processed. The NOL is designated MM Docket 88-140.

In an action designed to permit non-commercial educational stations to expand translator service, the FCC has removed the requirement that all rebroadcasts be by direct pick-up from the mother FM station. It will now be possible for NCE licensees to use satellite, STL, or other methods of feeding remote translators. Since NCE translators are not limited to the mother station's coverage area, the new rule opens the way for the institution of nationwide service by educational "super stations". This authority applies only to FM translators assigned to non-commercial Channels 200-220 and owned and operated by their primary stations. This action was taken in MM Docket 86-112.

Also in MM Docket 86-112, the FCC seeks comments on making available the new retransmission privileges to NCE translators owned and operated by third parties. The Commission also proposes permitting licensees of NCE FM translators to use broadcast STI frequencies for program relay, independent of primary stations.

The new FCC translator rules have potential for enormous impact on FM broadcasting. In an immediate sense, non-commercial educational broadcasters will be able to expand

their service to any part of their region, or the country as a whole, that can be economically justified. For a public broadcasting organization possessing satellite uplink facilities, one central FM station, even of low power, can feed an entire network of translators throughout the state. Considering that a good quality translator signal can be put on the air for under \$10,000, including satellite reception facilities, establishment of such networks will be relatively inexpensive. Depending upon eventual FCC actions, a similar proliferation of new translators could occur in the Commercial FM band. Especially, if translator options are extended to Class B-C operations.

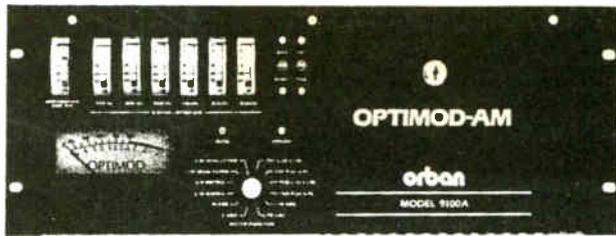
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### NRSC Stations Adopt 'Standard' Operating Procedure

NAB salutes these AM stations that have recently reported to NAB their adoption of new NRSC Standard: KOFC, Fayetteville, AR; KPRZ, Sand Marcos, CA; KJOY, Stockton, CA; WTIC, Hartford, CT; WSTC, Stamford, CT; Baton Rouge, LA; WLLH, Lowell/Lawrence, MA; KRWC, Buffalo, MN; KPLY, Sparks, NV; WOR, NYC; WEGO, Concord, NC; WHK, Cleveland; WDIR, Delaware, OH; KFIS, Klamath Falls, OR; KWJJ, Portland, OR; WBUT, Butler, PA; WAMO, Pittsburgh; WEJL, Scranton, PA; WHYZ, Greenville, SC; KZMX, Hot Springs, SD; WMSR, Manchester, TN; KREW, Sunnyside, WA; KTAC, Tacoma, WA; WIZM, LaCrosse, WI.

\*\*\*\*\*

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COST!  
CLOSEOUT!**

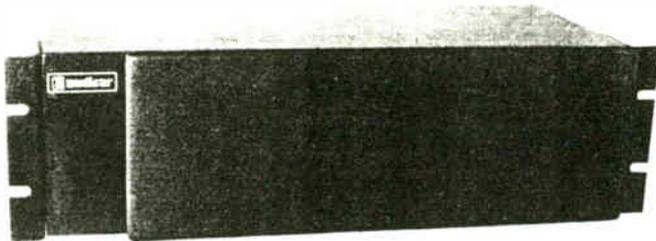


**ORBAN AM OPTIMOD**

The 9100A/1 and A/2 ORBAN OPTIMOD® was designed for the state-of-the-art AM broadcaster. If your station has an AM transmitter and audio chain which will come close to passing an FM proof, an STL good out to 15 kHz (for colocated facilities) and an antenna system capable of 11 kHz minimum bandwidth there is not a better AM processor made.

9100A/1 mono (adaptable to stereo) ..... **\$2495<sup>00</sup>**

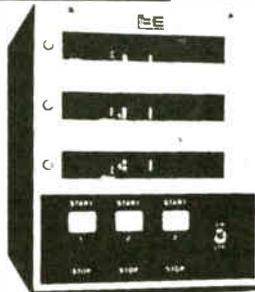
**AUDISAR**



Audisar's Model 14K100, 5.25" rack mount monitor loudspeaker includes mounting hardware for both rack and shelf use. The two-way convertible monitor system has a frequency response of 68 Hz to 12.5 kHz 3dB and a power rating of 30 watts. Its polypropylene woofer is matched carefully to its "Thiele" parameter design enclosure. The crossover network is a parallel 12 dB/octave type, specifically matched to the transducer's characteristics. The network includes high-frequency protection to prevent high-energy burst burn-out.

**Model 5300B Three Deck Below Cost!**

Looking for a heavy duty, three deck machine for A and B sized carts? Then check the 5300B! The 5300B is rugged, full featured cart machine. The advanced mechanical design employs an internal bulkhead for accurate deck and capstan positioning. Other features include removable upper decks, direct drive synchronous motor, reliable solid state solenoid switching, superb Phase Lok IV read brackets, FET muting, active cue tone filters and rear panel LED service aids.



(A & B Size)

**One Left! Special Price \$2795.00**

*Editor's  
Notebook*



Happy Fathers Day out there to all you fathers, especially the ones going through graduation exercises this year! June is the official start of the summer season, but we find it a busy season for the purchase of broadcast equipment and we'll be quoting some extra-low prices on equipment in the next couple months!

This is our annual subscription audit issue, a time when we update and trim our Common Point mailing list to cut unnecessary cost and prevent waste and duplication. Please fill out the reply card completely and return it to us so there will not be a disruption in receiving our little magazine.

Because some of you have asked, I am reprinting my "Magnificent Marti" article from the November, 1986 issue as a Common Point flashback this month. I'll be happy to answer any specific questions you may have regarding RPU transmission systems.

Until next month, enjoy the beautiful weather.

*Bob Stroebel*

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P.S. Take advantage of E.I.'s "Buchanan Hammer" truckload sale good only until last day of June.

**COMMON  
POINT  
READINGS**

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## NAB Requests FCC To Adopt NRSC AM Radio Standard

### Industry Moving Rapidly Towards Voluntary Adoption

The FCC has recently announced the receipt of a petition from the National Association of Broadcasters requesting FCC Rules Section 73.44 be amended to include transmission portions of the 1987 NRSC voluntary standard for AM radio. Specifically, the NAB has asked that NRSC's standard AM pre-emphasis curve and standard 10KHC audio bandwidth characteristic be incorporated in the technical rules. Reportedly, the FCC will examine the petition as part of its comprehensive review of the technical principles pertaining to AM broadcast assignment criteria initiated by a Notice of Inquiry in Docket no. 87-267. Public comments will be received until 24 January 1988, and reply comments within 15 days thereafter.

