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the technical journal
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Broadcast Engineering

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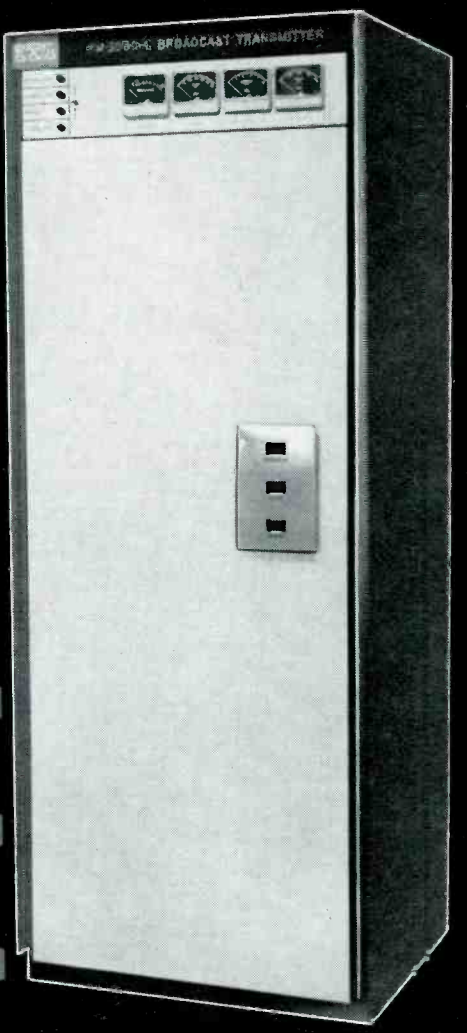

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Broadcast Engineering

Volume 4, No. 10 **OCTOBER, 1962**

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Translator News

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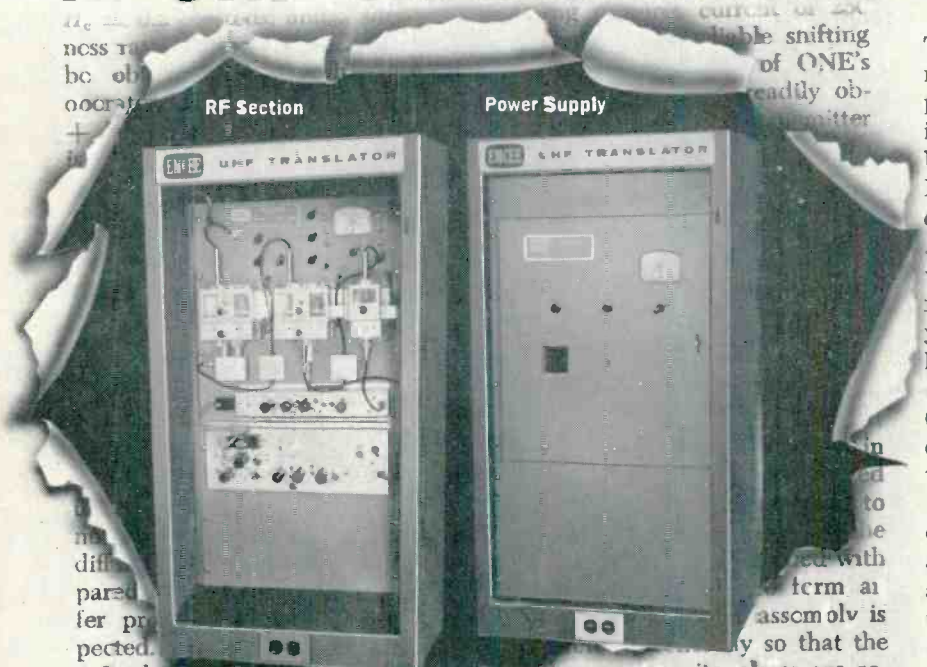

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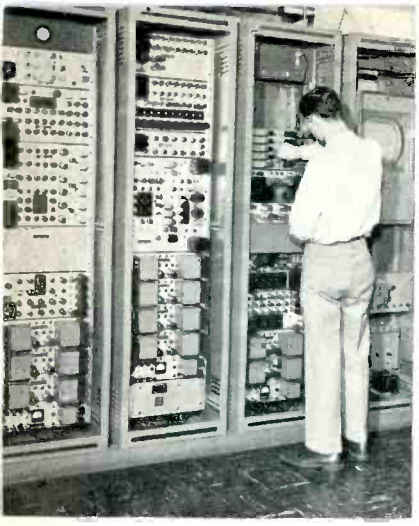

Color TV transmitter in the Sams plant is typical of technical facilities.

A Message from the Publisher

Effective with this issue, BROADCAST ENGINEERING will be published from the Indianapolis headquarters of Howard W. Sams & Co., Inc. This move, a result of the recent acquisition of Technical Publications, Inc., of Kansas City (See May, 1962 issue) will allow BROADCAST ENGINEERING to even better serve your technical needs.

Our extensive technical facilities and highly-trained publishing and electronics personnel will be put at the disposal of BROADCAST ENGINEERING to enable it to fulfill its editorial goal:

To provide those interested in the technical phases of broadcast-communications with objective, impartial, and current data on all aspects of the industry.

All Sams Company products — PHOTOFACT Folders, PF REPORTER Magazine, technical books, etc. — are based upon actual experience with, and analysis of, the electronics equipment they cover. All our publications are presented in practical, down-to-earth language, are written by authors who have first-hand experience with the subject. This same publishing philosophy will apply to BROADCAST ENGINEERING, and some evidence of this is reflected in the editorial staff we have selected to cater to your needs. Of the four Editors now working on BROADCAST ENGINEERING, three hold first-class licenses (two of these have been broadcast engineers) and, collectively, they have worked with every known communications device.

You will be hearing from, and seeing, our Editorial staff. You can be sure of their intense desire to make BROADCAST ENGINEERING truly a publication serving all your technical needs. Some indication of this desire is found in the new format, four-color cover, and other improvements reflected in this issue.
We welcome your comments and suggestions.

Howard W. Sams

(LEFT) Here is just a portion of the vast array of equipment now available for editorial research by the entire staff of BROADCAST ENGINEERING magazine. (RIGHT) The new 200,000 sq. ft. headquarters from which BROADCAST ENGINEERING is now published.

NEW! IMPROVED!

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WINC SATELLITE REMOTE UNIT

*by Phil Whitney** — The mobile unit described here is adequate for use as a satellite, in emergencies.

To hold an audience today, a station must constantly change its programming concepts with an ear to the ground and an eye on community needs and desires. WINC has developed an effective device which facilitates fulfillment of FCC's admonition to serve the public interest. A fully equipped mobile broadcast unit (pictured in Fig. 1) was constructed by the station's own staff, including all equipment and the finished interior, at an appreciable saving. Many stations have attempted to do the job with equipment inadequate for the requirement, due to haste and limited expenditure. Properly equipped and always ready to roll, the WINC "Little Red Wagon" is as indispensable as a tape recorder in their day-to-day broadcast schedule.

The vehicle is a Chevrolet Corvair, but Ford, Volkswagen, and other manufacturers also build similar models. Some stations will prefer the "bus" type, with windows, but here the "van" style was chosen for two reasons: There is more room for billboarding the station call letters on the exterior sides, and there is more interior wall space for equipment, soundproofing, and decoration.

The operating table was constructed on pipe flanges bolted to the floor. One-inch-pipe legs were screwed into these, and the ¾-inch plywood table surface was fastened atop the legs. The table top was covered with "Formica." Thus, an immovable table was constructed which stays in place, holds equipment even over rough roads, and is always ready for use. The table is situated directly in front of the two side doors which open fully to reveal the front drop which covers the area from the floor to the table top. On this piece of hardboard are painted the station call letters, frequency, etc.

*Director of Engineering, WINC, Winchester, Va.

Fig. 1. WINC's Little Red Wagon is closed up and ready for a call to duty.

Equipment

Two Presto "Pirouette" turntables were mounted in the table top (Fig. 2). ESL pickup arms were selected, although there are many others which would work as well. This type is dynamically balanced in any plane. A slight spring pressure holds the needle in the record groove and allows the vehicle to be parked at any angle without effect. The author feels that the following is the minimum equipment for a properly equipped broadcast unit:

1. A 150-170 mc remote-pickup, broadcast - quality transmitter. (A 20- to 50-watt converted communications unit can be used.)
2. A transistor mixing console to handle two mikes, two turntable pickups, and a tape recorder or radio receiver.
3. Turntables and pickups with cartridges.
4. A converted Citizens-band transceiver for 26-mc "order wire."
5. 500 feet of No. 14 flexible 115-volt AC cord on mounted reel.
6. A portable 1-kw, 115-volt gasoline generator or a 250-watt inverter to furnish 120 volts AC from the vehicle battery.
7. 250 feet of reel-mounted zip cord to use for feeding remote telephone lines.
8. A transistor portable or car radio to receive cues for broadcast and to feed the public-address unit.
9. Transistorized 15- to 25-watt PA amplifier to operate from vehicle battery, with one or two horns either permanently

mounted on roof or demountable.

10. Mikes, mike extension cord (100 feet), stands, and rooftop antennas.

Also desirable but not as necessary are:

1. A battery-operated "standby" 150-170 mc transmitter with transistorized power supply.
2. An auxiliary yagi antenna and quickly-assembled mast for long haul pickups.
3. A 12-volt battery charger to remove load from vehicle battery during remotes where external 115-volt AC line is available.
4. A small limiter to prevent remote-pickup transmitter overload.
5. A small transistorized 26-mc converted "handy-talkie," with associated receiver mounted inside mobile unit. (Converted CB unit can be used.)

The console is shown in Fig. 3. It was built from transistors and easily-obtained parts. There are two similar pickup preamplifiers and one microphone preamplifier with switching and mixing facilities to handle two mikes, and a tape or 26-mc receiver. All preamplifier outputs are fed through the mixing pots and isolating resistors to a two-transistor program amplifier, the output of which is about +10 db with 3% (or less) distortion. Using the input and output transformers listed, overall frequency response should be within ±2 db from 50 to 15,000 cycles. A hi-fi system test record can be used to check out the system after it is completed.

Some stations prefer to purchase a mixer from a hi-fi shop, and adapt it to handle low-impedance mikes. In this setup, a transistorized, battery-powered mixer was selected. (It is often necessary to pick up a program, such as a football game, at a remote point where it is not possible or practical to secure or generate power.)

The "handy-talkie" and the Browning 26-mc receiver are used when it is necessary for an announcer to operate at some distance from the mobile unit. These units work well up to about a half-mile. The receiver can be equipped with a 500-ohm output transformer in the plate or cathode circuit of the output tube; or the cathode bypass capacitor can be lifted off ground and run to a terminal strip, so it provides cathode-follower output coupling.

When an experienced operator is at the controls, there is usually no need for a limiting amplifier. This unit, however, was designed to be operated by anyone available when the need should arise. Since it is easy to overmodulate a communications transmitter on tones of 100 cps and below, a simple, three-tube limiting amplifier (Fig. 4) was constructed and connected between the console and the transmitter. This device helps optimize the modulation percentage for the best signal-to-noise ratio, without the fear of severe distortion on bass notes. Jacks are provided at the input and output of all units so a quick rearrangement can be made in case of emergency.

Transmission Equipment

Now for the transmitter and receiver. Communications-bandwidth FM transmitters are found only on the surplus market (because of the recent FCC split-channel regulations); but even these older wide-band transmitters and receivers are no longer suitable. Broadcast remote pickup bands are, however, still wide-band by modern standards. In the 150-mc group of frequencies, shared with co[illegible] services, the permissible band[illegible] is 60 kc. In the new remote-pick[illegible], band near 161 mc, the bandwidth is 30 kc. Either of these is capable of rendering a better frequency response than a class "A" telephone line. By proper conversion of Link, Motorola, Federal, and similar equipment, a frequency response of ±2 db between 70 and 7500 cps is easily obtained and, in some cases, ±2 db from 40 cps to 20 kc is possible.

Conversion of these transceivers is not too involved. The units can be found in many radio and surplus stores, priced from $20 to $195. Conversion will cost between $50 and $200, depending upon condition, availability of materials, and the ingenuity of the engineers working on the conversion.

The 6- or 12-volt plate supply and relays are removed from the chassis, making room for a 115-volt AC supply. The modified supply must often furnish as much as 550 volts at nearly 300 milliamperes; although the voltage and current requirement will vary with the transmitter. The required data is usually listed on the genemotor, which is removed. To cut down on heat and increase overall efficiency, silicon diodes are used instead of vacuum-tube rectifiers, in both the

• Please turn to page 30

Fig. 2. Transistorized mixer is mounted flush in top of operating table.

MEASURING PHASE SHIFT BETWEEN STEREO CHANNELS

*by J. B. Hatfield** — This article describes a simple device — and its construction — for checking phase shift.

Broadcasters should attempt to achieve high standards in stereo broadcast transmissions. Considering the difficulties in obtaining high-quality stereo program material, and the shortcomings of some receivers, the above achievement takes on more consequences. One important consideration in stereo broadcasting is the proper measurement and maintenance of minimum phase shift between the Left and Right channels, from the audio system input to the input of the stereo generator in the transmitter.

An overall stereo system is based on in-phase signals producing the stereo effect by variation in the amplitude of the Left and Right channels. For satisfactory stereo, the integrity of the phase between Left and Right channels must be maintained.[1]

Theory of Operation

By definition, in keeping with FCC stereo standards, equal-amplitude Left and Right signals produce zero modulation of the multiplex channel by the L—R channels and maximum modulation of the main FM channel by the L+R channels.[2] An exaggerated example will show the effect of extreme phase shift on the FM stereo system. Fig. 1 shows the result of 60° phase shift between the L and R channels, as it affects the L—R multiplex channel. It can be seen that the L—R modulation under this condition is no longer zero, but is equal to either the Left or Right channel alone. This condition results in a false stereo sound, preventing true reproduction of the stereo program at the receiver.

Excessive phase shift between the L and R channels can develop in any part of the stereo broadcast system ahead of the stereo generator, due to faulty or dissimilar components or improperly engineered telephone circuits. It is therefore desirable to have some means of checking the phase shift periodically.

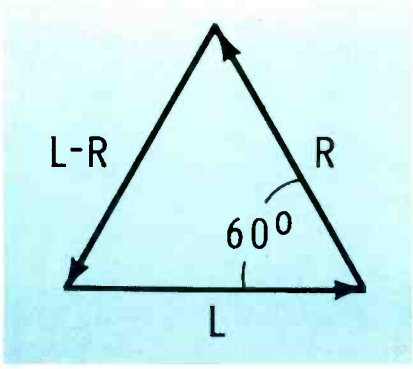

Fig. 1. Vector diagram showing effect of 60° phase shift on modulation.

If a noise-and-distortion meter or an AC VTVM is available, a simple phase-measuring device can be constructed for addition to such a meter. Emphasis will be placed on utilizing a noise-and-distortion meter since most stations have this type instrument on hand. In Fig. 1, the L—R voltage is equal to each of the L and R voltages, assuming that L and R are also equal. This condition provides a means of calibrating a phase meter when the L and R voltages are out of phase, or bucking each other. The simple device to be described will provide means of adjusting test tones on both channels so they are equal, and at the same time will utilize one of these voltages as a 60° calibrating point.

Circuit Details and Operation

Fig. 2 shows the circuit of the necessary calibrating equipment. The T pads cannot be of the step variety, but must be the continuous type, providing smooth control of the test tones. The T pads and 1% fixed resistors should all be of the same value, and, for broadcast purposes, 500- or 600-ohm units are suitable. T-pads 1 and 2, as utilized by the author, are of the sound-system type and are priced at about $3.00 each. The metal case on the unit (dotted line) is connected to the ground terminal of the noise-and-distortion meter. It is also wise practice to connect this terminal to a good ground, such as the station's equipment rack. As T-pads 1 and 2 provide the correct mutual termination on the output side, the high-impedance input of the noise-and-distortion meter should be used.

In making accurate phase measurements with this equipment, it is necessary to operate both T pads at a reduced setting, approximately one-half open, so isolation is offered to the switching of S1 and S2. After the above T-pad adjustments are made, a 1000-cps test tone should be fed simultaneously into the L and R inputs of the equipment under test, and the outputs of the equipment should be connected to the phase-measuring equipment as shown in Fig. 2. With S1 turned to the right channel and S2 turned to R2, adjust the calibrate volume control on the noise-and-distortion meter for full-scale deflection.

If the calibrate control will not bring the meter to full scale, increase the gain by turning the selector switch on the noise-and-distortion meter to a position that does produce a full-scale reading. Next, turn switch S1 to select resistor R1, and switch S2 to the left channel. T-pad 2 is now adjusted so a full scale reading is obtained, without making any adjustments on the noise-and-distortion meter.

The test tones on the left and right channels have now been ad-

*Consulting Engineer, Seattle, Wash.

justed equally, and full scale deflection on the meter is obtained. If these tones are now switched so that they are 180° out of phase, and the full scale deflection on the meter remains, it follows from Fig. 1 that a 60° phase shift exists between the L and R channels. Switch S1 is now turned to the right-channel position, and as S2 is already connected to the left channel through reversed leads, a 180° reversal in the inputs takes place. Under conditions of low phase shift, the meter reading should drop to a low value. If the meter goes off scale, with the unit wired properly, it is an indication that the two channels are out of phase; this is probably caused by a phase reversal at some point in one of the channels.

