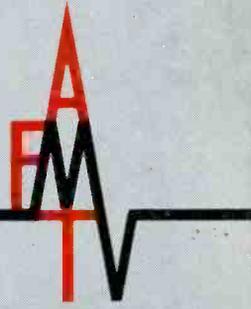


# BROADCAST ENGINEERING

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THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

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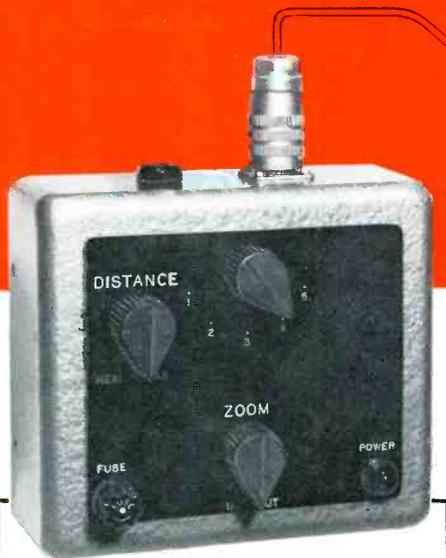
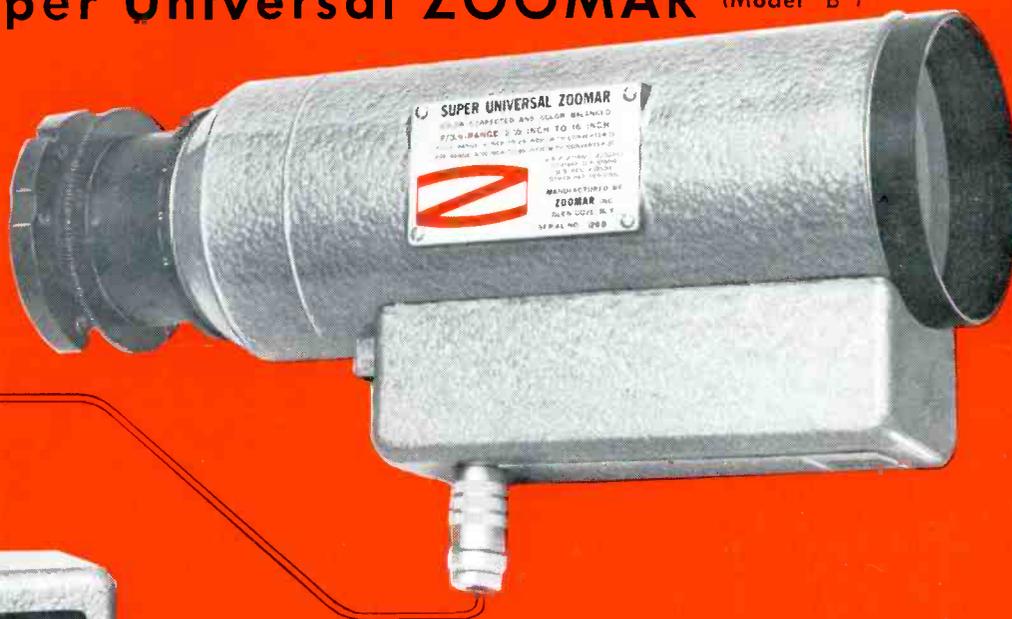
- Transistorized Video Distribution Amplifier

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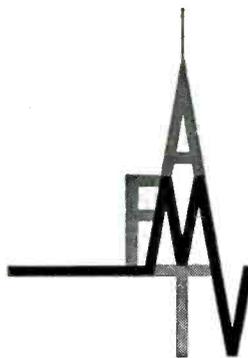
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THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY <sup>®</sup>

VOLUME 3

DECEMBER, 1961

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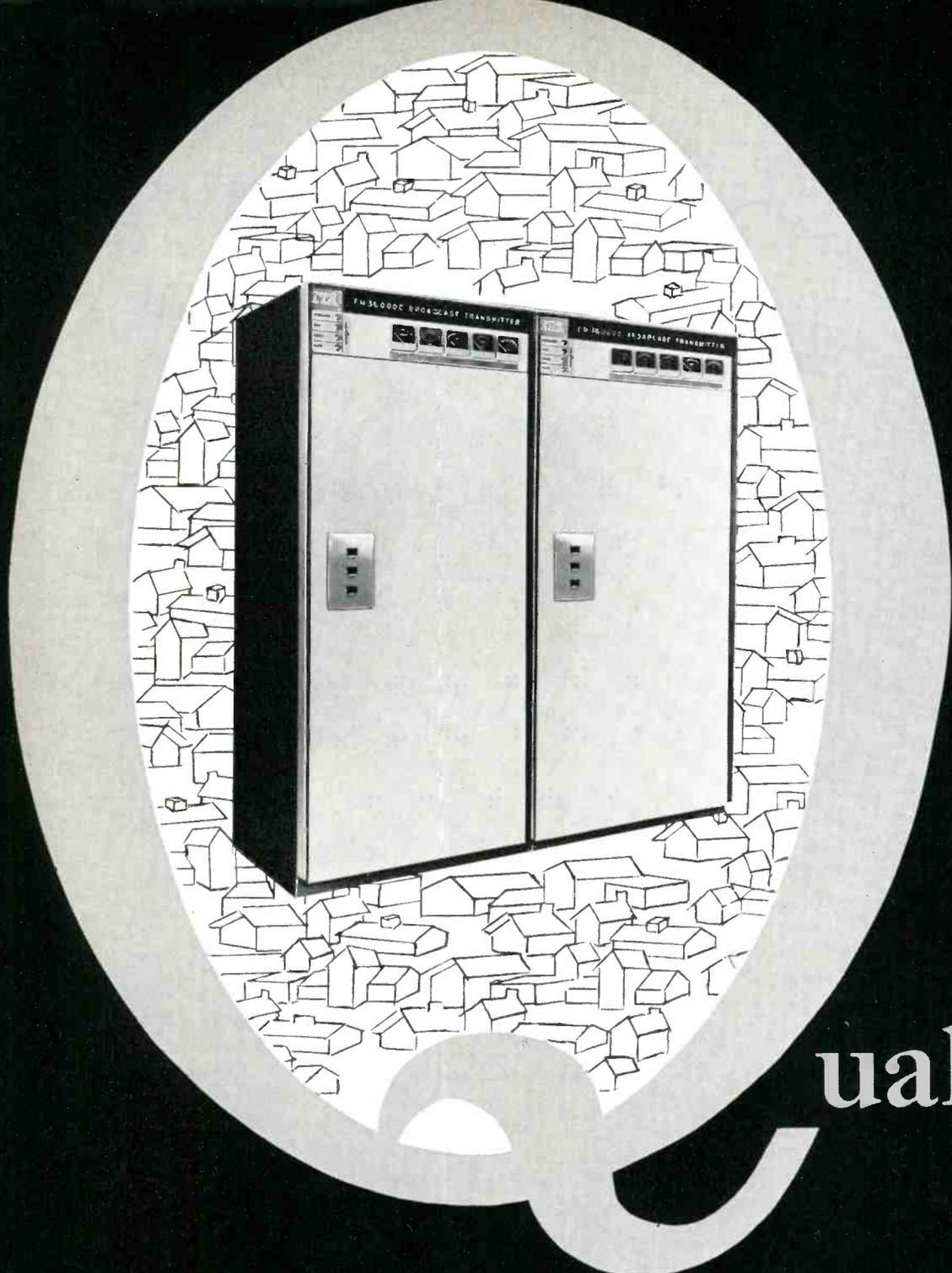
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# The Editor's Cue Line