The NRSC standard adoption has been a high priority to most interests working for enhanced AM viability. Costing under \$700 to implement, the NRSC standard boosts the transmission of an AM station's high audio frequencies for better reception on current bandwidth-limited receivers, while almost eliminating splatter into adjacent channel frequencies. Many believe that if the NRSC standard is fully implemented among all stations in the United States, receiver manufacturers will then improve the frequency reproduction capabilities of receivers. Such enhanced capabilities are mostly limited by adjacent channel interference today. BTU had an opportunity to observe documentation of several NAB audio tests at the November, 1987 Society of Broadcast Engineers convention. These were highly convincing, and stated a compelling case for the immediate conversion of US AM broadcasting to the NRSC standard. Apparently agreeing, a large percentage of AM broadcasters in major markets, as in other parts of the country, have already made this change.

\*\*\*\*\*

## Your Tower A Valuable Money Maker

Your tower could be a money tree! And you may be more competitive than you think when it comes to leasing antenna space on your tower.

Because of pressure of the current administration to charge fair market value for services, federal agencies

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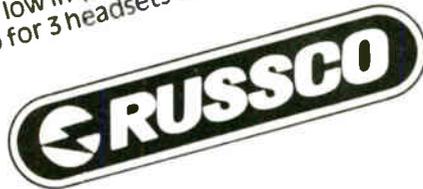
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Use the RUSSCO TELEMOTE and the phone line is your power!  
 - No batteries or AC plugs needed. Hook up to an ordinary rotary dial or touch-tone phone line and you're on the air! This tiny (8x6x3" - 3 lbs.) performer gives you 2 low impedance mic inputs, 1 tape input & pot controlled audio for 3 headsets & more!  
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have raised their rates, considerably, for antenna sites on federal property. Many well located AM towers also enjoyed "Grandfathered" zoning status. This combined with the high cost of erecting a tower and/or building could give you a ready market for the requirements of the fast growing paging, two way radio and radio telephone business.

Why not look at the yellow pages, usually on the same page you are

listed, and contact those dealers to see if you have just what they need. If you have an AM tower that is series fed, a Folded Unipole, such as that produced by LBA Technology, Inc., will allow you to add those other antennas without restoring to inscouplers or other such devices.

\*\*\*\*\*

## New Top-of-Dial AM Band Around Corner

### FCC Begins New AM Broadcast Band Implementation Inquiry

Since 1984, the FCC has been laying ground work for a new AM broadcast band from 1600 kHz to 1705 kHz. So far, the focus has been on international aspects, including technical criteria and planning the band use for compatibility with other northern and southern hemisphere broadcasters. The new inquiry principally deals with domestic matters to facilitate formulation of specific rule-making proposals immediately following final international approval, which is expected in June 1988. By promptly dealing with these issues the FCC hopes to send receiver manufacturers a message that they should quickly add the new band capability to radio sets.

The central issue in the Notice of Inquiry is the type of regulatory approach to adopt for development of the new band. In addition to traditional licensing approaches, the FCC has indicated its intention to explore national licensing of facilities in the expanded band. Under this approach, a single entity would be able to guide the development of an entire channel on a nationwide basis. Such a national licensee could operate the stations itself, or could lease the frequency to others. Such a scheme was seen by the FCC as having possible advantages in economies of scale, diversity in programming, networking, and the prompt initiation of service. The FCC sees these concerns as critical in view of the difficulty that AM stations currently face in competing in the nationwide marketplace, as well as the limited initial availability of receivers for the new band.

Anticipating demand for the new band which may far exceed its capacity, the FCC has also requested comments as to whether certain groups such as daytime-only AM licensees seeking full-time operation, and public and minority entities should be given preference to operate on the expanded band. Another issue raised involved what rules should govern Travellers Information Stations currently operating on 1610 kHz.

The FCC also seeks specific information on technical criteria such as the class of station, minimum and maximum powers to be permitted, protected contours, groundwave propagation, skywave propagation, coverage expectations and daytime skywave propagation. It also wishes to consider whether an assignment

plan, such as now used in FM, should be applied to AM stations in the new service. The Commission further requests comments on whether processing systems consisting of one-time filing periods, "first-come, first-served" or other filing procedures would be preferable to insure fairness and reduce potential processing delays. It is also looking for alternatives to the conventional comparative hearing approach to resolving conflict between potential licensees.

First new AM stations operations in the 1605 - 1705 kHz band are not expected until late 1990, at the earliest. International restrictions will not permit use of the new band until July 1, 1990 and normal FCC processing delays and construction time make initial operations unlikely until mid-1990. FCC willingness to entertain innovative new proposals for using this band suggests that those interested in it should give careful consideration to participating in shaping these new policies through the FCC Notice Of Inquiry and proposed rulemaking routes. The NOI is contained in General Docket 84-467.

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### Stanley Salek Named NAB Staff Engineer

Washington, Mar. 21.--Stanley Salek, engineering manager, Circuit Research Labs, Inc., Tempe, AZ, will join the National Association of Broadcasters' Science and Technology Department April 7 as a staff engineer, Michael Rau, the department's vice president, announced today.

From January 1983 to October 1984, Salek was a project engineer with Broadcast Electronics, Inc., Quincy, IL. He previously was an electrical engineer in the Paging Products Division of Motorola, Inc., Ft. Lauderdale, FL. He also was an engineer at radio stations WCMQ and WEDR (FM), Miami, FL, and WAXY (FM), Ft. Lauderdale.

He is a member of the Institute of Electrical and Electronics Engineers, American Electronics Association and Society of Motion Picture and Television Engineers, and has a Federal Communications Commission general radiotelephone license. He is the author of several technical papers including a chapter of NAB'S Engineering Handbook.

Salek received a B.S. in electrical engineering from the Florida Institute of Technology.

\*\*\*\*\*

COMMON POINT FLASHBACK:  
Reprinted from Nov. 1986

## Magnificent Marty!

by Bob Stroebel  
Common Point Editor

Some engineers have been known to refer to some of their equipment in human terms. Some of us have even given them names on occasion. My favorite piece of equipment while C.E. at WAUN, Kewaunee, was named "Marty". Lest you think this was a unique name for a bunch of nuts and bolts and solid-state devices, it really wasn't. In fact, I'll venture to say that a lot of engineers reading this article have a favorite piece of equipment which they call "Marty"...or more correctly spelled-out as "Marti". With Telco expenses going right through the roof, this little gadget is a most amazing costcutting device you can imagine!

In 1973 I purchased my first Remote Broadcast system. It was the dawning of a whole new age of Small Market broadcasting for me...free of telco installation bills, monthly service charges and long-distance toll charges! I even found a way to utilize our Marti System from the football and basketball play-offs over 150 miles away in Madison (Wi.) No...I couldn't "Marti-in" from there back to Kewaunee, Wisconsin, but I did save the installation and one-month service by "Marti-ing" to a local phone of a friend of mine who was attending the University of Wisconsin, and feeding the Marti receiver down the phone line! (It was too late to get a line installed at the Fieldhouse.)

In talking to fellow broadcasters over the years, I have found that many of them who had RPT equipment were only utilizing a fraction of the full potential of their remote broadcast systems. Some said they were able to use their equipment in town, but when they went out of town, they would still have to order-out phone lines! Some even said they had problems getting a signal from across town! After hearing the kind of range we were getting, they were naturally curious as to how we did it. At the urging of a number of radio people, I decided to write this article on "Making Martis work for you."