The phase shift, in degrees, between the channels can be read directly from the calibrations on the noise - and - distortion meter. From 0° up to 60°, the phase shift is almost linear with respect to the amplitude of the AC voltage, or the reading on the meter. This is true of any equal audio tones 180° out of phase, or that buck each other. It has already been stated that a full-scale reading indicates a 60° phase shift, so if we read the 10% distortion scale, we can multiply the reading by 6 and obtain a reading direct in degrees. As an example, if a reading of 3% is obtained, it is multiplied by 6 to obtain 18° phase shift. This conversion is possible because distortion values are also proportional to AC voltages. If the noise-and-distortion meter has an AC voltmeter scale, this scale will provide greater accuracy. It must be kept in mind that the full-scale reading is 60°, and other phase values in degrees are proportional to the AC voltage read on the meter.

The above example is based on a 1000-cps signal, but measurements may be made at any frequency over the entire audio band between 50 and 15,000 cps, after experience is gained in operating the equipment. If, after calibrating at the 10% distortion full-scale position, it is desirable to read lesser values of phase shift, the noise-and-distortion meter should be set to the next lower noise-level position (—10 db). In this position

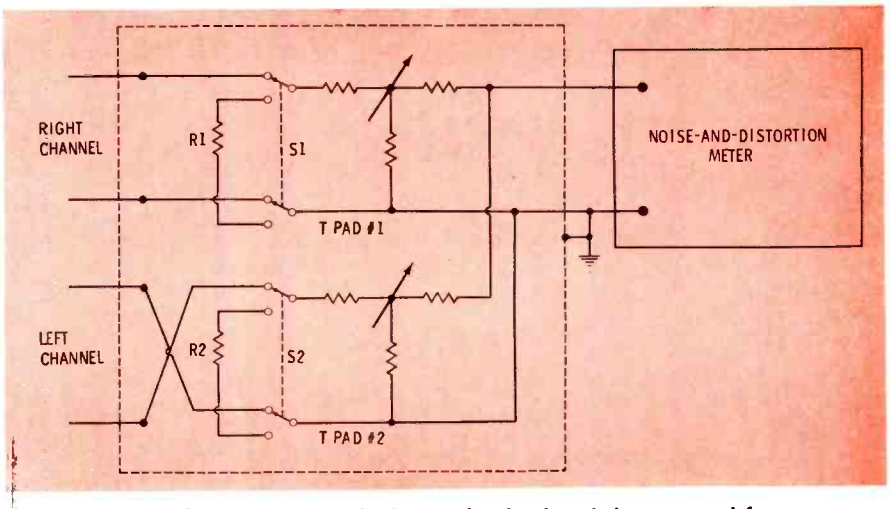

Fig. 2. Circuit diagram of adapter showing how it is connected for test.

the 3% scale is utilized, and degrees of phase shift is still obtained by multiplying the reading by 6.

The accuracy of this method of measuring phase shift is limited by the presence of any noise or distortion in the system being measured, but accuracies within 5° should be obtained easily with high-fidelity FM equipment. Distortion in most cases will cancel out in the measuring equipment, but high values of noise or distortion on just one channel will appear as phase shift. In using this equipment on the transmitter end of long telephone lines, the connections must be made on the customer's side of the telephone company's repeat coils. These coils present a 600-ohm termination to the measuring equipment, and prevent unbalance and possible noise caused by the unbalanced connection to the measuring equipment.

If the circuitry of Fig. 2 is traced through, it will be found the L and R input terminals cannot be tied together for checking purposes, as this will present a short to any oscillator connected at this point. To check the proper operation of this device, a good quality line-to-line transformer can be connected in either the R or L channel, consideration being given to the 180° phase reversal in the transformer. This should result in only a few degrees phase shift over the entire audio band, with an audio oscillator connected to both channels.

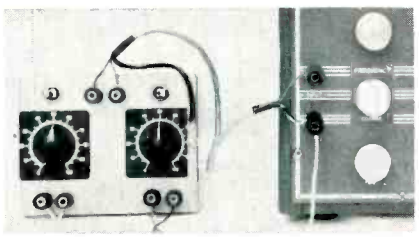

Fig. 3. Illustration of phase-shift check unit connected to distortion meter.

Calibration

By using the above test setup, connecting a paper capacitor in series with one side of either the L or R channel at the input terminal posts, and recalibrating the measuring equipment each time, it is possible to check the accuracy of the phase readings. When a 5-mfd capacitor is employed for 100 cycles (.5 mfd for 1000 cycles and .05 mfd for 10,000 cycles), the equipment should indicate 31° phase shift for 500-ohm equipment and 27° for 600-ohm equipment. These readings will be affected by the phase shift in the transformer, but readings within approximately 5° of accuracy should be obtained. In making these tests—in fact, during all measurements — neither T pad should be more than one-half open.

In some climates, the sliding contacts in the T pads become oxidized, resulting in erratic operation. As a precautionary measure, it is desirable to apply some contact cleaner to the three arms of the T pads before attempting to use them for the first time. The cleaner should also be used any time the operation of the T pads becomes rough. ▲

[1] *Phasor Analysis of Some Stereophonic Phenomena, Benjamin B. Bauer, IRE Transactions on Audio, Volume Au-10, Jan.-Feb., 1962, No. 1.*

[2] *FCC Docket No. 13506, No. 87911, Amendment of Part 3 of the FCC Rules and Regs to Permit FM Broadcast Stations to Transmit Stereophonic Programs on a Multiplex Basis, Adopted May 4, 1960.*

AUTOMATIC TIME INJECTOR

*by Patrick S. Finnegan** — This equipment provides accurate time signals for semi- and full-automatic operation.

WLBC Radio is continuously placing a greater reliance on audio tape (especially cartridges) with various degrees of automatic switching, to produce a better air presentation with fewer errors. One of the side benefits of this almost exclusive use of tape is the advantage of better scheduling of announcers' working hours. Programming of the early morning hours at WLBC Radio is geared to a Time/News/Temperature format.

Problem

While we have benefited from the use of tape in scheduling announcers, a new problem has arisen. It is relatively easy for an announcer to tape "chatter" for his morning show the previous day; it is difficult to incorporate correct time announcements on this tape.

Solution

Our solution to this problem of injecting correct time announcements without an announcer present, is what we call our time injector (Fig. 1), designed by the author, and built in our shop by our top staff engineer, John Kalpus.

The system is made up of a control unit (Fig. 2), which contains the timers, various relays, a relay power supply, and two automatic cartridge-tape machines. One ATC machine has the "odd" times, such as 6:01, 6:03, etc., while the second ATC machine has the "even" times, such as 6:02, 6:04, etc.

Timers in the control unit automatically cue each cartridge to the next announcement every 2 minutes. Circuitry is incorporated to prevent the audio from going on the program channel during the cuing cycle. A latching relay transfers the audio output, auxiliary cue start, and station call button to the opposite tape machine as soon as cuing begins. Other protective features include a safety provision to prevent cutting off an "on air" announcement should a cue cycle occur, and a time delay circuit to make either deck skip a cue cycle to prevent gaining time when it is used on the air.

Timers keep each cartridge cued up. A momentary switch action, either manually or from one of the normal-program ATC machines, will cause the time announcement to go out on the program channel. At the end of the time announcement, a momentary switch action from the time injector starts whichever station-program machine is selected.

Principles of Operation

The heart of the control unit consists of latching relay K9 and two timers. (Refer to the block diagram, Fig. 3, and the schematic diagram, Fig. 4—see page 14). The synchronous timers complete a revolution every two minutes and are adjusted so one tape machine or the other is being cued every minute. The cuing action causes transfer relay ~~M9~~ K9 to switch all program action to the idle tape deck, so that should a call come in from station equipment requiring an announcement, it will operate the idle tape deck.

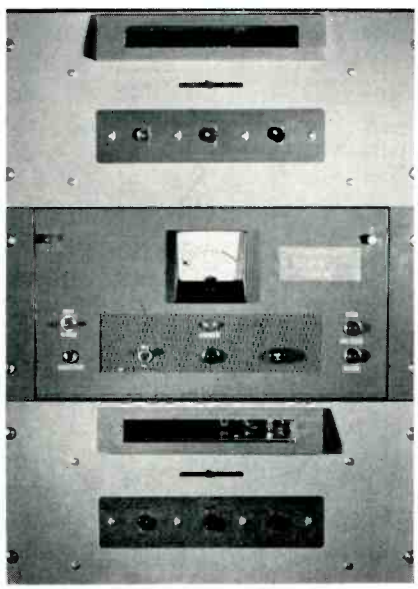

Fig. 1. View of automatic time injector showing switches and indicators.

Each side of the system is identical, transferred by relay K9. In the following description, the odd-time side will be considered, but the discussion also applies to the even-time side.

A call for a time announcement causes relay K3 to operate; at the same instant, this call voltage is applied to K5 and time delay relay K7. Relays K3 and K5 have holding contacts which keep them energized until the current is removed. A pilot light across K3 indicates that the odd-time is on the air. A set of normally closed contacts of K3 opens, breaking the coil return circuit of transfer relay K9. This prevents cuing action by the opposite timer from "dumping" K9, which would cut the air announcement and put the cuing audio on the air.

The coil return circuit of K3 is through the normally closed contacts of the auxiliary cue relay in the tape machine. When this circuit opens, at the end of the announcement, K3 returns to normal.

Start relay K5 receives its voltage at the same time K3 does. A 1000-mfd capacitor charges to the 24 volts through the normally closed contacts of K5. When K5 operates, this charged capacitor is thrown across the start circuit of the tape machine, discharging into this circuit, causing the tape machine to run. The polarity of the

*Vice President, Engineering, WLBC-AM-FM-TV, Muncie, Ind.

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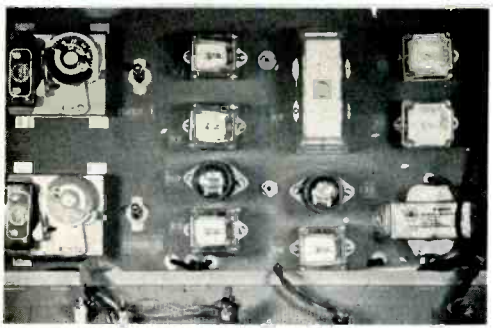


Fig. 2. Relays and timers can be seen in top view of control unit chassis.

silicon diode is such that resistance looking toward K5 is very low, but very high in the reverse direction. The diode acts as a one-way gate for the control current. This one-way action prevents K3 from being re-energized after it has relaxed at the end of the announcement. The cue cycle action operates through a set of normally closed contacts which open when K5 is energized. The coil return of K5 is through a set of normally closed contacts on K7. This time delay keeps K5 energized for 2 minutes, thus causing the odd-time deck to skip the next cue cycle.

K7 is a thermal time-delay relay, a normally closed two-minute type. Both the K7 heater and the start relay (K5) coil-return circuits are through these contacts. At the end of two minutes, the time-delay relay opens, causing K7 and K5 to relax. We discovered the time delay could be varied from about 1 minute to 2½ minutes, by adding a 200-ohm variable resistor in series with the heater.

The power supply uses four silicon diodes in a bridge arrangement. Because most relays have holding contacts, a normally closed push switch is inserted in the plus lead, to be used as a "clear" button, in case the relays get hung up for any reason.

Earphone monitoring of the individual tape decks is provided ahead of the transfer relay. This facilitates the initial setup and future maintenance. The jacks are insulated, nonshorting types, so high-impedance earphones can be used to bridge the 600-ohm balanced output of the tape decks.

A VU meter bridges the audio output to the program channel, and is followed by a fixed pad. We use zero level out of the machines, padded to station requirements. This gives better signal-to-noise ratio, louder earphone monitoring, and a better VU indication.

Our time announcements are made up on two 1,200-foot, 30-minute cartridges, one containing the odd and the other the even times. Each announcement is 3 seconds in length; the voice says, "WLBC time, 6:01" etc. Any other announcement the Program Department wishes to couple with a time announcement, such as a commercial or chimes, is on another cartridge in one of the station machines. We allow 6 seconds of tape for each announcement, as follows: 1 second blank lead-in, 3 seconds voice and auxiliary cue tone, 2 seconds to clear. These spaces are to prevent any cuing tones from accidentally appearing in the program.

To insure reliable, 24-hour continuous service, we use enclosed plug-in relays and over-rated components, and all relays are de-energized except when their function is required.

Making up the cartridges is a very exacting and tedious operation. They must be properly prepared, to get clean, tight announcements. For a full 12 hours, it takes 720 announcements, 360 on each cartridge. We first made up the voice announcements on reel type machines, using different voices, then dubbed them onto cartridges. Our machines operate continuously, 24 hours a day, and by avoiding any wording such as noon, AM, or PM in the announcements, the times are appropriate for any part of the day. ▲

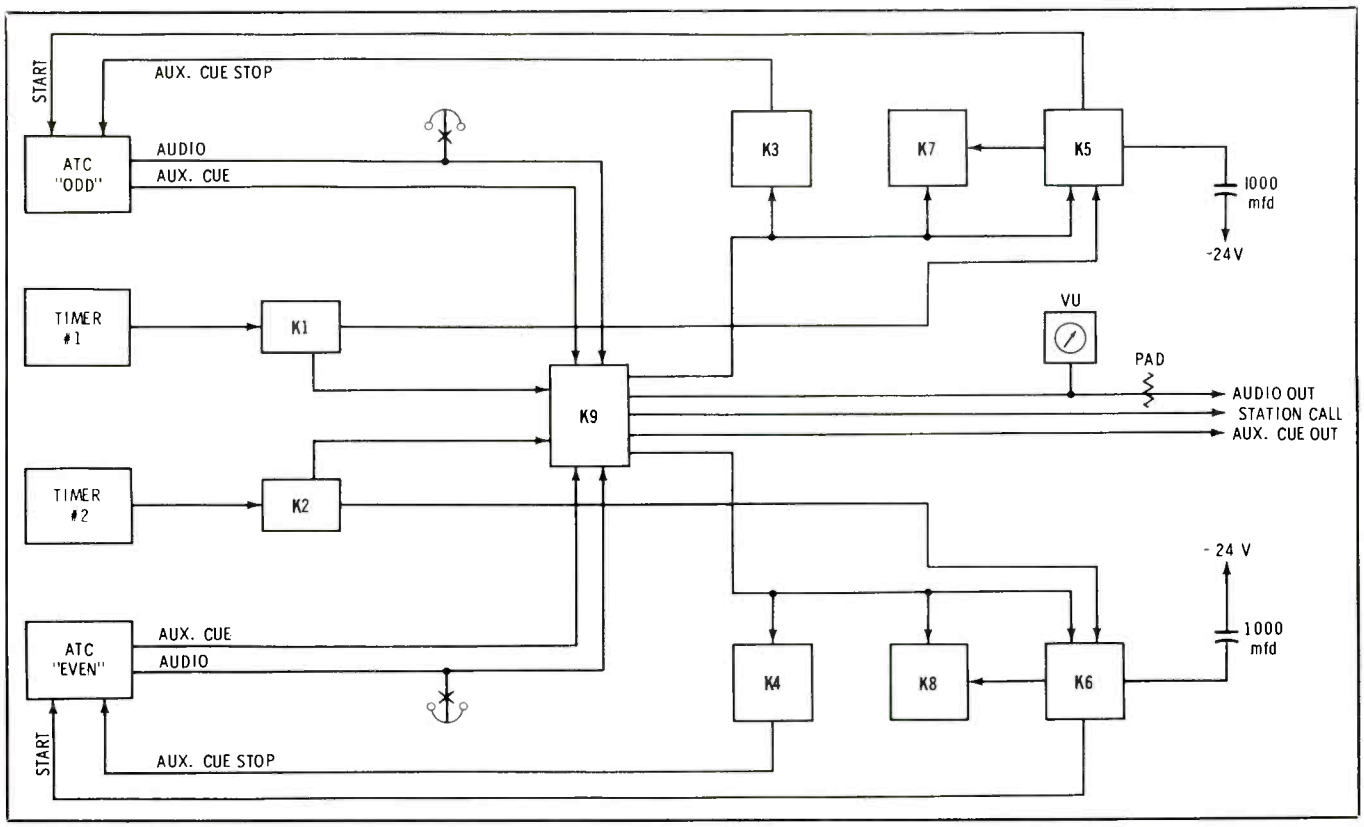


Fig. 3. Functions of various stages in automatic time injector can be seen in this block diagram.