The system I have the most experience with is on the 152 to 172 MHz band and I will confine this discussion to this type of equipment. At the studios we had a vertically polarized, 6db gain, omni-directional base antenna (Model SC-155AC). It was leg-mounted at the 290-foot level of

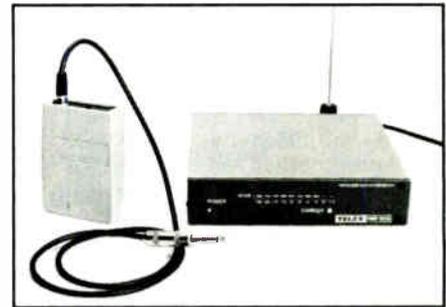
# Why do you suppose one company seems to introduce the most new wireless systems?



1984: FMR-2 Pos-i-Phase Diversity systems



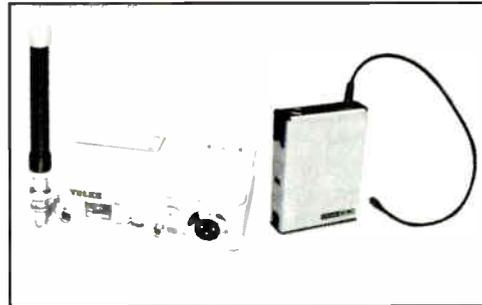
1985: FMR-50 Economic Non-diversity systems



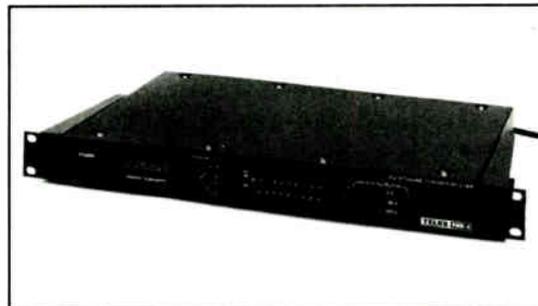
1985-'86: FMR-50G (pictured) Non-diversity and FMR-2G Diversity Guitar systems



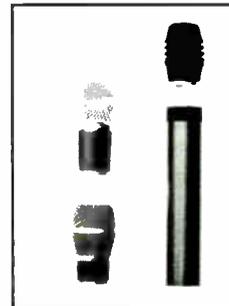
1986: Sound Enhancement, Personal Audio system



1986: ENG-4/WT400 Compact, Multi-Channel system



1987: FMR-4 Multi-Channel, Rack Mountable Receiver



1987: HT-400 2-Channel Mic/Transmitter with interchangeable heads

## Because they do.

For a long time now, Telex has been successfully introducing new wireless systems each year. They seem to have the knack for recognizing a market need and satisfying it. As a result, the popular Telex line of wireless products has grown to be the envy of the industry. Each time

a new Telex wireless product is developed, an eager market is willing to give it a try based on past experience or the recommendation of trusted colleagues. Next time your situation calls for wireless, choose from the growing Telex family. We're running fast to keep up...with you.

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## Magnificent Marty

(Cont. from pg. 4)

our FM tower.

Besides the length of run up the tower, there was another 100-foot run to the building roughly totalling 400 feet of transmission line from antenna-to-receiver. To minimize loss, I used some surplus 7/8-inch foam transmission line which I got at a bargain. However, now I feel that a low-loss 1/2-inch line would have been adequate and a lot less expensive!

Inside the studios, we had a conventional rack-mounted Marti receiver outfitted with a very unconventional antenna preamplifier. It was a 72-ohm VHF-UHF wide-band TV pre-amp, modified by removing the input balun which conveniently reduced the input impedance to 50-ohms. As things turned out, this pre-amp was one of the best experiments we ever did, as we will discuss later.

From the remote site our Marti RPT-40 Transmitter was installed in the back of a full-size Plymouth Voyager Van equipped with a special AC-DC power harness. When the van's 100-foot multi-cabled "snake" was led into the gymnasium and connected to an AC outlet, the transmitter operated on 120 volt AC power. If we lost power for any reason at all, a relay mounted in an outlet box in the van would instantaneously switch the transmitter over to the van's 12-volt battery, eliminating going off the air for several minutes when someone kicked out our plug!

The snake I refer to was a hundred feet of Belden 9775 cable (9-shielded pairs, 18-gage stranded wire, about 3/4 inch thick) which was wound on an 18" hand-crank reel mounted in the right-rear corner of the remote van facing a 4" x 4" door in the van's side from which the snake was dispensed. One end was terminated in a multi-pinned military-type female chassis connector mounted in the side of the heavy-duty reel itself. The mating male connector attaching the van harness to the snake reel had to be detached in order to roll-up or unroll the snake, then simply plugged-in making all circuits operational between remote site and the van!

Here's a run-down of snake's utilization. First of all a pair of belfoil-shielded wires to bring the 120 VAC through the Potter-Brumfield relay into the Marti RPT-40 transmitter and also to light a 60 watt bulb to

light the van without using the battery to power the dome lights. Shielding the AC leads as well as all the other pairs in the snake virtually eliminated any AC hum being induced on the audio circuits over the long run of the cable, even when feeding low-level mike audio (which we rarely ever did).

Another pair of shielded wires tapped into the van's AM-FM radio to provide a monitor at the working-end of the snake. Three-pair of shielded wires were terminated with 3-pin XLR audio connectors which plugged into the Marti inputs. Yet another pair plus one extra wire was attached to a 4-pin XLR connector to mate with channel #1 of the Marti which is a "Push-to-talk" mike input. A switch at the other end shorting that fourth-pin to ground keyed the transmitter wire of this pair wire the ungrounded side of the Marti monitor jack with the return accomplished through the common ground to the system. Though it is not very high level and would not normally be used to monitor, it is most helpful as a check on proper modulation of the transmitter, especially distorted, over-modulation.

For talk-back with the station, one of the nine pairs in the snake was connected to a Sub-Carrier Receiver in the van crystal-tuned to our stations SCA channel to receive talk-back from the studio. This loads the snake with 8-pairs being utilized plus one pair kept in reverse in case of an emergency. All these inter-connecting cables were connected to their respective mating connectors on the Marti and various other equipment in the van from the reel.

At the "performing end" of the snake was a large 18-pin Jones Plug (male) which plugged directly into the back of a Shure M-67 mixer specially modified with Jones female chassis connector mounted in the rear of the mixer. You might say our motto was, "One plug does it all!", for when the plug was inserted just about everything was ready to go.

The mixer served as the AC source for the snake-fed Marti out in the van. (When AC was lost, the M-67 also kicked over to its own back-up battery pack was per its originally design.) The Shure mixer's output was directly fed to the "Line-In" of the Marti. The van's AM/FM radio came up on the M-67's monitor phone jack when plug was pushed all the way in...and the Marti monitor camp up when the plug was pulled out to the second notch of the two-

position headphone jack. A mini-toggle switch installed on the back of the mixer turns transmitter in van "on" and "off". Levels on transmitter are set by using the 1 KHz tone on the Shure Mixer, first setting the Shure master level to 0 VU, then setting Marti Input 4 control to 0 VU on its meter. The gated level control of the RPT-40 easily keeps levels where they belong without over-modulating.

Program monitor from AM/FM radio and SCA Talk-Back can be fed to announcer by means of stereo headset using the right side for monitor and the left side for talk-back.

Meanwhile, back out at the van, we have one more thing to do to make our remote system operational: set-up the antenna, we used a conventional YC-150 Marti 9 db gain antenna, vertically polarized with the gamma match upwards. It was mounted on a Rohn Model H-50 fifty-foot telescoping mast dropped into a three-inch galvanized pipe installed in the center of the van between the floor and the roof with bolt-on pipe flanges and an oil tank filler cap at the top to keep it dry. The fit is reasonably snug to hold it securely. The RF output of the Marti Transmitter was run inside the van up to an Amphenol UHF Straight Jack mounted through the roof. Fifty feet of low-loss RG-8 transmission line is attached to the yagi, the four 10-foot sections of the mast were raised one-at-a-time with a pin inserted through holes in the mast to secure each section, and the other end of the coax is connected to the straight jack in the roof of the van, and we are ready to fire-up the transmitter and orient and antenna toward the station.

Orientation is not very critical until you get 15 or 20 miles from your receiving antenna. One way to orient the antenna is a simple, logical way... with an ordinary road map and an inexpensive compass. If geometry or geography is not your thing, a simpler way to orient your antenna is by making use of talk-back feature of this system mentioned earlier. A through-over switch at the station will switch the SCA's audio from the talk-back mike itself to the output of the Marti receiver directly and, by wearing a headset and listening for maximum signal as you swing the yagi around in the general direction of the station. You'll need normal modulation of the transmitter for, this, probably the 1KHz tone on the mixer, to have a noise reference level.

I'm sure while you were reading

(cont. to pg. 14)

# Famous "Buchanan Hammer" Truckload Sale!



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a gulton company

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TFT

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Technics  
TOA

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Sigma  
SSAC  
Stancor

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GLB (Preselectors)  
Marti  
Scala (Antennas)

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Advanced Micro-Dynamics  
Delta  
Gentner  
Marti  
Potomac  
Symetrix  
TFT

### SCA EQUIPMENT

Anixter-Mark  
Broadcast Electronics  
CRL  
Fairchild  
Marti  
McMartin  
Microdyne  
Modulation Sciences  
Scientific Atlanta  
Wegener

### STUDIO FURNITURE

A-Line  
Fidelpac  
LPB  
Micro-Trak  
Omni-Mount  
PAS  
Radio Systems

### STUDIO-TRANSMITTER LINK

Marti  
Scala (Antennas)  
TFT

### SURGE PROTECTORS

Dale  
Eagle Hill

### TAPE CARTRIDGE MACHINES

Audi-Cord  
Broadcast Electronics  
Dynamax  
Key Cart  
Otari  
Ramko  
Tapecaster

### TAPE ERASERS & ACCESSORIES

Broadcast Electronics  
Editall  
Fidelipac  
Garner  
Nortronics (Heads)  
R.B. Annis

### TAPE RECORDERS & PLAYERS

Fostex  
Otari  
Revox  
Studer  
Tascam/Teac  
Tape-A-Thon  
Technics

### TELEPHONE INTERFACES

Audio-Metrics  
Comrex  
Elgin  
ESE  
Gentner  
Russco  
Symetrix  
Telex  
Tellabs  
Zercom

### TEST EQUIPMENT

Autogram  
B & K  
Coaxial Dynamics  
Digi-Max  
Electro Impulse  
Fidelpac  
Fluke  
Potomac  
Sennheiser  
Simpson  
Tektronix  
Xedit

### TONE ARMS

Audio-Metrics  
Audio Technica  
Broadcast Electronics  
LPB  
Micro-Trak  
Russco  
Technics

### TOWERS & ACCESSORIES

Duro-Test (Beacons)  
Fortworth  
Kintronics  
Micro-Trak (con  
Pi-Rod  
Rohn  
SSAC (flashers)

### TUBES & TRANSISTERS

Amperex  
Econco  
Eimac  
General Electric  
National  
NTE  
Phillips  
RCA  
(and All Major Brands)

### TURNTABLES

Broadcast Electronics  
Numark  
QRK  
Rek-O-Kut  
Russco  
Technics

### TURNTABLE CARTRIDGES & STYLI

AKG  
Audio Technica  
Pickering  
Shure  
Stanton  
Technics

### TURNTABLE PREAMPS

ATI  
Audio-Metrics  
Broadcast Electronics  
Micro-Trak  
Radio Systems  
Ramko  
Russco  
Shure  
Stanton

### TRANSMISSION LINE & CABLE

Andrew  
Belden  
Cablewave

### TRANSMITTERS-AM

CCA  
LPB

### TRANSMITTERS-FM

Broadcast Electronics  
CCA  
Energy-Onix  
Q.E.I.

### WEATHER RADAR & EQUIPMENT

Gorman-Redlich  
Rodco  
Si-TeX (Radar)  
Taylor (Instruments)

# E.I. Spotlight on New Products

## PC programmable controller

Potomac Instruments' new 1500 PC Programmable Controller is an 8085 microprocessor based unit which functions as a stand alone intelligent controller.

It may be linked via land line or radio to the optional 1510 ST Studio Terminal for automatic remote control applications.

## Mic preamp

ATI introduced a new microphone amplifier, the M100. It is an extremely low noise, high CMR, direct balanced input instrumentation amplifier, according to the company.

The M100 boasts servo operating point stabilization, and drives a distortion-free transformer isolated line output.

Features include a variable gain input, switchable limiter, two pole active low cut filter and 48 VDC phantom power.

## TSL system

TFT's new 8700 series TSL system was designed for use in the 450 MHz group "P" frequencies. Up to four users can share a single TSL system.

This data multiplexing system employs DTMF codes to open the squelch of the proper receiver in the network at the proper time.

A data stream is then sent at a rate of up to 1200 baud from the shared central transmitter to one of the receivers.

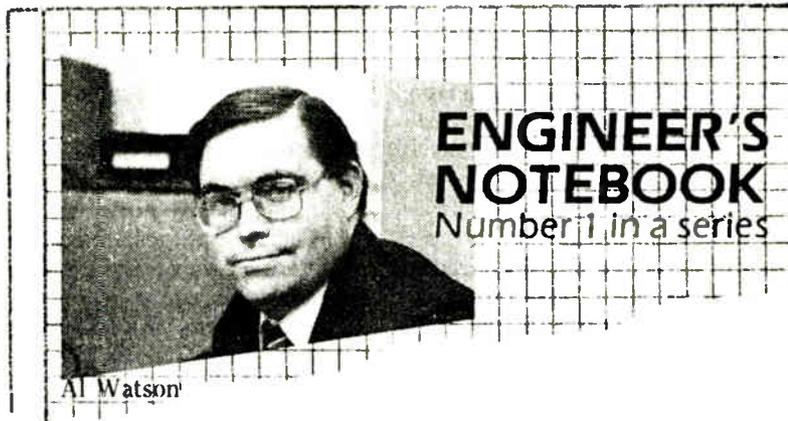
The basic price for this system is \$2750. The DTMF option is an additional \$920 for the transmitter and \$420 for the receiver.