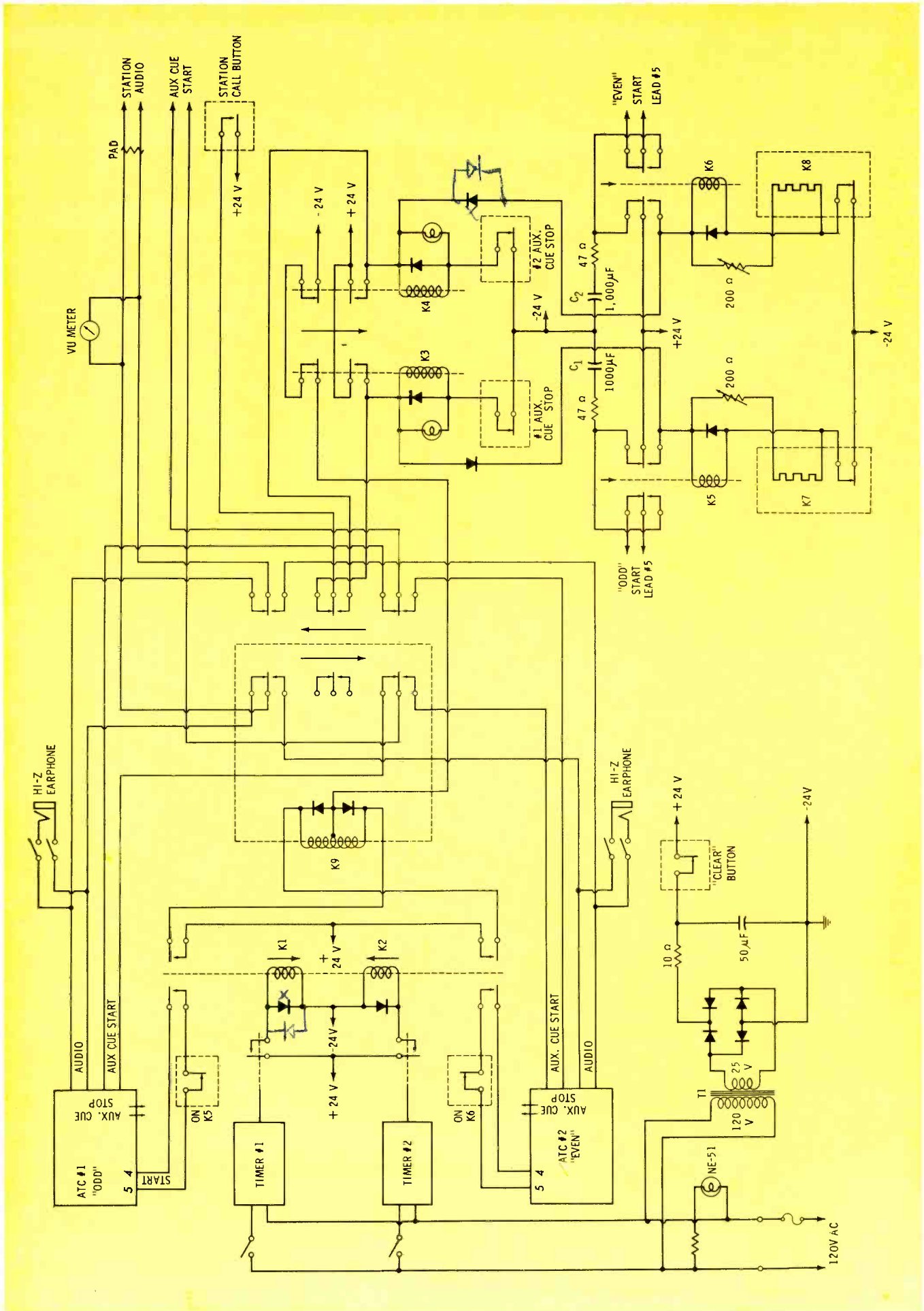


Fig. 4 Schematic diagram of automatic time injector showing external inputs.

NEW ONE KILOWATT AM TRANSMITTER WELCOMED BY INDUSTRY

Maximum Reliability Combined With Unusually Rich Fidelity

Introduction of the new BC-1G 1000 watt AM transmitter by the Gates Radio Company has met with an enthusiastic response from the broadcast industry. Gates, a subsidiary of the Harris-Intertype Corporation, reports that shipments of the new model have already been made to stations both in the U. S. and abroad.

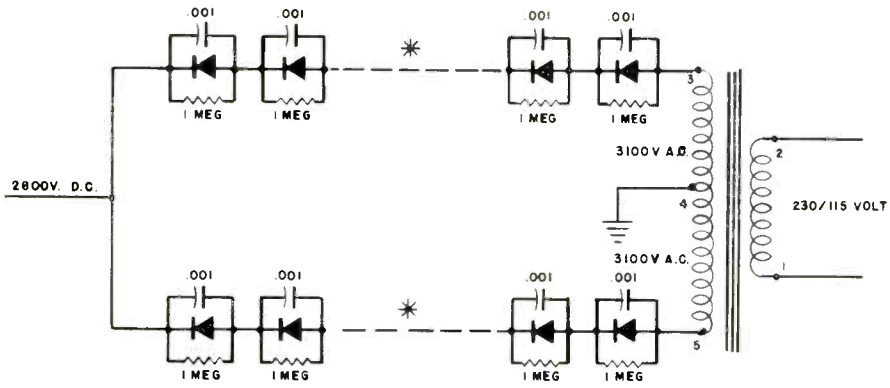
Appropriately called the "BIG G", the new Gates transmitter was designed and manufactured to provide broadcasters with maximum on-air reliability—with field-proven 833A tubes in both R.F. and modulator circuits, a new convectional cooling system to greatly lengthen component and tube life, and silicon rectifiers in all power supplies for lifetime reliability without tube change. As shown in Fig. 1, the high voltage silicon power supply utilizes 60 silicion diodes, each rated at one full ampere.

Low intermodulation distortion was also a major engineering objective in the design of the Gates BC-1G. The combination of a cathode follower audio driver, an unusual over-all feedback system, low leakage reactance in the modulation transformer and modulating the R.F. driver as well as the power amplifier has resulted in an unusually rich fidelity of transmission. The low leakage modulation transformer has produced typical distortion readings of 1.5% or less at the critical 7,000 cycle audio frequency.

For maximum harmonic reduction, the new transmitter incorporates a full "T" output network. The final amplifier and "T" network are tuned by variable coils of the large edgewise type manufactured by Gates.

For Class IV stations, the BC-1G quickly and efficiently reduces power to 250 watts. Control circuits are interlocked so power is removed momentarily when switching from 1 KW to 250 watts. Switching in the primary of the main plate transformer eliminates power consuming and heat generating voltage dropping resistors. Plate voltage is reduced on both the power amplifier and modulator tubes, resulting in added tube hours as well as savings in power costs.

Complete technical information on the BC-1G transmitter is now available. Write Gates Radio Company, Quincy, Illinois, for Brochure No. 112.



✱ Each Half Wave Silicon Assembly consists of 30 each: Silicon Diodes, Capacitors and Resistors. Diode rating — 1 Ampere, 600 Piv.

Fig. 1

PREVENTING SIGNAL CONTAMINATION

*by Donald L. Coleman** — This article shows how shielding and grounding, coupled with adequate conduits, ensured "clean" station operation.

In recent issues of this magazine (May and June, 1962), G. Jennings had some important points regarding the elimination or prevention of unwanted signals and responses in broadcast systems. Here is a concrete example of the results you can expect when care and thought are used in making an installation.

First, perhaps, a description of our plant (see Fig. 1) will give you an idea of some of the sources of signal contamination.

Equipment Layout

In the plant there are two 1-kw AM transmitters (one is an alternate main) which feed a two-pattern phasor and a four-tower directional antenna system; a 5-kw FM transmitter feeds an 8-bay antenna, side-mounted on one of the AM radiators, providing an ERP of 20 kw; two 60-watt mobile base stations, with roof-mounted antennas, operate on 35 and 157 mc, respectively; four racks of monitors and audio equipment; three tape recorders; an emergency studio with the usual turntable preamps, etc.; an FM tuner, used for rebroadcast pickup from a roof-mounted 5-element yagi; multiplex receiver/monitor; a Conelrad receiver tuned to a station only 70 kc away from our AM operating frequency; and subcarrier generators for two SCA channels. All this under a 20′ by 24′ roof!

Obviously, there are many noncompatible frequencies involved—consider the tape-recorder oscillators, various receiver oscillators, multiplier stages in the FM transmitter, VHF base stations, frequency-monitor oscillators, SCA generators, plus audio frequencies from as many as five different program sources. Add to this the fluorescent lights, water pump, blowers, etc., which all produce noise, and you'll see there is an unbelievable number of possible beats, squeals, crosstalk, and monkey chatter. However, they all live together in perfect harmony. Here's how.

First, note the admonition given by Jennings. "If it isn't specifically supposed to be insulated—ground it!" We did. We decided to use conduit for all wiring in the building, including RF transmission lines, audio cables, and power wiring—see Fig. 2.

Cable Routing

Separate conduit runs were used for each type of circuit. The conduit is embedded in a concrete slab floor. However, before the floor was poured, all conduit runs were bonded together with copper strap. The strap was bonded to a half-inch diameter copper cable which runs completely around the building under the footing. The fourth wire of the three-phase power service is grounded to this cable, as well as to the usual power-company ground. The shield of the telephone cable into the building is also bonded to this half-inch copper cable. Instead of depending on a conduit-to-rack connection to provide rack grounds, the ground cable is run through its own conduit to each rack and transmitter.

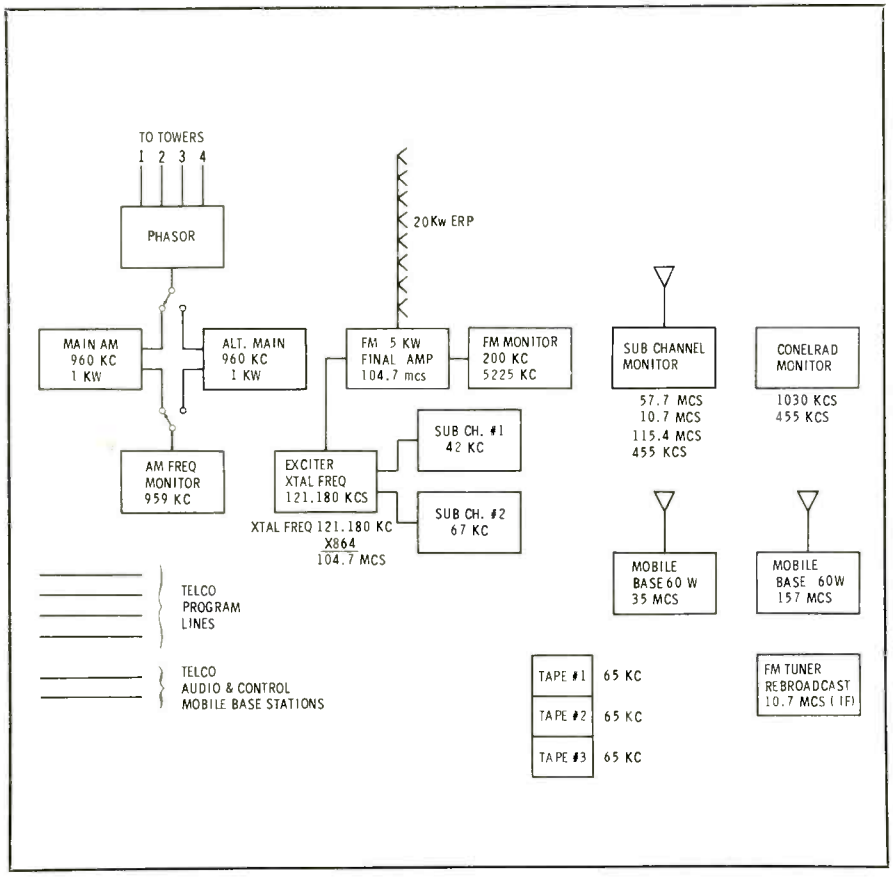
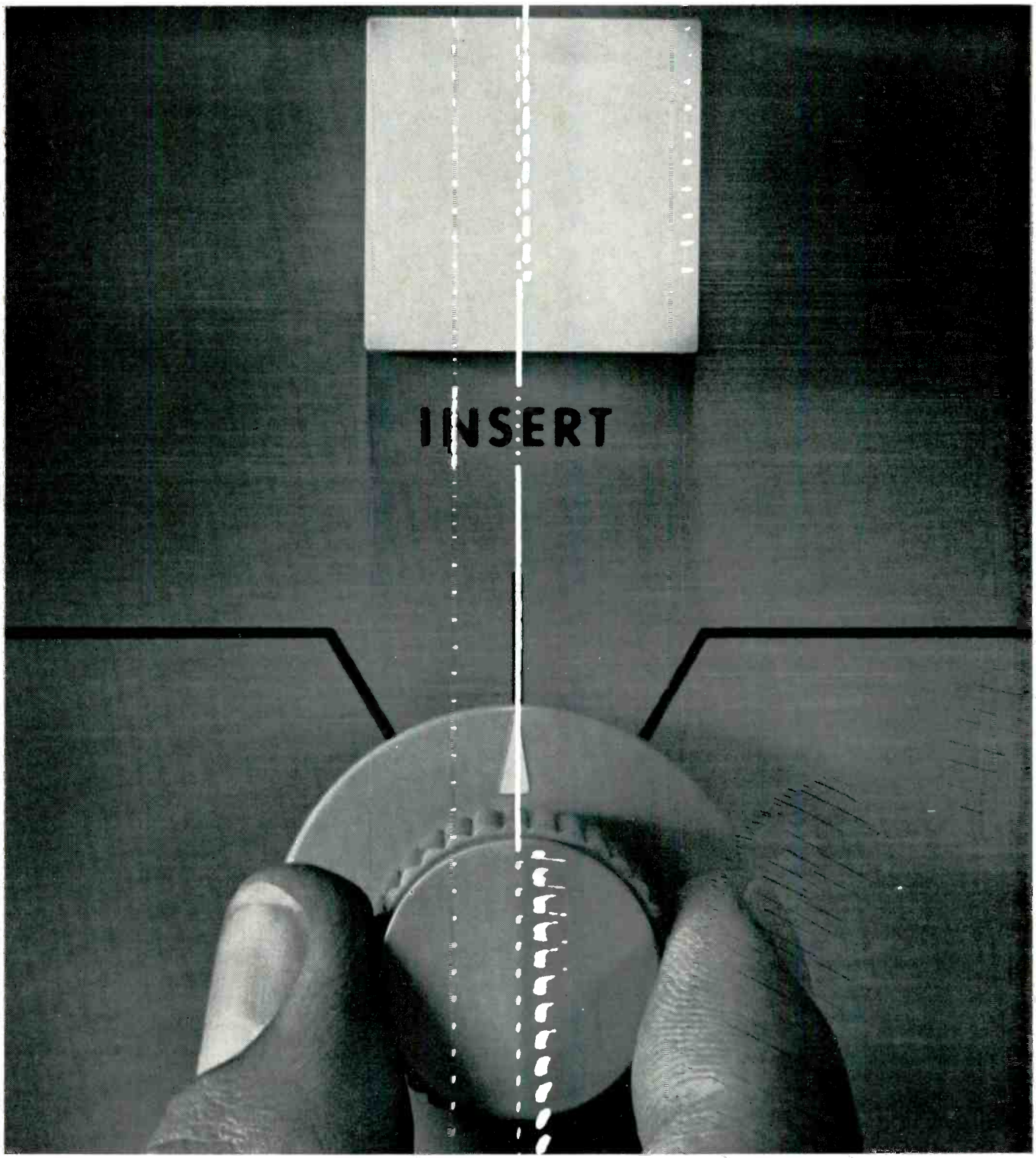


Fig. 1. Many of these frequencies are multiples of some lower frequency.

*Chief Engineer, WFGM-AM-FM, Fitchburg, Mass.



What cuts the cutting out of video tape editing? **AMPEX Electronic Editor.**

Don't cut your tape. Cut your cost. How? Simply turn the knob on an Ampex Electronic Editor. The old scene is erased, the new one added—all electronically. And both old and new sections of the tape can be viewed during actual production. The Ampex Electronic Editor inserts new scenes, new commercials, production changes, or corrects goofs—without splicing. You save time, save tape!

The Electronic Editor also lets you do stop-and-go recording, multi-camera effects with a single camera, and squeeze action—all without cutting the tape. Best news of all: no special training is needed. For more details write the only company providing tape and recorders for every application: Ampex Corp., 934 Charter St., Redwood City, California. Sales and service engineers throughout the world.

Controlled grounds are used on the interior rack wiring wherever possible. The audio wiring has an insulated shield, and is grounded only where a ground is desired. Where grounds are made, they are connected to the copper cable; thus, all the equipment is bonded together with solid, low-reactance connections.

Although copper strap would probably have been better, it is not as easy to install in the conduit; also, copper cable was available at less cost than the strap. We found that it was very workable, easy to make connections to, and handled from a reel much more easily than a coil of strap—and no cut hands!

Ground Connections

The ground cable is brought to a pit in the floor, which has a quarter-inch steel cover, in three sections (for easy removal). All power wiring for tower lights, pattern-change relays, and doghouse lights are brought to this pit. Also terminated in the pit, from separate conduits, are the coax feeds to each tower from the phasor, coax sample lines to each tower, intercom feeds to each doghouse, and tally-light circuits from each pattern-change relay.

All these circuits, plus the half-inch ground cable, leave the pit through the back wall of the building, and remain underground all the way to each tower. This keeps coax shields and power wiring from carrying RF back into the building. It also keeps the intercom feeds "cold."

The ground cable does not go from the building to each tower. It follows the transmission lines to the nearest tower, at which point it ties into the antenna-ground system at the tower base. The radials from each tower are bonded to a piece of cable which encircles the tower footing. All intersecting radials between towers are bonded to lengths of the same type cable.

Inside the doghouses, all components that need not be insulated are mounted on, or grounded to, a copper strap; this includes coax shields, tower-light bypasses, tower-matching equipment shelves, sample-line shields, etc. The copper strap is bonded to a piece of half-inch cable which runs through the

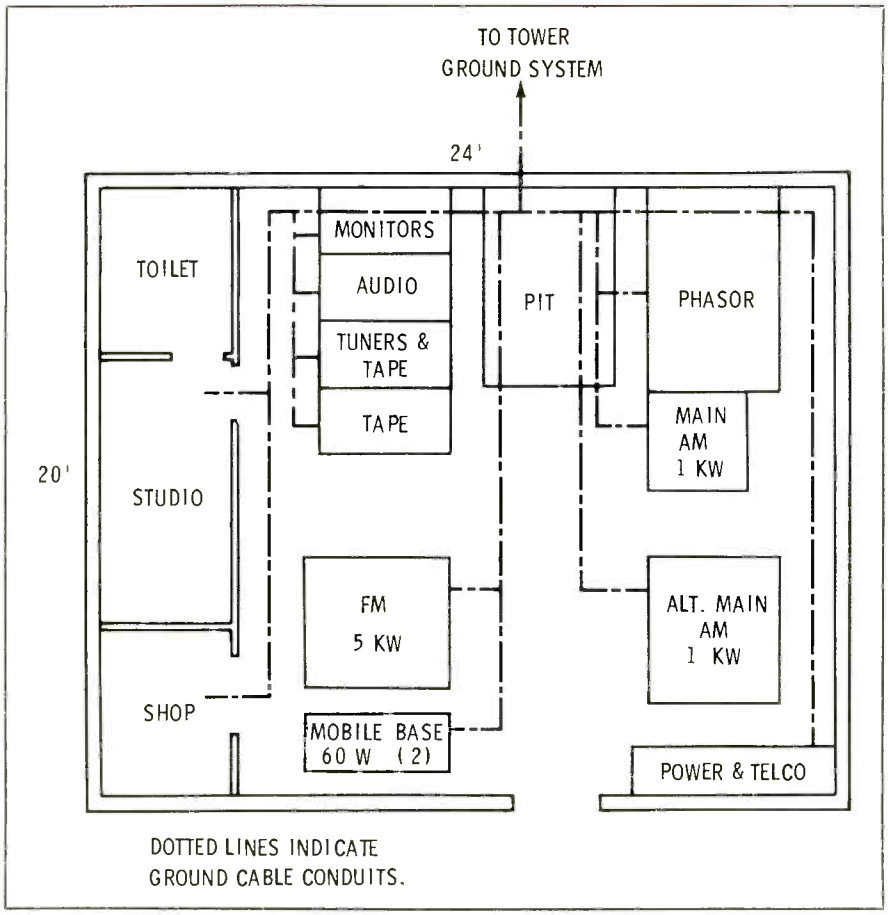


Fig. 2. The conduits, as a general rule, take the shortest, most direct route.

doghouse floor and ties to the ground-system junction at the tower base.

The FM transmission line is the only line which is not buried; it is 1⅝" Heliax, and it was felt there might be some danger of collapsing it. This would be particularly true when the ground freezes. Therefore, this line runs to the tower on 5' posts. We use the quarter-wave-insulator principle so the line can be grounded at the tower base, and at as many points as deemed necessary between the tower and building.

As can be seen, the whole system is tied into one solid ground system. Silver solder was used. (This is important because a lightning surge can vaporize regular soft solder.) It meant carrying gas tanks and a torch all over the antenna site, sometimes in the bucket of a tractor when the ground was soft. It means that we have a lot of copper in the ground. It meant a lame back and callused hands.

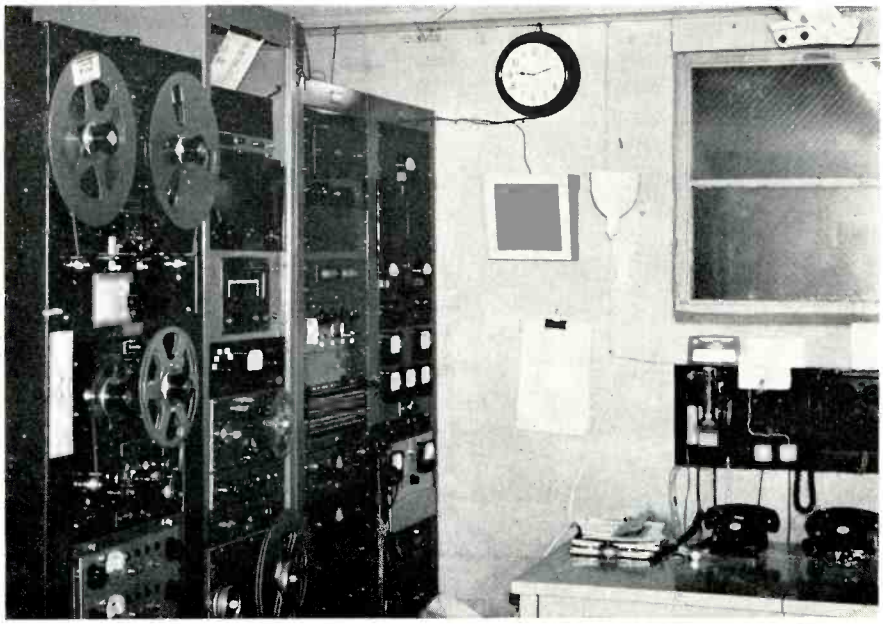


Fig. 3. This photo illustrates audio, monitoring, and tape layout at WFGM.

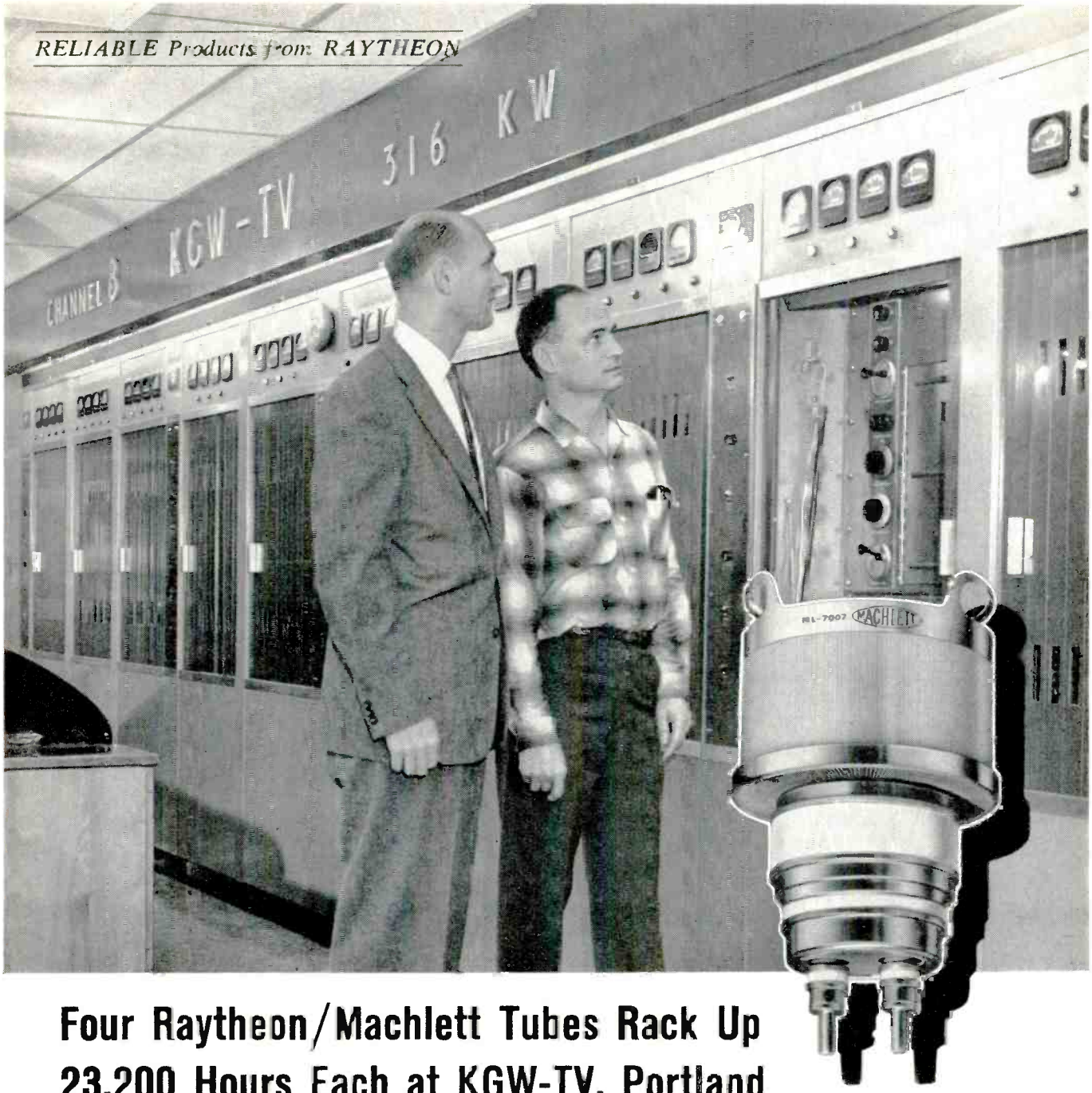
But it also means that we have done just about everything in our power to keep our signals where they belong. It is now common for us to have separate programs on AM and FM, with background music on the subcarriers, be recording on one of the tape recorders, have one or both of the mobile base stations in operation, and be doing alignment work on multiplex receivers—all at the same time and without any interference between the various operations. In addition, there is a 5-kw AM station about a quarter-mile away; it causes us no trouble, although its RF can be detected in our antenna system when we are off the air.

High-impedance audio equipment has no place in a transmitter installation. However, these show no sign of signal contamination.

When the installation was originally made, and as it grew with time, almost no troubleshooting was required to eliminate signals that appeared where they shouldn't have been. We did have to apply filtering in two instances, however. The first was on the input of the FM tuner; a sharp-rejection filter, tuned to our own FM frequency, reduced the signal input enough to prevent overload. The second instance was on the input of the Conelrad receiver—an old automobile receiver with an AC power supply. This set was chosen because of its metal case; the shielding of the case helped, and a rejection filter tuned to our AM frequency completed the job.

The foregoing principles can always be applied to a new installation. Some of them can be applied to an existing station, and it pays off. The days of the "throw-it-together-and-hope-it-works" installation are gone. With the FCC's increasing insistence on good engineering, and with the listening public's increasing ownership of good quality receiving equipment, a few pains taken in the right places will pay big dividends in trouble-free operation and good, clean signals. ▲

RELIABLE Products from RAYTHEON



Four Raytheon/Machlett Tubes Rack Up 23,200 Hours Each at KGW-TV, Portland

A durability record of 23,200 hours vpa life by each of four Raytheon/Machlett 7007 tubes is only part of the gratifying results documented recently by KGW-TV, Portland (Ore.) at its 100 KW RCA transmitter.

Eight others (of a total of 22 R/M 7007s used by KGW-TV in its high power stages) have logged in 15 to 20,000 service hours. Another six are nearing the 15,000 hour mark. Stability has been excellent, permitting long periods of operation without retuning or signal deterioration — a particular advantage where parallel p.a.'s are used and adjustments critical for optimum operation.

Telecasting on Channel 8 at 316,000 watts, KGW-TV enjoys an outstanding reputation for its live remote coverage of topical events.

Setting new standards in superior performance for commercial telecasters, Raytheon/Machlett tubes are available through your Raytheon Distributor. Or write Raytheon Company, Distributor Products Division, 411 Providence Turnpike, Westwood, Massachusetts

RAYTHEON

RADIO TRANSMITTER MAINTENANCE

*by Thomas R. Haskett** — PART TWO of a series describing a routine maintenance procedure, extending to monitors and Conelrad.

Monitors are required, both by FCC regulations and good engineering practice. Carrier frequency, modulation percentage, and (for directional AM stations) the phase of the antenna elements with respect to one another have to be checked. As measuring devices often have certain inherent amounts of error, it is not wise to assume that monitors are accurate — they must be checked and calibrated periodically. When monitor readings change, the trouble may be in the monitor or in its feed system, rather than in the transmitter.

The frequency monitor is checked and calibrated before it leaves the factory, and the buyer is usually furnished a certificate of calibration—a statement that the instrument's accuracy is within some fraction of one per cent of the primary standard (WWV). After the monitor has been in service for some time, however, it sometimes begins to lose its accuracy (due to the normal aging of tubes) and has to be recalibrated. Eventually, tubes or components must be replaced, which also requires that the unit be recalibrated. Troubleshooting of a frequency monitor must be done very carefully. The manufacturer's instructions should be followed exactly, and a written record kept, showing the date and the work done. Since many of the tubes are in audio or power-supply service, their testing has already been covered; the others should be tested by substitution and recalibrating the unit. After any component replacement, the monitor should be calibrated against an external reference. It is seldom necessary to return the instrument to the factory however, as calibration can be done in the field.[1] Most stations contract with commercial frequency - measuring services to check their signals, usually at monthly intervals. The reading of the frequency monitor at the time of such monthly measurement, when compared with the report from the measuring service, indicates the monitor's error.

The modulation monitor is also tested and calibrated at the factory, but may lose some of its accuracy after awhile. With the exception of a signal-detector diode and a thyratron, its tubes are in power-supply or audio service, and can be tested by methods outlined previously. The diode and the thyratron can be checked with a tube tester, or by substitution.

The monitor is easily calibrated by the following method: It should be connected for normal monitoring and an oscilloscope used to observe the transmitter output. For this purpose, RF from a sampling loop near the final plate tank should be fed directly to the CRT vertical - deflection plates — not through the vertical amplifier. (A blocking capacitor should be used, with voltage rating about twice the transmitter output, and capacitance .001 mfd or less.)

The transmitter is then modulated with a 400- or 1000-cps sine wave, and the scope sweep adjusted to display a steady trace. The modulation depth of the transmitter can then be adjusted to various levels which can be measured conveniently on the scope screen—25%, 50%, etc. The monitor can then be calibrated at each of these points.

When this has been done for the percentage-type modulation meter, it should also be done for the peak-modulation indicator. (This device usually consists of a lamp driven by a thyratron, with a controllable

*Broadcast Consultant, Michigan City, Ind.

[1] *Editor's Note: A monitor can be repaired at the station but unless the trouble is mainly a faulty tube or a similar noncritical failure, the manufacturer should be called on for repairs.*

WOZ Radio – AM Transmitter Meter Log

Osc 6AK5	Buf 5763	IPA 6146	LPA 4-400A	RPA 4-400A	L Mod 4-400A	R Mod 4-400A	Date	Name - Remarks
2.3 ma	10 ma	18 ma	125 ma	125 ma	30 ma	30 ma	11-1-61	H. Allen
2.3 ma	10 ma	18 ma	125 ma	125 ma	30 ma	30 ma	11-8-61	W. Smith
2.3 ma	10 ma	18 ma	125 ma	125 ma	30 ma	31 ma	11-15-61	H. Allen
2.3 ma	10 ma	18 ma	125 ma	125 ma	30 ma	30 ma	11-22-61	Installed new R. Mod. Penta No. 9813 and balanced the stage. W. Smith

Fig. 3. Typical AM transmitter log showing how various readings are recorded.

firing or triggering level.) A tone must be employed, because the peak indicator will read extremely short duration peaks that the meter will not register when using normal voice or music modulation.

It is possible to calibrate the carrier-shift meter by deliberately detuning the transmitter final amplifier, thereby producing nonsymmetrical modulation, which will show up on the oscilloscope and can be measured and computed. However, this technique is rather involved, tedious, and risky (for the transmitter). If detuning is attempted, the nonsymmetrical sine-wave modulation should be limited to short periods—a few seconds at most. Practically speaking, the long-term accuracy of most carrier-level indicating circuits is good, since such accuracy depends on the proper value of load resistance across the detector diode and the linearity of the tuned circuits ahead of it; neither are apt to change very much, and both can be checked by other methods.

The AM phase monitor also needs upkeep; its tubes can be checked on the tube tester, since they do not handle RF. Of course, they can also be checked dynamically in the monitor, utilizing a combination of techniques. These units are usually self-calibrating, or at most, require only an external VTVM for calibration. The accompanying technical manual usually covers the subject in detail. A check of the monitor's readings can be obtained by taking several field-intensity measurements at the monitoring points established in the station license, and computing relative phase from such data. (Basically, this shows only whether the array is "in" or "out," but as such, it can be used to verify or disprove the monitor readings.)