## Four-track recorder

Studer Revox's new A807 4½" VUK 4-track machine is available in the line's high speed version with overbridge metering. It features three speeds and servo controlled DC capstan motor and spooling motors.

TITLE N/DYM

Project RE45



## N/DYM™ Technology Comes to Broadcast Microphones

By Alan Watson, Director of Engineering  
Electro-Voice, Inc.

Those familiar with the benefits enjoyed by musicians through the new neodymium-magnet microphones have no doubt predicted that the new technology would soon be available in broadcast microphones. And now, with the advent of the Electro-Voice RE45N/D hand-held shotgun microphone, the prediction has come true.

The advantages N/DYM™ technology brings to broadcasting are significant. Above all, it gives us a microphone with the high output previously available only from condenser mics—but without the problems of dead batteries, noises caused by poor ground connections in phantom-powering, humidity damage, static electricity, and poor rf rejection.

The Alnico magnets used in most dynamic mics yield a sensitivity of 6 dB less than would be possible if the steel parts of the magnetic structure could be completely saturated with the field. Increasing the Alnico magnet size does not work since the added size interferes with the acoustic design of the mic. Neodymium magnets, however, are so powerful that the magnet can be far smaller and still provide the "lost" 6 dB of sensitivity.

N/DYM Technology extends far beyond a mere substitution of magnetic material. To maximize the new opportunities, Electro-Voice engineers found that the ideal neodymium magnet shape is one with a thin, wafer-like configuration.

This permitted using a voice coil and attached dome of far larger diameter while reducing the surround—yielding important added advantages for broadcast engineers: a smoother, more evenly contoured pickup pattern with extended high- and low-frequency response and better rejection of unwanted noise from the sides.

For more information, please write to us for the specification sheet and brochure on the RE45N/D—the broadcast industry's first N/DYM dynamic shotgun microphone.

**Ev** Electro-Voice®  
a MARK IV company

BROADCAST/PRODUCTION MICROPHONES

*Quality-made in the U.S.A. since 1927*

## FCC Proposes Liberalizing FM Spacing

### Downgrades and Contour Computations Get Attention Also

The FCC has proposed changes to its rules that would authorize the use of directional antenna systems, or lowered power and/or antenna height, to reduce spacing between an FM station and its adjacent and co-channel neighbors.

Although short spacing would be permitted on existing channel allotments, the Commission has firmly rejected any deterioration of short spacing in the initial allotment process. Short spacing privileges would be extended to all commercial FM stations if they could provide the required signal level over their community, while protecting adjacent and co-channel station, and new channel allotments. The FCC proposal represents a radical departure from its previous refusal to consider interference protection to other stations in its assignment process. Previously, only non-commercial stations and "grandfathered" commercial stations were permitted to employ directional antennas for interference control. If adopted, the new rules will present many opportunities for FM stations that wish to change to more favorable transmitting locations to adapt to coverage requirements of their communities and survey areas. It will, however, be necessary to demonstrate that any new channel assignment being requested can operate at full facilities without the directional antenna option, and still meet all FCC requirements from some location, before the channel is assigned.

In a related matter, the FCC proposed to simplify the process for stations wishing to downgrade their facilities. At present, it is necessary to file a Petition for Rule Making if a station wishes to downgrade from say Class C to C1. Under the new procedure, only an application for the new facility would be required, and the downgrading would be automatic upon its grant. This freedom would be especially helpful to stations attempting to locate new transmitter sites to give them their most cost-effective market coverage.

In the future, the FCC proposes that all coverage maps for FM stations will be computed using a single standard computer algorithm. At present, the primary reference is a set of curves that must be visually read, even though the FCC and most consultants have their own computer

programs to do the job. The new procedure would eliminate the small differences that occur in this process, some of which have led to expensive and time consuming litigation. Most licenses and applicants will see no significant impact from this change.

\*\*\*\*\*

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**Broadcast Audio Consoles**

**Audio Processors**  
**Modular Distribution Amplifiers**

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

### New NRSC Stations... **WBBM, WHO, WCCO, WHAS Join the 'KLUB'**

737 AM stations have already adopted the new NRSC Standard for improved audio quality, including these stations which have recently reported their adoption of the Standard:

WRRX, Tuscaloosa, AL; KFBK, Sacramento, CA; KSTR, Grand Junction, CO; WRFM, Miami, FL; WMOG, Brunswick, GA; WBBM, Chicago; WHO, Des Moines; WHAS, Louisville, KY; WCGW, Nicholasville, KY; WCMD, LaPlata, MD; WCCO, Minneapolis/St. Paul; KCUE, Red Wing, MN; KMTW, Las Vegas; WLXN, Lexington, NC; KQDJ, Jamestown, ND; KLUB, Salt Lake City; KUDY, Spokane, WA; WATW, Ashland, WI. Also: CJCY, Medicine Hat, Alberta; CJVI, Victoria, BC; CHSM, Altoona, Manitoba; and CJBQ, CJTN and CJNA, Belleville, Ontario.

\*\*\*\*\*

## NAB Asks FCC to Prohibit Interference - Causing Devices

WASHINGTON, Mar. 10--The National Association of Broadcasters has asked the Federal Communications Commission to amend its rules to bar nonlicensed radio frequency devices from using broadcast bands allocated to the AM, FM and television services. Such devices, which can cause interference to station signals, include wireless microphones, personal computers, garage door openers and home security systems.

NAB Regulatory Review Committee Chairman Ray Lockhart, president and general manager, KOGA AM/FM, Ogallala, NE, said, "The changes that the FCC has proposed to remedy the problem are not adequate. What is needed is an outright prohibition in order to assure that these devices do not cause interference to radio and TV signals."

The Commission has proposed to amend its rules to "promote more effective use of the spectrum while providing additional...flexibility in the design, manufacture and use of such devices." In its filing, NAB said a more effective approach would be to prohibit their use in the allocated broadcast bands.

NAB also said that the Commission cannot rely on an absence of complaints to infer that interference does not occur. It noted that an NAB study regarding AM band reception showed that none of the consumers surveyed indicated that they would complain to the FCC when interference is experienced. The Association said this result also could apply to interference in the FM and television bands.

NAB said it agrees with the FCC's grandfathering proposal to minimize the impact on equipment manufacturers. However, it said that the suggested 10-year period is excessively long and proposed five years, instead.

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## Broadcasters' Towers Raise Complaints FAA Gets New Penalty Authority

(Reprinted from *Broadcaster's Technology Update*, an LBA Group publication)

Broadcasters and other FCC licensees were put on notice by FCC's Field Operations Bureau that recently discovered nationwide laxness in conforming to FAA tower regulations would not be tolerated. In recent inspections, FCC engineers found that 13% of the stations inspected had problems with their lighting systems and 27% had painting problems, severely compromising tower visibility. Worse, 50% of the lighting violations had not even been reported to the FAA, as required by law.

FCC rules require licensees to inspect tower lights daily and report malfunctions within 30 minutes to the nearest FAA Flight Service Station. In addition, licensees are required to maintain all aspects of marking and painting within their license specifications, and must make and log a 90 day check of tower conditions. Where several licensees share a tower, all are responsible for FCC/FAA compliance. Since maintenance of these standards is critical for aviation safety, FCC expects to step up enforcement and forfeiture action in the near future.

Aeronautical safety requires that towers over 500 feet be checked with special care, since such tall towers protrude into most used flight altitudes and have more complex lighting systems. Many tall towers have been built recently by independent UHF-TV operators and upgrading FM stations. Unfortunately, many of these operators have minimum technical budgets, low technical personnel competency, and a general lack of concern for compliance in technical areas. In a recent spot check, 8 strobe-li-towers over 1000 feet high were identified from the LBA Group aircraft on a night flight. Four had some apparent strobe-lighting defect. The two worst offenders were known to be FM upgrade structures over 1500 feet high. This is an extremely dangerous situation that the industry should be well aware of, if for no other reason than the potential liability to the tower owners and occupant licensees. An inadvertant air collision with an improperly marked tower can expose owners and licensees to multi-million dollar liability judgments. While checking your technical procedures to

minimize risk, also check the adequacy of tower liability insurance coverage.

The Congress has also become concerned about tall structures in the national air space, and in recednt aviation legislation (HR2310) has ordered the Department of Transportation to consider if tall structures reduce safety or capacity of the national air space plan. It orders the notice to DOT of the construction of buildings (notice of towers is already required) that may limit safety or efficiency of the aviation system. Moreover, Congress mandated civil penalties of up to \$1,000 for failure to notify the FAA of proposed construction of towers posing a potential hazard to air navigation.

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## Post Those OSHA Forms; Time for Ownership Reports for Some States

Legally speaking...If your TV station has 11 or more employees, remember to post OSHA Form 200 (log and summary of occupational injuries and illnesses) or comparable state form, during entire month of February, starting Feb. 1...Iowa and Missouri stations: Remember to properly post your new license by Feb. 1...Arkansas, Louisiana, Kansas, Mississippi, Nebraska, New Jersey, New York and Oklahoma TV stations: Also by Feb. 1, file your Annual Ownership Report on revised FCC Form 323. If report on file with FCC is complete and accurate, you need only certify that with FCC.

\*\*\*\*\*

## RADIO SYSTEMS



### FUNCTIONAL SIMPLICITY

#### DA-16 Distribution Amplifier

The DA-16 provides 8 stereo or 16 mono, independent audio outputs from one input. The RSDA-8 provides 8 mono outputs. Each output is completely isolated and has an individual level control. A single feed can be routed to multiple locations of varying level requirements and impedance, protecting the integrity of the signal quality through every output.

#### DA-16

Mfg. list .....\$425.00 Sale price .....\$318.75

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# 4th of July Fire Cracker Sale!

From now to the 4th of July -  
**15% Off E.I.'s regular low prices on minimum order of \$50.**

| Cartridge                       | E.I.       |        | STANTON          |            | E.I.   |  |
|---------------------------------|------------|--------|------------------|------------|--------|--|
|                                 | Reg. Price | List   | Stylus           | Reg. Price | List   |  |
| 500 (all)                       | --         | --     | D5127 (78 rpm)   | 11.95      | 19.60  |  |
| 500A                            | NA         | NA     | D5107A           | 7.95       | 12.00  |  |
| 500A MkII                       | 13.95      | 37.50  | D50A MkII        | 7.95       | 12.00  |  |
| 500AL                           | 15.95      | 53.00  | D5107AL          | 7.95       | 12.00  |  |
| 500E MkII                       | 12.95      | 45.00  | D50E MkII        | 8.95       | 15.00  |  |
| 500EE MkII                      | 16.95      | 50.00  | D50EE MkII       | 10.95      | 20.00  |  |
| 600A                            | NA         | NA     | D6071A           | 12.95      | 20.25  |  |
| 680/681 (all)                   | --         | --     | D6810 (mono)     | 18.95      | 30.00  |  |
| 680/681 (all)                   | --         | --     | D6827 (78 rpm)   | 18.95      | 30.00  |  |
| 680EE                           | 34.95      | 76.00  | D680             | 19.95      | 31.25  |  |
| 680EL (w/2 styli)               | 61.95      | 106.00 | D6800EL          | 19.95      | 30.00  |  |
|                                 |            |        | DP6800EL (3-pak) | 53.95      | 90.00  |  |
| 681A                            | 60.95      | 88.00  | D6807A           | 21.95      | 32.40  |  |
| 681EE                           | NA         | NA     | D6800EE          | 24.95      | 39.00  |  |
| 681EEE MkIIs                    | 64.95      | 120.00 | D6800EEE MkIIs   | 27.95      | 45.00  |  |
| 681SE                           | 59.95      | 110.00 | D6800SE          | 25.95      | 39.00  |  |
| (Stanton derivative cartridges) |            |        | D51              | 10.95      | 23.00  |  |
| (Stanton derivative cartridges) |            |        | D65-2            | 19.95      | 33.00  |  |
| L727E                           | 19.95      | 75.00  | D72E             | 12.95      | 24.50  |  |
| 981 MkII (HZ or LZ)             | 96.95      | 250.00 | D981Is           | 62.95      | 90.00  |  |
| <b>SHURE</b>                    |            |        |                  |            |        |  |
| M3D                             | NA         |        | N3D              | 7.95       | 20.95  |  |
| M44-C                           | 19.95      | 54.95  | N44-C            | 11.95      | 24.95  |  |
| M44-E                           | 22.95      | 61.95  | N44-E            | 13.95      | 27.95  |  |
| M44-3 (78 rpm)                  | 19.95      | 54.95  | N44-3 (78 rpm)   | 11.95      | 24.95  |  |
| M44-7                           | 19.95      | 54.95  | N44-7            | 11.95      | 24.95  |  |
| M70B                            | NA         | NA     | N70B             | 5.95       | 16.95  |  |
| M78E                            | NA         | NA     | N78E             | 18.95      | 34.95  |  |
| SC35C                           | 33.95      | 48.50  | SS35C            | 12.95      | 18.50  |  |
| SC39B                           | 46.95      | 68.00  | SS39B            | 18.95      | 27.80  |  |
| SC39EJ                          | 52.95      | 76.00  | SS39EJ           | 23.95      | 34.90  |  |
| BC70 (w/3 styli)                | 62.95      | 90.00  | SS70 (4 pak)     | 56.95      | 82.00  |  |
| BC80 (w/3 styli)                | 87.95      | 126.00 | SS80 (4 pak)     | 78.95      | 114.00 |  |
| BC90 (w/3 styli)                | 87.95      | 126.00 | SS90 (4 pak)     | 78.95      | 114.00 |  |
| <b>AUDIO-TECHNICA</b>           |            |        |                  |            |        |  |
| ATP-1                           | 24.95      | 45.00  | ATP-N1           | 12.95      | 25.00  |  |
| ATP-2                           | 32.95      | 60.00  | ATP-N2           | 19.95      | 35.00  |  |
| ATP-2XN (w/2 styli)             | 48.95      | 90.00  | ATP-N2           | 19.95      | 35.00  |  |
| ATP-3                           | 43.95      | 80.00  | ATP-N3           | 25.95      | 50.00  |  |

**Electronic Industries Incorporated**

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# MEMO FROM METZ



by  
David L. Metz

## “CAVITY FILTERS or what to do after you drink the fruit juice”

Here we go again into the Metz vault of radio frequency golden oldies. I built my first cavity filter in 1962 at the age of 14. I needed something cheap that would stop the harmonic emissions of my homebrew (home made) six meter (that's the 50 MHZ ham band kids) transmitter. I had a desperate need for a filter that would pass my signal and stop everything else cold.