FM Monitors

FM stations use a combined frequency and modulation monitor; this is an obvious practical advantage in terms of economy and function, and is possible because of the modulation system. Since some of its tubes handle RF, they can be tested only by substitution and comparison of the monitor's reading with an external reference. The measuring service can be used to check and calibrate not only the carrier-frequency section, but also the modulation section of the monitor. This is done by modulating the transmitter with a steady-state sine wave and setting the modulation to a convenient level, as read on the monitor's "percentage-of-modulation" meter. The measuring service can then be contacted by telephone to determine their modulation reading, which is compared with that of the monitor. (Strictly speaking, the measuring service will determine the station's frequency swing during modulation, from which the modulation level can be computed. For instance, a station whose unmodulated center frequency is 101.1 mc would be expected to show frequency deviation between 101.025 and 101.175 mc for 100% modulation.) If a phone call each month is too expensive, a pre-arranged plan can be worked out, with various modulation levels being sustained for specified lengths of time; a written record can be kept of this schedule and compared with the report from the measuring service.

Conelrad

Although at some stations the Conelrad monitor is located at the studio site, it is discussed here because functionally it is associated with the transmitter plant. Basically, such a unit is merely a receiver; in many cases, extra features such as thyratrons and relays may be incorporated for alarm purposes. From the standpoint of trouble-shooting, it can be handled like an ordinary BC receiver. Many Conelrad alarm receivers work on the simple carrier-failure principle; some more expensive models employ a 1000-cps tuned circuit and a time-delay network in an audio stage. This avoids false alarms caused by intermittent carrier breaks on the part of the monitored station, since the entire carrier on-off-plus-tone Conelrad procedure must occur for the alarm to trip. Adjusting this 1000-cps trap and checking the time-delay stage can be difficult, for the operation of the whole receiver and alarm circuit can be tested only by duplicating the complete Conelrad alarm sequence. However, this can be accomplished by using an audio oscillator to modulate an RF generator, and feeding the output to the receiver antenna. (See Fig. 4.)

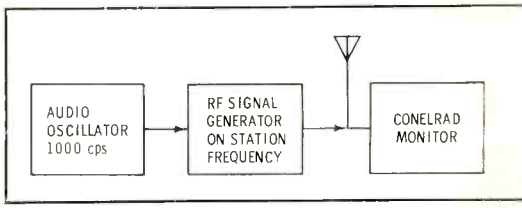


Fig. 4. Hookup for aligning Conelrad monitor that employs 1000-cycle trap.

Remote Control

Some stations operate their transmitters by remote control, with the monitors located at the studio control point. It then becomes necessary to employ an RF preamp that is almost always a simple two- or three-stage TRF amplifier, with an output of from 2 to 10 volts of RF. The maintenance procedure is the same as for an ordinary BC receiver—perhaps even simpler, since the meters on the monitors show the gain of the preamp. The tubes can be tested dynamically, by substitution and subsequent observation of the monitor meters, or by listening to the audio.

If an RF preamp is used (in monitoring a remotely-controlled FM transmitter) it must be broadly tuned, to avoid clipping the higher modulation levels and the resultant error in modulation-monitor readings. In this case, it may be necessary to use an RF sweep and marker generator in conjunction with a scope and a detector probe in order to "broadband" the preamp. The technique is identical to that used in sweep-aligning a high-quality FM broadcast receiver. Actually, a TRF preamp is inherently a broadband device, regardless of whether it's used for AM or FM; however, in the FM system the bandwidth is a bit more important. All monitors and RF preamps should be checked, visually inspected, and cleaned at least quarterly.

Other Equipment

At directionally operated stations there is always a field-intensity meter for measuring the radiated signal of the station. In order for its readings to be accepted without question by the FCC, its calibration and resulting accuracy must be held to certain specified limits. Although it needs maintenance at times, station personnel should not attempt to do anything other than replace tubes and batteries. Even in these

operations, the manufacturer's instructions must be followed exactly if the instrument's accuracy is to be maintained within the specified limits.

The meter is designed to be self-checking, indicating whether or not new tubes or batteries are needed. If indications cast a doubt on its accuracy, and tubes and batteries do not seem to be at fault, the meter must be returned to the factory for repair and recalibration; few broadcast stations have the expensive and specialized equipment necessary to calibrate such a meter within the stringent limits established by the Commission.

The field-intensity meter is used at irregular intervals and for odd lengths of time; hence no routine maintenance schedule can be worked out for it. The best thing to do is just to check it each time it's used. A common field-check procedure is to take readings alongside another meter, at several different sites.

If there is any standby equipment at the plant (such as an auxiliary transmitter or a spare limiter) it should be test-operated once weekly for at least 15 minutes. This gives reasonable assurance that it will work when needed, and complies with FCC Regulations concerning auxiliary gear. It is usually possible to schedule this test during the weekly maintenance period.

Tubes

At this point, the reader is referred once more to the first article of the series—in particular, the section advocating continuous operation of vacuum-tube equipment for the purpose of reducing tube-replacement costs. The same principle applies with transmitters. The general rule is that if a unit is in use at least 60% of each 24-hour period, it should be left on all the time. This, of course, excludes the plan for standby and emergency equipment. Also, it does not mean that the transmitter should be left "on the air" following the station's regular sign-off; the plate supply should be turned off, shutting down the carrier and the high voltage, but the heaters should be left on, thereby keeping them at an even temperature and prolonging tube life.

Remote-control systems seldom employ vacuum tubes; most of their circuit elements are normally passive. Hence, their maintenance is a relatively simple matter. The heart of each system is usually a stepping relay which controls subsidiary relays, which in turn make and break the actual transmitter control circuits. For this system of relays, a power supply is necessary, and solid-state rectifiers are generally used. As was mentioned in the discussion on transmitters, such diodes should be checked with an ohmmeter. That is, not only should their output voltage under load be measured, resistance readings should also be taken with the supply de-energized. The principal steps in maintenance are: cleaning the relay contacts, checking the power supply, and checking and calibrating the remote-reading meters. The meters should be calibrated weekly; one man at the transmitter plant calls meter readings to another man at the studio, who then correspondingly sets the meters on the studio units. Cleaning, as well as measuring voltages and resistances should be done on a monthly basis. ▲

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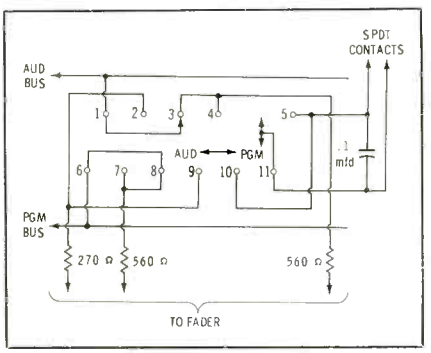
Tape-Rack System

By Mel Aldrige, Staff Engineer, WCER, Charlotte, Mich.

A large number of tapes are used in WCER's operation. To afford more efficient and convenient operation, we made the tape rack shown in the illustration. The rack is 48" long by 19" high, and the spacing between reel supports is 5". The slots are 1" apart and measure 2½" by ½". The large slots that hold several reels are 3½" by 2½". Along the front of each shelf is an aluminum strip to hold numbered tags, which correspond to reel numbers.

Our log identifies the tapes as in the following example: "#5—Smith—A." This means tape #5, name of sponsor, and cut A. These designations may be changed as sponsors change, but always appear in our master tape-control book. Every reel uses the same information format, to avoid errors. The cost of this system is very small, and the increase in efficiency well worth the effort.



Automatic Remote Control for Turntables and Tape Transports

By Dave Schmidt, Chief Engineer, KNOW, Austin, Texas

Many stations are using the Gates "Yard" as their main control board. This console offers interesting possibilities to the engineer interested in establishing semiautomatic switching operations with a minimum of rewiring. At KNOW, we automatically start any of the turntables or tape recorders whenever the associated channel switch is placed in either the "program" or "audition" position.

Simply disconnect the relay B-minus (terminal 11) from the channel switches you wish to use for control. Next short terminals 5 and 10 on the same switches. You now have a separate SPDT switch on the desired channels. Run pairs of wires from the equipment you wish to control, to the appropriate channel switch. Warning: Don't use AC, because hum problems may develop in the control console. Instead, use something like a 12-volt DC relay for remotely starting AC motors, or similar equipment.

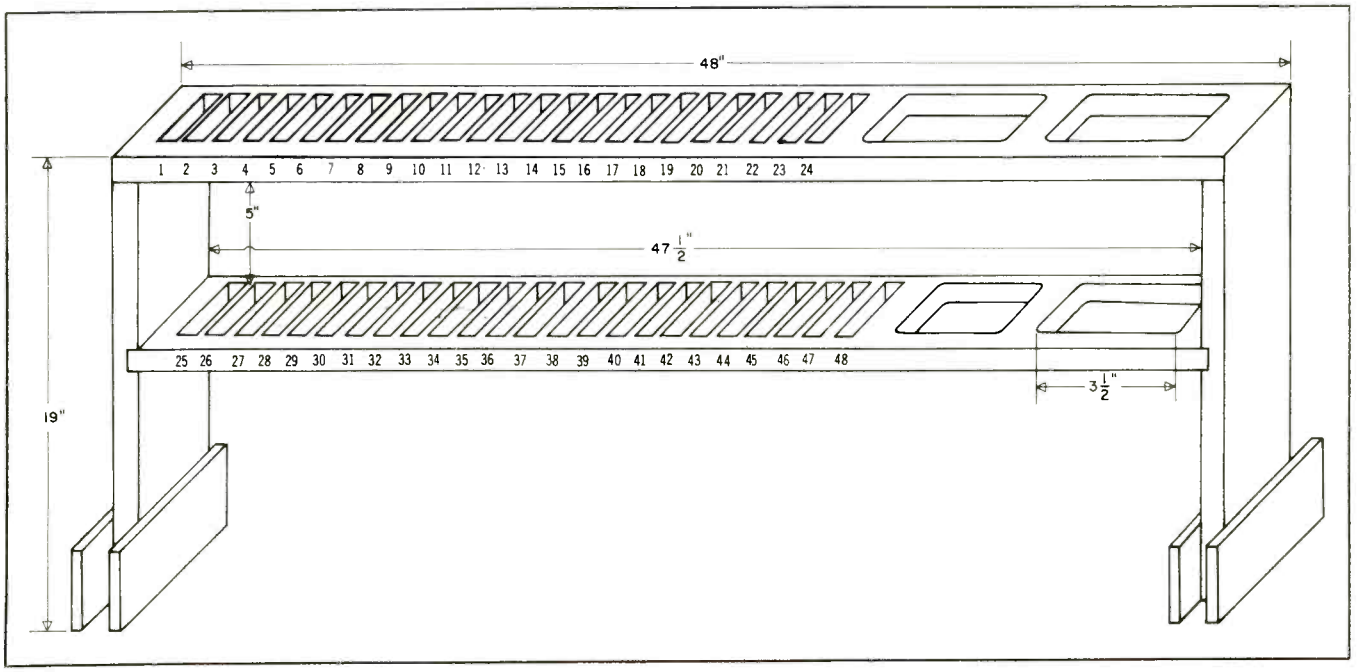
The control of everything is now directly in front of the announcer. The advantages of this are obvious.

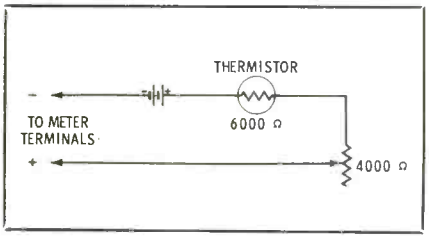
Temperature Indicator for Rust Remote-Control Equipment

By Eugene Seier, Technical Supervisor, KMMJ, Grand Island, Neb.

For stations which use the Rust Series RI-108C or RI-108D remote-control equipment, and have a spare metering position available, here is a simple, inexpensive device for monitoring transmitter-room temperature. With slight modifications, the indicator will monitor the temperature in the transmitter cabinet, or any other critical area.

This device is built around a Fenwall JA36J1 thermistor wired in the simple circuit shown in the diagram. The total cost, not including a mounting box, is only $3.66.





A standard holder is used for the RM12R mercury battery. The box can be of any convenient size, but must be open enough to allow free circulation of air around the thermistor. Ours was bent from a piece of sheet metal to a size of 5″ x 3″ x 1¼″; the front was left open and covered with a piece of screen, which can be removed for battery replacement.

The JA36J1 thermistor was chosen because its nominal resistance and temperature-resistance characteristics were such that ordinary room temperatures could be read directly on the Rust meter—a 200-ua movement with a scale calibrated from 0 to 130. Seventy degrees thus falls approximately at midscale. It was calculated from the temperature - resistance curves that the error on the meter would be approximately one degree for a temperature change of ten degrees, but so far it has been less than ½ of 1 degree over a ten-degree temperature range.

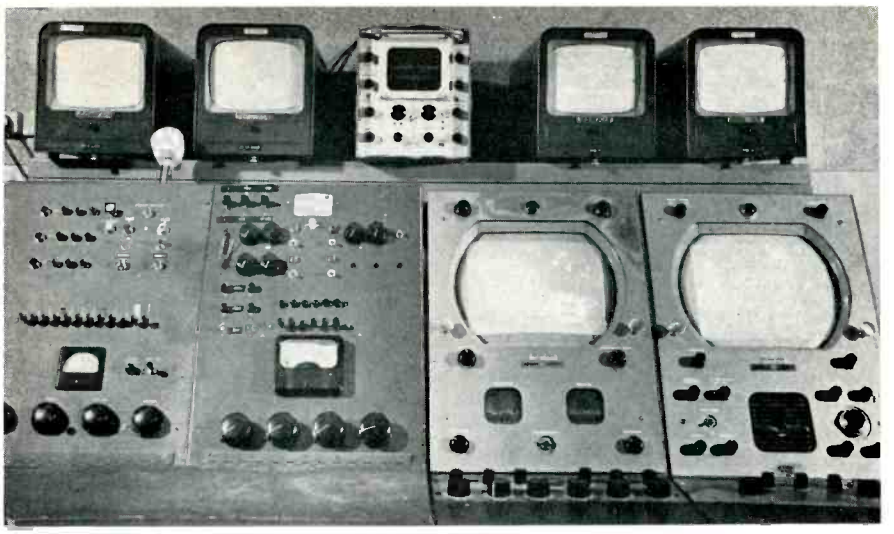
It is suggested, if some use is contemplated other than monitoring room temperature, that the Fenwall Thermistor Engineering Package, Cat. No. 9E877, be obtained. This kit contains a complete listing of thermistors made by Fenwall as well as a very handy slide rule for determining which thermistor has the required temperature-resistance curve.

Since the current in this circuit is only 100 microamperes at a temperature of 70 degrees, and is drawn only when the temperature is actually being read, battery life should be no problem.

Two-Channel TV From Single Control Position

By Herb Evans, Chief Engineer, WTHS-FM-TV, WSEC-TV, Miami, Florida

Our educational television station, WTHS-TV Channel 2, has operated with such acceptance by the



school system that we are now inaugurating a second channel, WSEC-TV (17), to provide two simultaneous levels of instruction. For example, classes in science for the seventh grade and math for junior college may be transmitted at the same time.

The Channel 17 addition was subject to strict budgetary limitations. We therefore took many shortcuts (without sacrificing broadcast quality) while building the simple console shown. Educational Channels 2 and 17 may be programmed simultaneously from this cluster of equipment. Normally, two studios will be available, and switching accomplished in the individual control rooms. However, at times, a single operator will have control of both channels. In that event, he will have at his command the following functions:

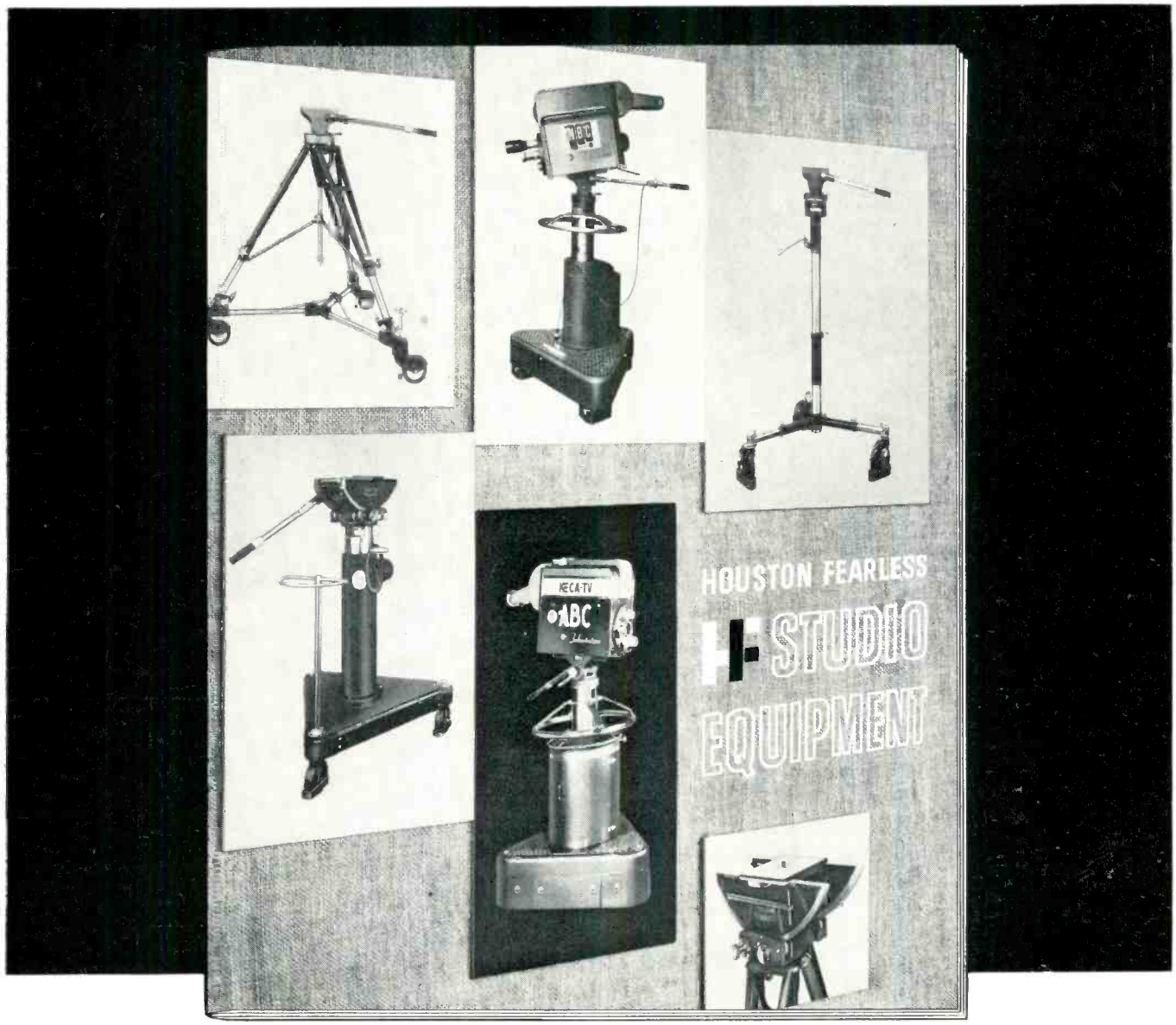
Channel-1 console, Channel-17 console, film-1 desk, film-2 desk (in the lower panels, left to right, in the photograph).