A good Drake low pass filter cost about 500 weeks allowances so out came the good old American Radio Relay League Handbook. With the help of a fine old gentleman Mr. John Wickey, WOCUQ, I came up with my first cavity filter.

I don't see the cavity filter much anymore today. The modern helical resonator and the cavities close relative, the strip line filter, have replaced it in many applications. If you need something quick and cheap however....

The circuit is figure 1. L1 and C1 make up a resonate circuit at the desired operating (passband) frequency. I.2 & I.3 couple the radio frequency energy in and out of the filter.

We made the filter out of two five pound coffee cans soldered end to end. A scrap of 1.5" copper water pipe because I.1. Some relic of W.W. II volunteered a 50 PF variable capacitor to resonate the thing and two SO-239 coax connectors. I.2 and I.3 were four inch pieces of number 12 copper wire.

The damned thing worked so good that I painted it with black crackle paint to cover up the Volgers logo on the cans. I used it right up till I shut down my six meter station for good five years ago. The “Q” on these filters is fantastic. Insertion loss measured around 1 DB. At 57 MHZ the attenuation exceeded 50 DB.

If you have access to lab equipment, try experimenting with the size

and position of the coupling loops I.2 & I.3. These have some effect on the bandwidth and loss of the filter. The closer they are to L1, the less the loss, but the wider the filter will be.

When I first got into broadcasting I had the reverse problem. The station had a primitive VHF remote receiver with a front end as wide as a barn door. Anything transmitting even close to our operating frequency screwed the receiver (and our remotes) up.

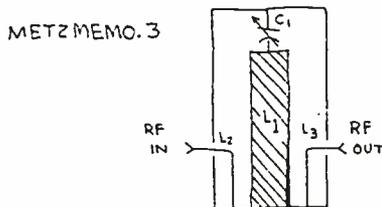
Till we bought the new Marti, the solution sat on top of the rack. A cavity filter made from a orange drink can. A half inch copper pipe became L1, I used a 20 PF piston trimmer for C1. BNC connectors and number 14 wire made up I.2 & I.3.

This thing tuned so sharp that at first I thought it passed RF about as well as a grounded copper sheet. As long as the temperature didn't vary, the cavity stayed on frequency and kept the garbage out of our receiver.

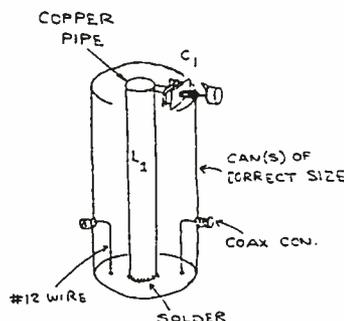
Over the years I inspired others to build these things. The biggest one cleaned up the harmonic emissions of a 28 MHZ SSB transmitter. The cavity started off life as a 35 gallon oil barrel. L1 was a piece of copper down spout, honest! The more conventional fruit juice filter cleaned up the front end of a few FM broadcast receivers. There is still no substitute for front end selectivity to get clean reception.

I've never built one of these for 460 MHZ. I suppose a bean can (baked) would be about right. Be sure to wash the can out if you try it.

\*\*\*\*\*



CAVITY FILTERS



## Magnificent Marty

(con't from page 6)

this article, the wheels of your mind were turning and you were coming up with all sorts of variations of this system such as a wireless mike, or a hand-held Marti transmitter to feed the van its audio...or possibly a neumatic tower which requires no muscle-power to raise...or maybe just the fact that if your station is an AM only station you'll have to figure out a totally different system of talk-back to complete this system. In fact, Ed Duellman, one of our columnists, has an ingenious system like that and possibly he'll share that with us in a future issue of Common Point.

This system extended the range of our Marti to well beyond 50-miles. Our longest shot was from Fond du Lac to Kewaunee, some 74 air miles! Our second longest distance from Clintonville to Kewaunee was 63-miles. In fact, just as an experiment, we drove the van up on Rib Mountain (not really a mountain but a large hill with an elevation of 1,924' above sea level) in Wausau, Wisconsin and produced a very usable signal 150 miles away! By the way, our Marti receiving antenna was about 1,015 feet above sea level. But I am sure that if most broadcasters could extend their Marti's range to 35 or 40 miles, that improvement would be most appreciated and, above all, would lower station expenses for phone lines each month particularly for sports play-by-play broadcasts!

Marti, Shure, and the other manufacturers mentioned in this article have made improvements in their products and have made available new products which would certainly up-date this mid-1970 technology, such as the Shure 267 Gated Mixer and UHF Antenna pre-amps specifically made for this purpose. The pre-amp I modified with the help of the manufacturer turned out to be the biggest rason for our excellent range, but also made our system subject to occasional interference from closeby police and railroad two-ways when we had a long shot to make. A resonant-cavity took care of this problem, but today probably would not even be necessary with the proper pre-amp properly matched at both ends, and with the proper terminations.

If you are interested in more information on your Marti system, or have any questions regarding this system, please give me a call at Electronic Industries, Inc. on our toll-free numbers: Out-of-State (800) 558-0222 or In-State (800) 445-0222. I'll be happy to help you any way I can.

\*\*\*\*\*

## EI Classifieds

EI Classifieds are free to the readers of Common Point Magazine. To place an ad, simply write it on the Acknowledgement Card that comes with each issue and mail card.  
**WANTED TO SELL**

**WANTED TO SELL:** ITC 750 Reproducers, good condition, 3 available, \$400 each, Ampex 350 with Inovonics 360 electronics, stereo, heads need refurbishing, \$500; studer A725 CD player with digital speed control, very good, \$700; gates exec. console, presently on-air, available about July 15, most original pre-amp/amp cards replaced with Altec modules, \$1500, with some spare parts; IBM system 24 computer, main frame only, no peripherals, with spare hard drives and other subassemblies, \$500, you ship, 515-621-6960, WUBE/WDOJ, 225 E. 6th St. Cincinnati, OH 95202.

**FOR SALE:** McMartin 802 - stereo console extra input and output cards and P.S. Regulator \$1,000.00. (612) 529-1003, 2105 Fremont N. Minneapolis, Mn 55411.

**FOR SALE:** X-tel Alt printer, 2-Belden 50 ohm RG-8, 3 foot connectors, w/ends, 402-379-3300, Box 937, Norfolk, NE 68701.

**WANTED TO BUY:** Gates BC-1H, any condition, need for parts, KGAI, Albany, OR, 503-926-8683.

## TALKBACK

**DULUTH, MN**--I always look forward to each issue. Your doing a nice job.

**WICHITA, KS**--Keep up the good work.

**BELGRADE, MT**--It's great!

**LEITCHFIELD, KY**--Great mag. thanks.

**MADISON, WI**--Enjoyed the "Ferrite Beads" info. More columns like this are welcome reading.

**SHELBYVILLE, IL**--Like Article on Ferrite Beads!

**BE 12C** turntables with Rec-o-Kert 12" Arms and stanton cartridges, DEMO's \$300. Electronic Industries.

Annis Han-D-Mag Head de magnetisers, \$28.95. Electronic Industries.