Channel-2 line monitor, Channel-17 line monitor, dual-channel waveform monitor, VTR-1 monitor, VTR-2 monitor (on the upper shelf).

The Channel-2 panel includes control over three projectors; lamps may be extinguished and slides changed. A single button permits this panel to take broadcast control away from the studio. Below this group of buttons is a bank of 12 "take" buttons for two film chains and two VTR's; these provide direct switching for both audio and video. The Gates remote console, remounted below, completes this panel.

The Channel 17 panel includes (starting at top left) an intercom for dual-channel use, an illuminated "tote board" showing status of broadcast control on both channels, and the Channel 17 "take" button. Below these are four sets of remote controls for "stab" amps, videotape gain, and pedestal and sync level. Start-stop switches for the VTR's and a Magnecord audio tape recorder are at the left. Six video-audio buttons controlling rack relays are in the center, with their tally lights. An RCA remote mixer, as an audio console, is situated at the bottom of the panel.

The two film consoles permit previewing, as do the 8-inch Conracs (for VTR's) above. No, the white microphone is not for a "combo" announcer—it's the intercom mike. ▲



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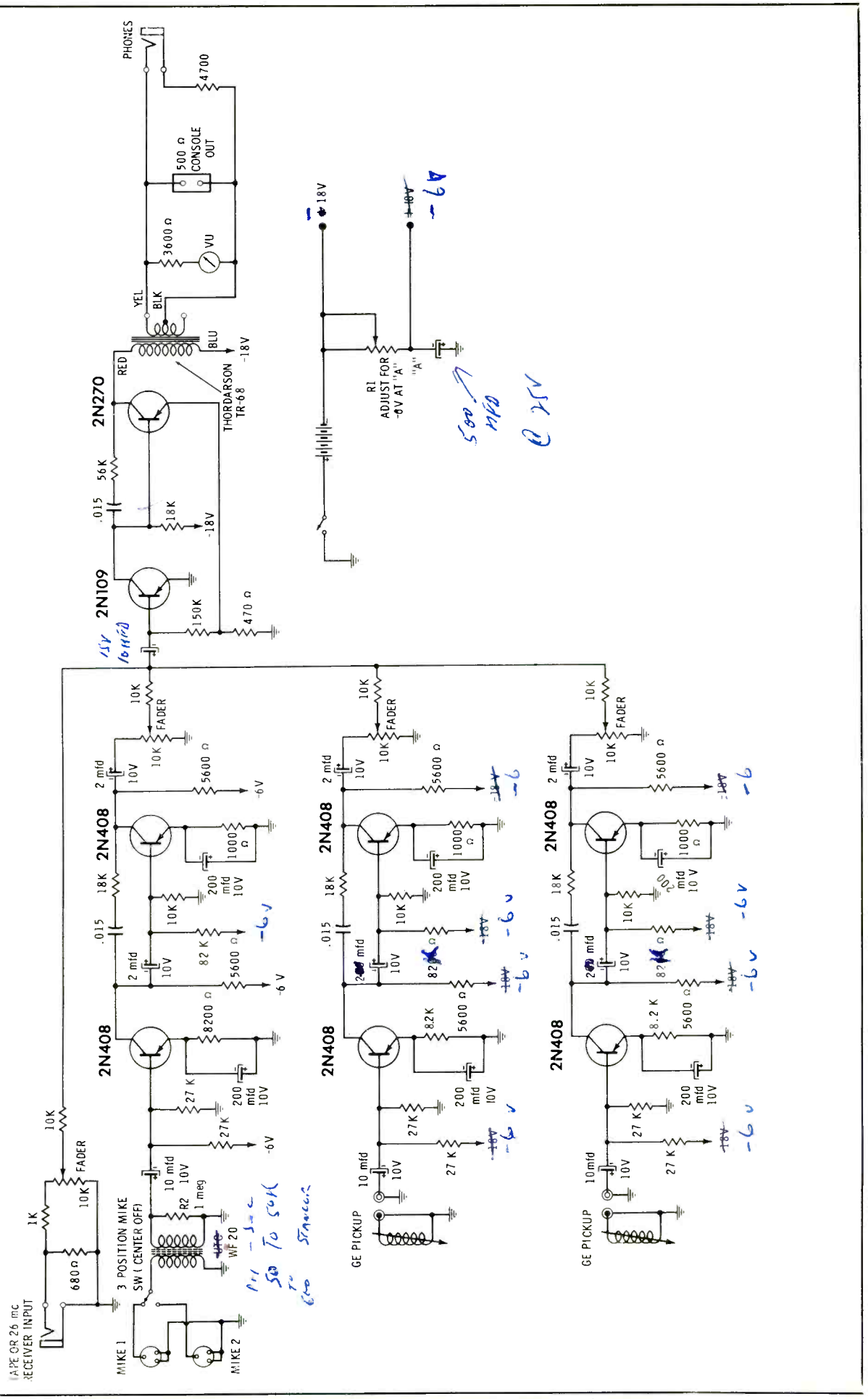

Fig. 3. Satellite console is transistorized and draws minimum of power.

WINC Satellite

(Continued from page 9)

transmitter and receiver conversions.

The receiver conversion is simple. Change to an AC power supply, provide new crystals, tune up to the new frequency and provide a high-fidelity audio output transformer. In some cases, it will be necessary to eliminate extra de-emphasis capacitors and resistors—use 75 microsecond de-emphasis only. The output transformer can be coupled through a .5 mfd capacitor to the plate of the first audio tube. This will lower the speaker volume from the receiver somewhat, but these circuits are generally not used anyway, except for "calling in." (A Thordarson 25S32 transformer was used, with the 500-ohm output fed to a remote-input position on the station console.)

The transmitter conversion is not complex either. The microphone input transformer and audio stage are discarded. The chassis is stripped of the genemotor and all control relays. In their place a 115-volt AC power supply is built. A new 500-ohm-line-to-grid audio-transformer of broadcast quality (Stancor WF-20 or equivalent) is installed away from the power transformer and filter choke fields. An RF filter is installed between the 500-ohm primary and the audio input jack on the transmitter. This consists simply of two RF chokes and four .001-mfd capacitors to ground.

The secret of the broadcast-quality circuit is contained in the bass-boost network which is installed between the top of the secondary of the input transformer and the grid circuit of the modulator tube. In each transmitter this will vary somewhat, since inherent parameters will be different. The circuit used in converting the Link transmitter is shown in Fig. 5. This network of three resistors and a capacitor pulls down high-frequency response (which, in a phase-modulated system, climbs with frequency) making a broadcast-quality system out of what was originally a limited-range device. Since these transmitters were originally designed for intermittent use, it will be necessary to reduce the plate

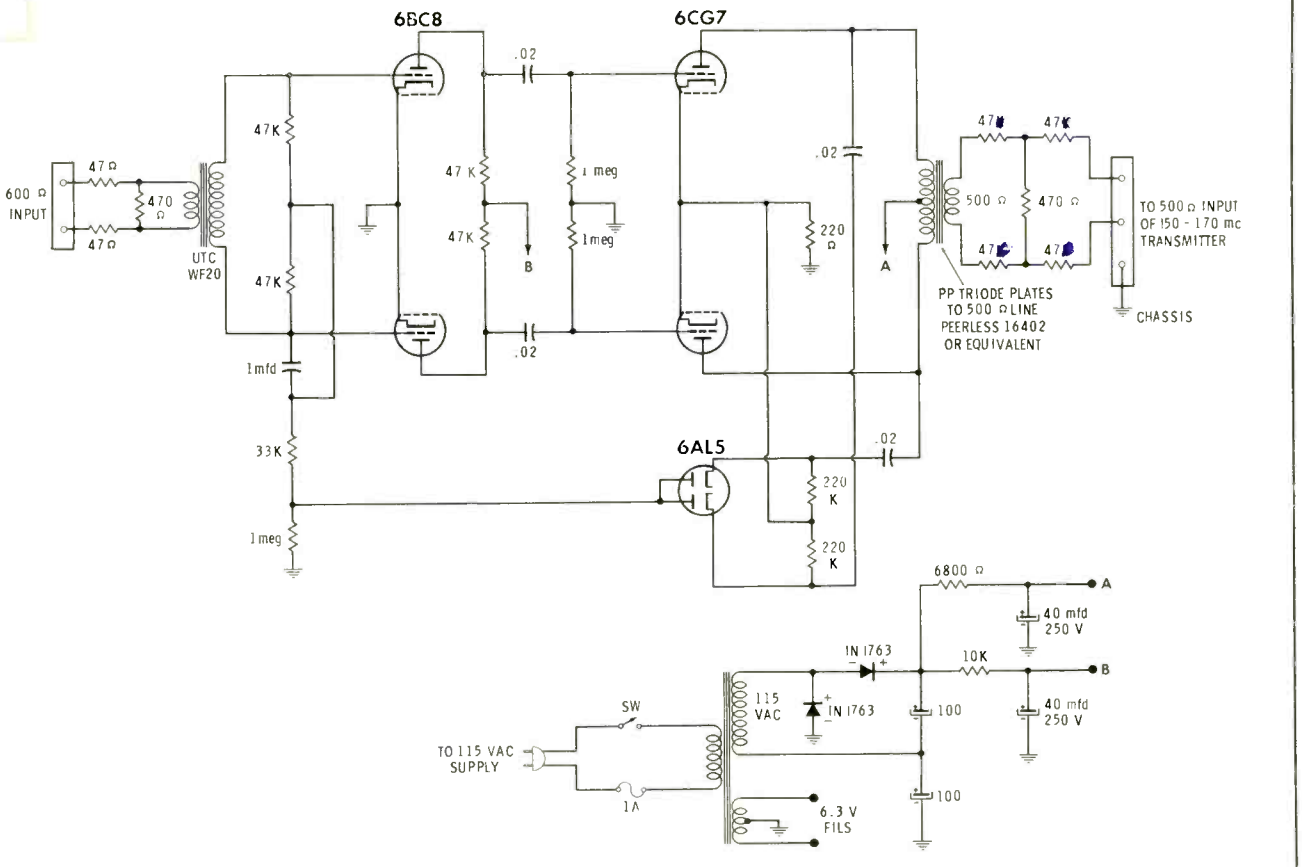

Fig. 4. Limiting amplifier uses only three tubes and handles large excursions.

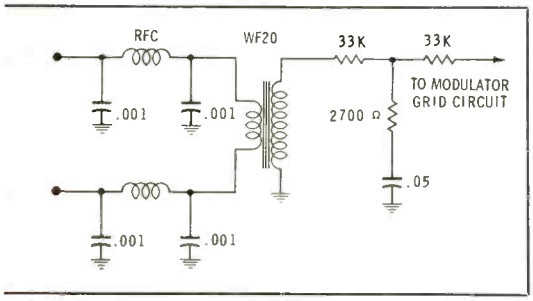

Fig. 5. Equalizing network can be used for most communications transmitters.

voltage to the drivers and final amplifier, so it can run for hours at a time. In 50-watt conversions, the output is dropped to around 35 watts. One such unit is sometimes used 60 hours at a stretch, without component failure. No replacements have been necessary, after more than a year of use. In the mobile broadcast unit pictured, one of the rooftop antennas is a half-wave whip with a matching section in the base. This gives a 3-db gain over the quarter-wave whip (also shown on the roof), and amounts to doubling the transmitter power; the ERP is 70 watts. This antenna is commercially available from several manufacturers.

The receiving antenna at the studio is a ten-element yagi, converted from an amateur beam by cutting down the elements. This antenna is mounted on a rotator atop a telephone pole. A stacked collinear array may be used, especially when it is possible to attach it to the AM tower.

Using the Unit

A proof-of-performance test should be carried out on the completed system to spot any problems. To flatten response, adjustments can then be made in either transmitter or receiver, or both. This is easily done by changing capacitor or resistor values in the pre-emphasis and de-emphasis networks. Taken overall, the job breaks down into a number of rather simple separate operations.

A standby transmitter on the same frequency as the main transmitter also can be fed from the console. The standby unit is powered from the vehicle battery. The turntables can be run by the AC inverter. Thus, a broadcast can be originated for short periods, completely from the vehicle battery. The 115-volt gasoline generator is frequently used to power all AC equipment including internal bus lights and external spotlights. The public-address amplifier is always in demand on remotes.

When football games are broadcast from inside the vehicle during bad weather, a clear plastic windshield is attached across the side opening, and the bus heater keeps the announcers and spotters comfortable. When it is necessary to operate from a high vantage point for any special event, two automobile-top rack mounts and a piece of reinforced ¾-inch plywood are installed. The announcer can then sit or stand on the vehicle roof. These items are carried under the operating table. A five element yagi antenna and demountable mast, used on the "long-haul" pickups, are carried on hooks extended from the vehicle ceiling. With this equipment, any special event within a 25-mile radius of the studio can be broadcast. ▲

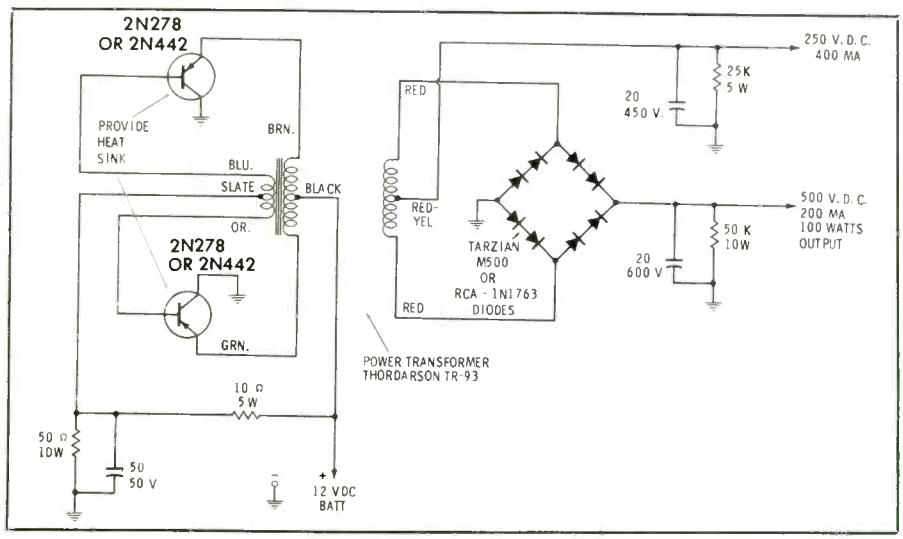

Fig. 6. Transistorized supply operates standby transmitter from battery.

NEWS OF THE INDUSTRY

TI Realigns Activity

Mark Shepard, Jr., Executive Vice President of **Texas Instruments Incorporated,** Dallas, announced recently that TI's Transistor Products and Components divisions have been combined into one division to be known as the Semiconductor/Components division. Combination of the divisions, Shepherd said, was in line with an approach to organization that has been evolving during the past year and which is designed to permit TI to realize fully the opportunity for company products and services in current and future markets.