AKG, K-18 lightweight dual headset with noise cancelling dynamic boom microphone. List at \$75.00 - sell for \$49.00. Telex CS-91 Spots-caster Headsets \$99.95, Call Electronic Industries at 1-800-558-0222 out of state, or 1-800-445-0222 in Wis.

Why Pay  
**\$29.95**

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Electronic  
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**APRIL SPECIAL:**

10 foot long jumpers  
with male N connectors  
on each end....

**\$9.95** each  
you can cut them up to  
any other length

**FOR SALE:** A 500 ft. Utility 540 42" face tower. Good condition, with lights. Also 375 ft. HJ-50 Andrew 3" transmission line, with hangers. 402-371-0780, WJAG/KEXC 309 Braasch, Norfolk, NE 68701.

# With our Automatic Remote Control System your transmitter – and your personnel – will operate with increased efficiency

Have you ever wondered if your night operator will remember ... to switch patterns at sunrise? ... to periodically check critical levels? ... the correct transmitter restart sequence? You'll never have to worry if Potomac Instruments' RC16+ is on the job. Because it'll do all these tasks for you. Plus a lot more. Automatically.

With its microprocessor based control logic, the basic RC16+ provides 16 telemetry channels with automatic out-of-tolerance alarms and remote raise/lower controls;

plus 16 status channels. The automatic functions — pattern shift, transmitter restart, power control — are pre-programmed in accordance with station license requirements and controlled with an accurate master clock.

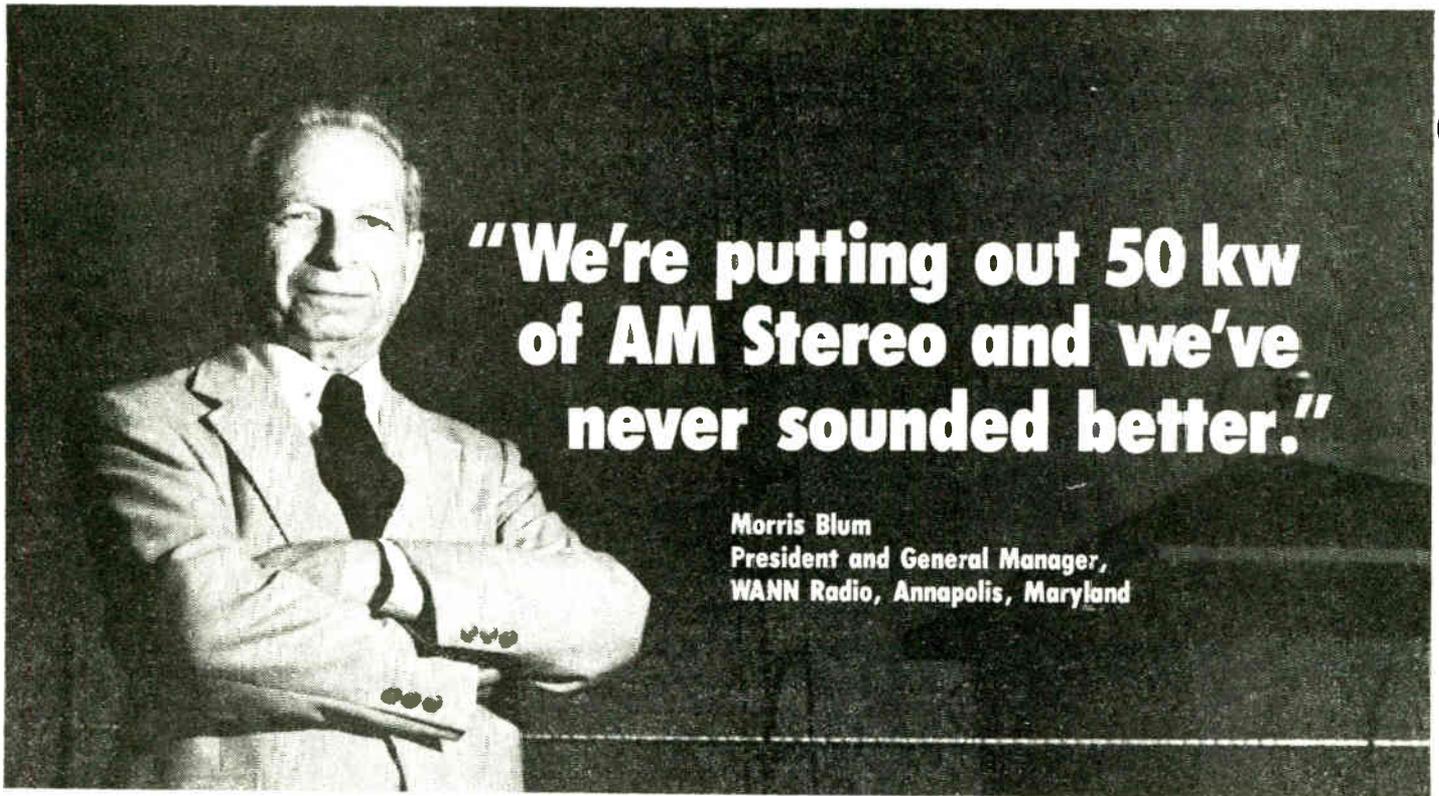
The RC16+ is also expandable. In 16 channel increments, up to a total of 64 channels. With the remote video display option your chief engineer can get a detailed readout of all measured parameters. It's updated every 30 seconds and connects to any standard telephone. The optional plug-in automatic logger provides a permanent record of all transmitter activity. Log intervals, sequence, and alarm flags are user-selectable.

And, best of all, the RC16+ is cost effective. No other unit on the market offers these features and capabilities at this low price.

|                                 |            |
|---------------------------------|------------|
| Basic System .....              | \$4,995.00 |
| Additional 16 Channels .....    | 1,865.00   |
| Plug-In Automatic Logger .....  | 2,499.00   |
| Remote Video Display Unit ..... | 650.00     |



## POTOMAC INSTRUMENTS



**"We're putting out 50 kw of AM Stereo and we've never sounded better."**

**Morris Blum  
President and General Manager,  
WANN Radio, Annapolis, Maryland**

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

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

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

**"And Of Course, We're In Stereo"**

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

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

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

**"Naturally, I Chose Delta Electronics"**

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

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

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

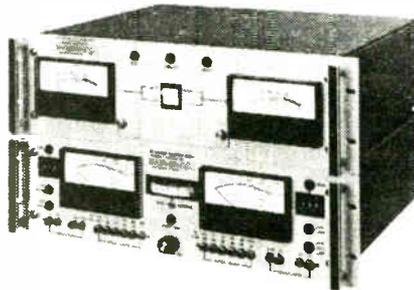
"Even better, Delta stands behind it with full technical and service support. Any problems or questions—I just pick up the phone. They're always ready to help.

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

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

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

**Call for a quote!**



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

Electronic Industries  
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**DELTA ELECTRONICS**