'62-'63 Conference Committee

President, Marketing. In his new ca- **Association of Broadcasters** announced the appointment of a 10-man committee to plan the Broadcast Engineering Conference held each year as part of NAB's Annual Convention. The 1963 Convention is scheduled for March 31-April 3 at the Conrad Hilton Hotel in Chicago. Orrin W. Towner, director of engineering for WHAS, Inc., Louisville, Ky., was named chairman of the group. Appointed to serve with him were William S. Duttera, director, allocations engineering, NBC, New York, N. Y.; J. B. Epperson, engineering vice president, Scripps-Howard Broadcasting Co., Cleveland, O.; James E. Gray, chief engineer, WYDE, Birmingham, Ala.; Albin R. Hillstrom, director of engineering, KOOL (AM-FM-TV), Phoenix, Ariz.; Clyde M. Hunt, vice president for engineering, Post-Newsweek Stations, Washington, D. C.; Leslie S. Learned, director of engineering, Mutual Broadcasting System, New York, N. Y.; Frank Marx, president, Engineering Division, ABC, New York, N. Y.; James D. Parker, director, Television R-F Engineering, CBS Television Network, New York, N. Y. and Jack Petrik, chief engineer, KETV, Omaha, Neb.

Switching System Delivered

A super-speed message/data communications switching system, the first of its kind in North America, was recently delivered to the international headquarters of the **Aluminum Company of Canada, Ltd.** (ALCAN) by the **ITT** information Systems Division. The equipment, scheduled to be fully operational by the end of the year, is called the ITT 7300 ADX (Automatic Data Exchange) System. It can handle more than three million bits of electronic information per second and can be incorporated into any existing record communications network. It also can form the basis for new networks that handle messages and data in ways not previously possible.

EMI/US Receives Award

EMI/US, Ltd., received an award for having the "Best Display" at the convention of the Society of Motion Picture and Television Engineers (SMPTE), recently held in Los Angeles. A. Bruce Rozet, EMI/US Vice-President and General Manager, accepted the plaque from Harry Teitelbaum, Convention Vice-President for SMPTE, in a ceremony at EMI/US headquarters here. The award noted the excellence of a display of television broadcasting equipment staged by EMI/US. EMI/US is a major supplier of precision electronic equipment for broadcasting and general communications. It is affiliated with EMI Ltd., of the United Kingdom, and operates as a division of **Capitol Records, Inc.**

ITT Reports Record Quarter

International Telephone and Telegraph Corporation announced today that net income, sales and revenues, and orders on hand, all reached new highs in the second quarter of 1962. In his interim report to stockholders, President Harold S. Ganeen said earnings for the second quarter amounted to $10,743,066, or 64 cents per average common share, compared with $9,842,979, or 59 cents, for the corresponding period in 1961. Total sales and revenues for the six months ended June 30 amounted to $517,018,294 in 1962, up from $431,576,725 in 1961. Net income for the first six months of 1962 increased to $18,924,987, or $1.13 per average common share, compared with $17,083,189, or $1.03 a year ago.

Magnasync Appoints Rep.

Mr. William P. Lear, Jr., has been appointed European factory representative for **Magnasync Corporation,** North Hollywood, California. Mr. Lear's centrally-located offices and warehouse, at 11 Rue Michel, Geneva, Switzerland, provides Magnasync's European dealer network and customers with service of maximum efficiency. Magnasync manufactures a complete line of motion-picture sound-recording systems for entertainment, military, industrial, and educational fields.

Texas Crystals Acquired

Whitehall Electronics Corporation of **Minneapolis** recently acquired the Texas Crystals Division of Westronix Corp., according to an announcement from Raymond E. Jacobson, Chairman of the Board of Whitehall. Texas Crystals, which moved its entire plant and facilities from River Grove, Illinois, to Ft. Myers, Florida, three years ago, manufactures quartz frequency-control crystals. While the company previously specialized in crystals for the Citizens-band field, it now produces a complete line of quartz oscillating crystals from 80 kc to 100 mc in various type holders.

Large Screen Color-TV

Theatre Network Television, Inc., New York, N. Y., has announced the first large screen color television network in the United States. The TNT network of large screen color TV, called "colorvision," provides closed-circuit TV communications for business, industry, government, and other groups. The first demonstration of the new color TV projector was held Wednesday, July 25th, at the TNT Technical Center, Woodside, Long Island. The network, including the new and existing projectors, will soon be available in 51 cities. In addition, TNT will offer its program and production services in color television. The projectors, called "Norelcos," are based on the Schmidt optical principle, and have three projection barrels per unit; they were purchased from North American Philips.

ETV Survey Conducted

The first nationwide educational television survey indicates a need during the next decade for more than three times the 309 channels already allocated to ETV. This large-scale deficit in channels for teaching was pointed out by Anthony J. Celebrezze, Secretary of Health, Education, and Welfare, in releasing the report compiled by the **National Association of Educational Broadcasters** under a contract with NEW's Office of Education. "The study just published is of immediate interest," said Secretary Celebrezze, "because it provides a blueprint for an adequate educational television service for the United States. It should provide useful guidance in the administration of the Educational Television Act recently enacted by Congress, which will make available matching grants for new non-commercial educational television facilities."

Video Tape Bulletin

A new series of information bulletins on video tape recording has been introduced by the **3M Company,** St. Paul, Minn. Called "Video Tape Playback," the first issue of the quarterly publication contains a case history on splicing technique, an article on SMPTE's recommended practice on magnetic head tip penetration, and a discussion of video tape storage.

New Catalog

The 672-page "Allied Electronics for Industry," available on request from **Allied Electronics Corp.,** includes more than 70,000 components, parts, and products regularly stocked by Allied Radio. Additions to the 1963 catalog include hundreds of newly developed devices such as laser crystals, fiber optics, electroluminescence, integrated microcircuitry, and reed relays. Expanded sections cover semiconductors, relays, and other electronic and related equipment.

Bogen-Presto Changes Name

Bogen-Presto Division of **Lear Siegler, Inc.,** producers of quality sound products

Gates to Build Portable Broadcasting Facility

The U. S. Army Signal Corps has ordered a "Flying Radio City"—a high-powered broadcasting facility that can be set down by helicopter anywhere in the world and put on the air to a civilian population or to enemy forces in a matter of hours. **Gates Radio Company,** Quincy, Ill., will build the first system at a cost of $1,200,000 and deliver it within 10 months. The "heli-portable broadcast system" includes two powerful transmitters and all essential studio and control equipment, housed in 21 "heli-huts" or mounted on open skids. It will have a 150-foot-tall antenna tower that telescopes for flight; seven studio-control shelters with tape recorders, turntables and radio news teletypes; and eleven diesel-powered electric generators. A sensitive receiving station will enable technicians to monitor hostile broadcasts or pick up and re-transmit the Voice of America, Armed Forces Radio Service, or any other program. One transmitter will be a 50,000-watt standard AM broadcast unit, with a possible coverage of about 12,000 square miles (equal to the combined areas of Maryland and Delaware). The other will be a 50,000-watt short-wave transmitter with a potential range of 6,000 miles. Gates Radio engineers will also train a cadre of Army personnel to operate and maintain the equipment, which will then be tested and evaluated in the field. Flown in by Army H-37 helicopters, the complete broadcasting system can be assembled and activated in a matter of hours. A 'copter can carry one heli-hut, a shelter unit which also serves as the container for equipment designed for air-lift. A typical hut, looking like an outsize packing box, is 12 feet long, 6 feet wide and 6 feet high. It can weigh up to 4,000 pounds and still be flown 200 miles by an H-37 'copter without refueling. The huts can also be transported in standard cargo planes or trucks. Four of the heli-huts are required to house the AM transmitter, 4 for the short-wave transmitter, 4 for relay equipment, 2 for receiving equipment, 3 for control equipment, 3 for studios, 1 for announcing-teletype equipment. On the non-enclosed skids will be 3 antenna systems. 11 diesel-electric generators, and 9 fuel tanks. A special requirement for the Army Signal Corps is for the system to operate normally at elevations up to 12,000 feet. Gates was called upon to develop and match exacting new standards in such areas as blowers to cool the transmitter tubes, higher voltage insulation for wiring, and protection of other components affected by the lower atmospheric pressure of high elevations.

for more than 30 years, has changed its naem to **Bogen Communications Division,** it was announced recently. Harold A. Goldsmith, Bogen president, said the name was changed to reflect more closely orientation of the broad range of sound products produced by Bogen for home, office, industry, and defense. "Bogen," "Challenger," "Presto," Pagemaster," and other established trade names will be retained for the division's products.

Slide Projector Available

The Gray 3B "Telejector," for automatic 35 mm slide projection, is again available to television stations in the U. S. Featuring a unique optical mixing system, the "Telejector" superimposes two images alternately on one optical axis, providing unusually smooth automatic lap dissolves and changes. Push-button operation, either locally or remote, provides uninterrupted slide sequences for television commercials, news photographs, and station breaks. A sequence of twelve slides can be loaded at one time, and additional turrets can be substituted in seconds while the "Telejector" is in operation. Among the line of optional accessories available for the Gray 3B "Telejector" is the 35B Manual Fader, which allows the remote production of special effects, nonsequential slide changes, slow lap dissolves and supers. The 3-B/T "Telejector," a 50-cycle projector capable of operating in a range from 100 to 250 volts, will continue to be available.

Translator Brochure

A new 12-page brochure describing television rebroadcast translators has been made available by **Electronics, Missiles & Communications, Inc.,** Mt. Vernon, N. Y. This informative booklet tells all about translators, how they are used to bring TV to barren areas and how they can be a project of various organizations.

PERSONALITIES

. . . **Shure Brothers, Inc.,** Evanston, Ill., has announced the formation of a New Products Division to be directed by **Marvin B. Lorig,** in the position of vice pacity Mr. Reynolds will be responsion will actively seek new directions for corporate growth through new product ideas from independent inventors, by joint venture, by acquisition, and through internal development.

. . . **Manson Laboratories, Inc.,** has announced the appointment of **William D. Gabor** as Senior Project Engineer in their Communications Division. Manson designs and builds HF, SSB and UHF communication systems, frequency standards, synthesizers and precision oscillators. In addition, they also manufacture high-power modulators, power supplies, transmitters and microwave tube testing equipments.

. . . **Dr. D. L. Jaffe,** President of **Polarad Electronics Corporation,** Long Island City, New York, has announced the appointment of **Herbert W. Pollack as** General Manager of the Industrial Products Division with responsibilities encompassing all phases of marketing, engineering, and manufacturing of Polarad's line of test equipment, including microwave signal generators, receivers, spectrum analyzers, and field intensity measuring equipment.

. . . **William H. Reynolds** has been appointed by **Minneapolis-Honeywell Regulator Company** as director of education and training for its Industrial Products Group. He succeeds **Ellery Hall,** who becomes senior industrial salesman in San Francisco. In his new assignment, Reynolds will have administrative responsibility for the company's Philadelphia-based Instrumentation Education Center.

. . . **George Anthony,** president of **Tape-Athon Corp.,** Inglewood, California, recently announced the appointment of **Thomas L. Aye** as the corporation's new general sales manager. In making the announcement, Anthony stated "Mr. Aye's association with our organization will greatly assist our efforts to meet the goals Tape-Athon has set for itself in the coming years."

. . . **Fred W. Reynolds, Jr.,** has been appointed General Products Marketing Manager for **Cornell-Dubilier Electronics,** New Bedford, Mass. The appointment was announced by Glenn E. Ronk, Vice President, Marketing. In his new capacity Mr. Reynolds will be responsible for marketing A-C and D-C capacitors, ceramic capacitors and tubular capacitors manufactured at New Bedford.

A Few Highlights from the November Issue

PLANNING A NEW FM-STEREO STATION

The first of two installments, discussing transmitter and antenna choices, methods of obtaining desired ERP, and STL and Stereo Generator considerations.

UNDERSTANDING AND USING DBU'S AND DBK'S

With the increased need for using ratios in transmission system calculations, this article will show how to simplify your math by using db's.

FRAME-LOCK DEVICE FOR THE AMPEX VTR

Details of a simple frame-locking generator which eliminates roll-over during transition between tape machines.

RADIO TRANSMITTER MAINTENANCE — PART 3

The final installment outlines a typical maintenance schedule which can be varied to suit individual station requirements.

ADDING A PAGING SYSTEM TO YOUR AIR-MONITOR

Clever use of phantom lines and careful balancing of AC and DC voltages results in a two-wire paging modification which also permits full control of your monitor system.

plus . . . a new monthly column, by our own John Battison, discussing how to handle many typical day-to-day technical engineering problems.

and . . . the ever-popular Engineer's Exchange column, containing numerous suggestions and ideas for improving broadcast operations.

in addition . . . a couple of surprise items you won't want to miss.

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Please check BOTH Your business and occupation

- ☐ AM Radio Station
- ☐ FM Radio Station
- ☐ Television Station
- ☐ Network
- ☐ Consulting Engineer
- ☐ Manufacturer or Distributor
- ☐ Recording Studio
- ☐ Government Agency, Library, School
- ☐ Owner, Manager, Officer
- ☐ Engineer, Technician
- ☐ Other.....

1062

NEW PRODUCTS

Standard For Communications Frequency Measurement

A new single-unit secondary frequency standard for communications frequency measurement for every allocated frequency in the spectrum is available from the Communications Department, **Allen B. DuMont Laboratories,** Clifton, N. J. Termed the DuMont "Fairco" Mark III Frequency Meter, the new frequency standard can reduce to five kc throughout the ham, citizens, and mobile band the more widely separated frequency standards from radio station WWV. The new meter will complement and add to the company's existing communications test equipment units including the 5819-A Universal Test Meter for servicing and tuning, as well as the 5890-B transistorized frequency meter for adjacent or split channel systems. Audible beats at loudspeaker volume are obtained through output peaking circuits and a mixer amplifier speaker system. Sufficient output is obtained to saturate the limiter of most communication receivers, or to mix with a transmitted signal and produce a heterodyne beat. Exact frequency setting is determined through a zero voltage reading in the receiver discriminator circuit or a zero heterodyne beat from a transmitted signal.

3-Channel Transistorized Audio Amplifier

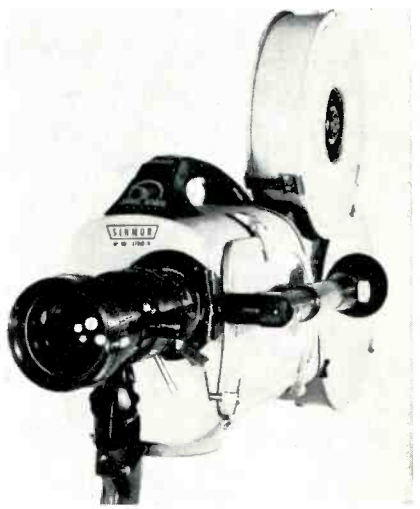
Nassau Laboratories, Port Washington, N. Y., recently introduced a new sound system which contains an amplifier in which three separate audio channels can be mixed as desired and independently controlled from the front of amplifier. These special features make the system particularly useful to both designers and users of high fidelity equipment, as well as other people who need public address and background-music systems. Designated as Model NLAA-25, the new amplifier features bandwidth of 20 to 15,000 cps. with 25-watt continuous output. Channel 1 is a switchable low or high impedance microphone channel, while channel 2 is a switchable high impedance, 1600-ohm, or balanced-to-ground 600-ohm telephone-company-type music input. Channel 3 is the second microphone channel included as optional equipment and is similar to channel 1. The unit can be used as either in fixed or field locations.

CCTV Camera

A Precision 800 Camera, unit of the new television system by **GPL Division-General Precision, Inc.,** permits clients and agency personnel to see how packages, props, and models will actually look when on the air. Medium-priced, the Precision 800 operates in dim or bright light and automatically compensates for dark or light subjects and varying illumination, and can be used with a minimum of lighting accessories by non-technical personnel.

½-Mil Mylar Tape

Sarkes Tarzian, Inc., Bloomington, Ind., has added ½-mil audio tape with a "tensilized" Mylar base to its line. The new tape is available on standard 3, 5, and 7-inch reels containing 300, 1,200, and 2,400 feet. In addition, a new 3¼-inch reel contains 600 feet of ½-mil Tarzian tape and provides double the listening time of standard 3-inch reels. The "tensilized" Mylar tape has increased resistance to heat, moisture, and stretching, plus the same oxide coating formula which has made Tarzian tape suitable for the professional and home recording. Each reel is factory-sealed in a protective plastic bag.



New 16 mm Sound Camera

Featuring the **Debrie** patented "V-Gate" which eliminates the need for register pins, pressure plates, etc., the "Sinmor 16" camera is equipped with an "Angenieux" 17- to 68-mm Zoom lens. Available, too, and interchangeable, is the new 12- to 120-mm "Angenieux" Zoom lens. Designed for studio or field work, the "Simmor 16" provides 16-mm pictures with magnetic sound. **Andre Debrie,** College Point, New York.

How Much Have YOU Heard About co el Custom Coverage Antennas?

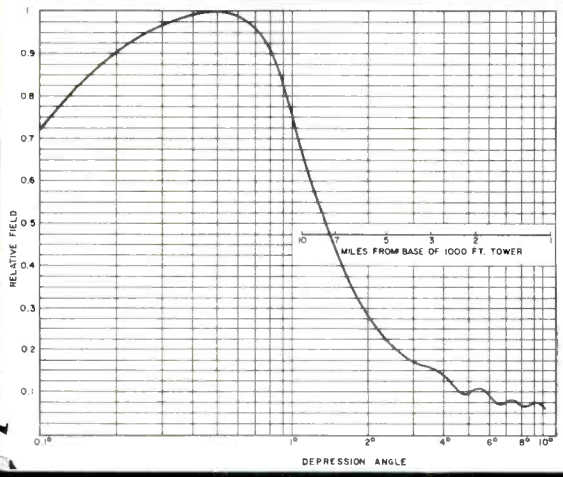
. . . probably very little, because we've been so busy trying to satisfy the demand for our antennas in Europe, Australia, South America, Africa and Asia. Now that our expanded production and development facilities are completed, we'd like to tell you about our achievements in custom coverage antenna systems . . . that provide a greater variety of horizontal and vertical patterns, with greater ERP and greater economies. CO.EL. manufactures a full line of low band, high band and UHF antennas. Described below is one of the many CO.EL. antenna systems.

UHF BROADBAND DIPOLE ANTENNAS

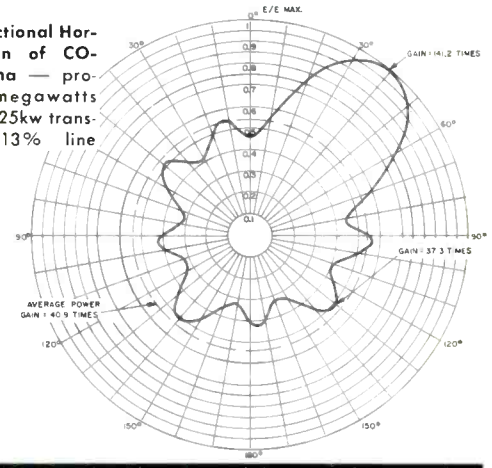
FEATURES — Custom Patterns to meet your station's coverage requirements, with either directional or circular horizontal patterns and shaped vertical patterns ■ Directional Patterns providing megawatts of peak ERP with existing transmitters ■ Increased signal strength without increased operating expense ■ Very low VSWR — guaranteed 1.04 or better ■ No De-icers required ■ Can diplex two stations into common antenna, eliminating need for costly side-by-side mounting ■ Rugged heavy duty construction ■ Expert checkout service by qualified antenna engineers.

Write for details on this and other CO.EL. TV antennas, towers, 10mc FM antennas; and all antenna accessory equipment including filterplexers, notch diplexers, sideband filters, harmonic filters and rigid transmission line.

CO.EL. UHF Antenna — mounted in self-supporting polyester cylinder, with internal ladder.



Vertical Pattern in Main Beam of CO-108UD Antenna — Smooth pattern provides uniform signal strength. Beam tilt is optional.

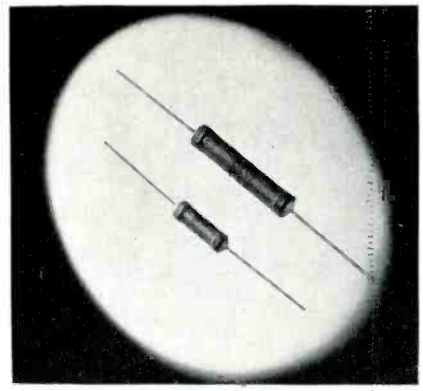


A Sample Directional Horizontal Pattern of CO-108UD Antenna — providing 3.1 megawatts Peak ERP with 25kw transmitter and 13% line losses.

co el

24 CAROL ROAD, WESTFIELD, N. J. / AD 2-0250 / Cable: COELTENNA WESTFIELD

Specialists in Advanced Antenna Systems



Precision Wire-Wound Resistors

Clarostat Mfg. Co., Inc., Dover, N. H., recently announced the new Series CC precision wire-wound power resistors for industrial and commercial applications. The CC Series is available in 1, 2, 3, or 5% tolerances in 3, 5 or 10-watt sizes. Extremely low ohmage ranges are available to meet the growing need for such units. The CC resistors are axial-lead, with a silicone-treated, non-hygroscopic cement coating. The new 1% wire-wound resistors feature completely welded construction, whereby the winding is welded electronically to the terminal leads. Cement coating, core, and metal components are thermally matched for coefficient of expansion. The leads are made of a weldable alloy, tin coated, permitting assembly by welding or soldering. Models available are: CC-3-D, 3 watts; CC-5-E, 5 watts; CC-10-F, 10 watts.

Premium Tape For Multi-Track Recorders

Reeves Soundcraft Corp., Danbury, Conn., has introduced a new premium recording tape, "Golden Tone," which has been produced to meet the exacting demands of today's advanced recorders. The tape, which will cost somewhat more than standard premium tapes now on the market, is expected to have special appeal for fine music enthusiasts and others concerned with obtaining the ultimate in tape sound reproduction. The tape has a dynamic range of 77 decibels, and "skews" and "burrs" are reduced to a minimum by the use of new slitting techniques during manufacture.

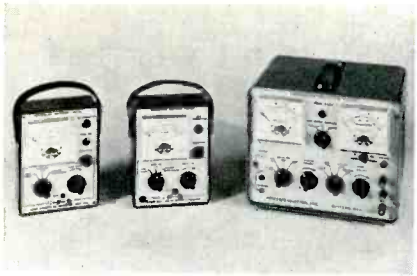
Lighted Button Switch

Two models of a new line of lighted button switches, called "Press-Lite," are available from **Oak Manufacturing Co.,** Crystal Lake, Ill. These switches are presently available in 2-amp 125 VAC, and 15-amp 125 VAC ratings, single pole-double throw, maintained contact. A typical application is visual indication of circuit condition plus two-circuit switching. The 2-amp switch is only 9/16 inch O.D., and the 15-amp switch is only ¾ inch O.D., making them the smallest lighted button switches on the market today for their ratings.

Cash!

HAVE YOU found a better way of handling your jobs at the station? Or developed an improvement in the studio equipment? Or built some "gadget" which does a very special job in broadcasting operations? Share it with your fellow engineers, and make it **PAY** at the same time! Write up the details, snap a few clear photos (or sketch a diagram), and submit your idea to BROADCAST ENGINEERING. All articles accepted for publication are paid for immediately upon acceptance.

The Editors



Silicon-Controlled-Rectifier Testers

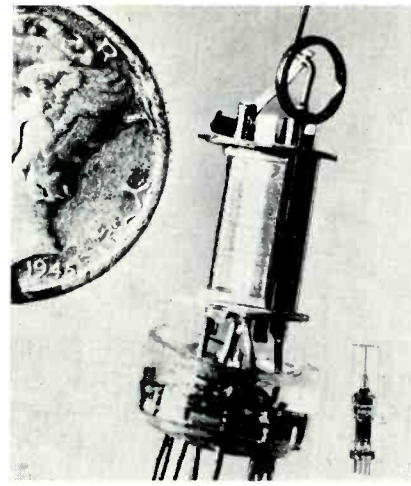
Three new precision-engineered silicon controlled rectifier testers are now available from **Solitron Devices, Inc.,** Norwood, N. J. These testers will make 100% testing of incoming shipments of silicon controlled rectifiers a practical possibility. Moreover, the compact, lightweight units will find wide use in research and development laboratories, and in the field for the maintenance checking of equipment containing silicon controlled rectifiers. The first two models, the battery-operated R-104 and the AC line operated R-106, are both used to determine the gate voltage and current required to fire the SCR, and the anode-cathode leakage in ohms. The R-104 is priced at $69.95, the R-106 at $79.95. The R-200 is capable of testing SCR dynamically, checking gate voltage to fire, gate current to fire, anode-cathode breakover voltage, repetitive peak forward blocking voltage, full cycle forward leakage current, repetitive peak reverse blocking voltage, full cycle reverse leakage current, and SCR holding current. It will also display the dynamic volt-ampere firing characteristics on an auxiliary oscilloscope. The R-200 is priced at $269.50.

100-Watt UHF Translator

A new 100-watt UHF Translator has been announced by **Electronics, Missiles & Communications, Inc.,** Mt. Vernon, N. Y. A new concept in translators, the Model HTU-100 features unique push-pull circuitry in the mixer and output stage, eliminating cavities and thus permitting the use of economical tube types. The use of double conversion enhances the bandpass stability, resulting in improved picture quality in both black-and-white and color. Metering and directional couplers indicate all the necessary operating parameters. The output channels are any UHF TV channel from 70 to 83. Input may be UHF or VHF depending on model chosen. The equipment meets the requirements of FCC Rules, Part 4, Subpart G.

Advertisers' Index

Professional Services



Frame-Grid Probe Tube

The 8254/EC1000 is a subminiature triode manufactured by **Amperex Electronic Corp.**, Hicksville, New York. A frame-grid tube, the 8254 is characterized by high transconductance—14,500 umhos at 14 ma; high gain-bandwidth —385 mc; and extremely low capacitances—Cin = 5.4 pf, Cout = 0.5 pf. Used as a probe, the 8254 has a flat frequency response from DC to 300 mc with an output impedance of 75 ohms. The tube has a resonant frequency of 400 mc, while the input impedance at 250 mc is 450 ohms.

Noise-Cancelling Microphone

A new microphone especially developed for mobile and fixed-station use in areas of high-volume background noise has been announced by **Shure Brothers, Inc.**, Evanston, Illinois. Called the Model 488 "Sono-Bar," the new microphone provides highly intelligible speech communication while cancelling out unwanted background noise in such typical noisy installations as airplanes, helicopters, motorcycles, trucks, fire engines, sporting events, factories, transportation terminals, subways, and other high noise areas. Three versions of the 488 are available: 488A-high impedance; 488B-low impedance; and 488T-transistorized for direct replacement of carbon microphones. List prices are: Model 488A (high impedance) $57.50; Model 488B (low impedance) $57.50; Model 488T (transistorized) $72.50.

Classified

Advertising rates in the Classified Section are ten cents per word. Minimum charge is $2.00. Blind box number is 50 cents extra. Check or money order must be enclosed with ad.

The classified columns are not open to the advertising of any broadcast equipment or supplies regularly produced by manufacturers unless the equipment is used and no longer owned by the manufacturer. Display advertising must be purchased in such cases.

EQUIPMENT FOR SALE

Transmission line, styroflex, heliax, rigid with hardware and fittings. New at surplus prices. Write for stock list. Sierra Western Electric Cable Co., 1401 Middle Harbor Road, Oakland 20, California. 6-61 tf

Commercial Crystals and new or replacement crystals for RCA Gates, W. E., Bliley and J-K holders; regrinding, repair, etc. BC-604 crystals. Also A. M. monitor service. Nationwide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 31, Temple, Texas. 9-61 tf

GOVERNMENT SURPLUS, NEW 10 CM. WEATHER RADAR SYSTEM — Raytheon, 275 KW peak output S band. Rotating yoke P.P.I. Weather Band 4, 20 and 80 mi. range. Price $975 complete. Has picked up clouds at 50 mi. Wt. 488 lbs. Radio Research Inst. Co., 550 5th Ave., New York, New York. 5-62 8t

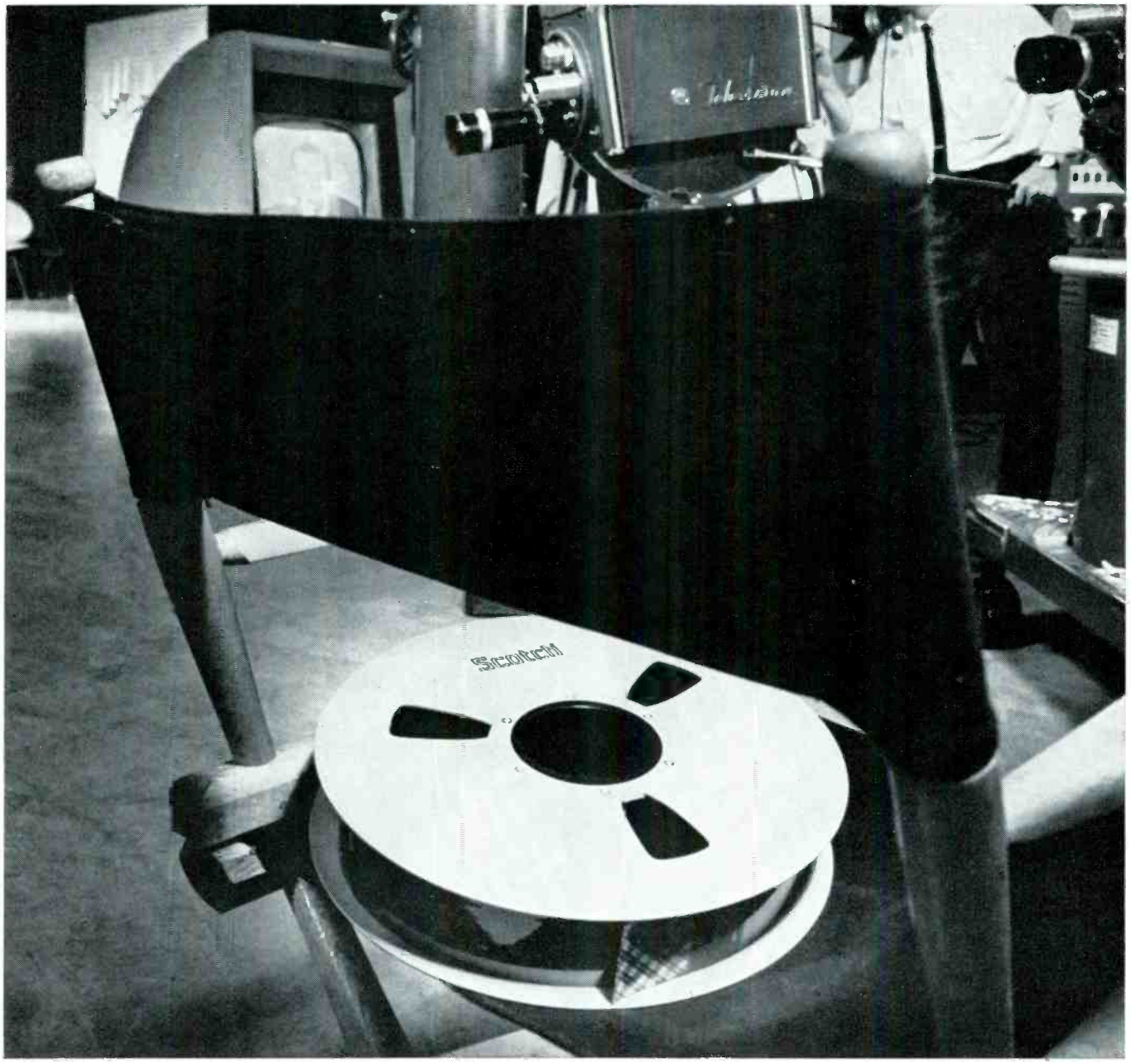
PHILCO MICROWAVE LINK. 7 KMC System. Type CLR-6 also in stock: Repeaters, 12 and 24 channel multiplex. Large quantity. Exc. cond. Radio Research Inst. Co., 550 5th Ave. New York, N. Y. 5-62 8t

Will buy or trade used tape and disc recording equipment — Ampex, Concertone, Magnecord, Presto, etc. Audio equipment for sale. Boynton Studio, 295 Main St., Tuckahoe, N. Y. 4-62 6t

ONE USED RCA Type 5-D 5/1 kw broadcast transmitter complete except for interconnecting cables. In excellent condition with large stock of spare tubes and spare parts. For technical information write or call, L. A. Brogger, Chief Engineer, Radio Station KUOM, University of Minnesota. For bid blanks write or call, Purchasing Agent, University of Minnesota, 404 Morrill Hall, Minneapolis 14, Minnesota. 10-62 2t

MISCELLANEOUS

ENGINEERING And Art Degrees earned through home study. Electronics, Mechanical, Liberal Arts. When writing specify course desired. Pacific International College of Arts & Scences, primarily a correspondence school. Resident classes also available. 5719-W Santa Monica Blvd., Hollywood 38, California. 8-62 6t



How to succeed in pictures...

Simple secret: make the tv image an *event*, not just a picture . . . a lifelike "something that's happening right now," rather than a once- or twice-removed representation! Best way to do it . . . with SCOTCH® BRAND Live-Action Video Tape.

When you put the show on "SCOTCH" Video Tape, you ensure complete electronic compatibility of picture source and picture-on-the-screen. Result is a sense of "*now*-ness" that is unique. No compromises; no translation from an optical medium to an electronic screen; no blur that glosses over the inherent speed differences in media.

And no other video tape has so much experience on the tv production scene. Since the premiere of video tape in 1956, research at 3M Company has been making "SCOTCH" Video Tape constantly better. So that today, for consistent uniformity, there is no other choice. "SCOTCH" BRAND is your best insurance of success in tv pictures.

Magnetic Products Division 3M COMPANY

The Mark of a Matched TV System

Designed to work together electrically and mechanically, RCA Matched TV Systems assure maximum picture quality and equipment stability. RCA is the only manufacturer that designs and builds complete matched TV Systems.

RCA® The Most Trusted Name in Television