## Engineers' Symposium

The Eleventh Annual Broadcast Symposium of the Professional Group on Broadcasting of the Institute of Radio Engineers (IRE) has just been held in Washington, D. C. Approximately 300 top engineers attended from all over the country. As a result many good ideas and new concepts were exchanged.

When the IRE was first founded it was composed mainly of *radio* men, engineers and technicians, who were actively engaged in the art and science of communications *per se*, which ultimately led to radio and television broadcasting as we know it today. But in the many years that have passed since IRE's birthday the picture has changed, and today radio broadcasting plays a very minor part in the activities of the Institute. The steering committee of the IRE became cognizant of this, and some years ago in an effort to retain members whose interests were broadcast engineering only, formed the Professional Group on Broadcasting. This is now one of nearly 20 other so called professional groups of the IRE. But even with this sop to the original aims and composition of the IRE, more and more broadcasters are *not* finding what they want in the IRE. The PROCEEDINGS is far too sophisticated for the average radio station engineer, and even for the many of the engineers who hold higher degrees. So what is left for the station man?—the irregularly produced issues of the papers of the various Professional Group

meetings! These fill a very small part of the vacuum left by the lack of broadcast meat in the IRE menu.

Possibly a new institute is needed for broadcast engineers, one started in just the same way as the IRE was originally? Perhaps it should be called the IBE, Institute of Broad-

cast Engineers, and be presided over by one of the great broadcast engineers of a few years ago? How many years is it since a broadcast engineer was president of IRE?

We leave you that thought this month. Your comments addressed to the Editor will be welcome.

## FCC Vacillating

The long awaited "decision" in the clear channel case has come out, and the situation is now in many ways worse than it was. Two Commissioners dissented from the views of the majority, and one, Commissioner Robert Lee, expressed himself very lucidly with far more than a layman's outlook in his dissent. Briefly the decision is to duplicate 13 clear channels with approximately 2000 miles between the duplications, and directional antennas to protect the class 1A stations remaining in the East. The other 12 class 1A's will remain 1A's without duplication for the present. And herein lies the hooker! Because of the indecision on the part of the FCC on what to do with the other clear channels a new AM freeze is to be imposed—not as bad as that which occurred after WW-II, but enough to put more than a small crimp in many broadcasters' plans! Channels 30 KC each side of the unreleased clear channels are to be frozen, or at least in most cases put into a pending file to see what effect, if any, a grant would have on any future increase of power to 750

KW for those remaining clear channel stations.

It is most unlikely that the Commission's expected rush to claim the new duplicated 1A's will materialize. One consultant, we know, tells of a client who came to him excited at the thought of getting 10 KW night, with perhaps 25 KW day and only a few months to wait—oh, yes! the new Rules provide for expedited grants and no processing line for the new class II clears! If an applicant files by Oct. 30, 1961, he could have a grant by next April.

But when he found that he would have to put his \$100,000 investment in a town of five hundred or so people he lost interest. It is very likely that this will become a common event as potential broadcasters attempt to comply with the Commission's instructions to bring new night service to less than one per cent of the USA. If the Commission's daydreams are fully realized it is possible that 12,500 square miles will receive new service, at the expense of freezing 53 channels. (Figures from Commissioner Lee's Dissenting Report).

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actively solicits readers' written material. If you have ideas for equipment that you have built, or have designed but not yet built, or any installations you may have made, etc., sit down and write a story about it. Be sure to send plenty of photographs and drawings to illustrate it. We can use from one magazine page to three, or even four if the story is of sufficient interest. Our regular rates will be paid promptly on acceptance by the editor.

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# An Idealized Weather Radar System for Broadcasting

Radar, used in conjunction with television and radio, provides a perfect tool for the broadcast weatherman. This article describes how a combination of technical ingenuity and showmanship combine to make a lifesaving and useful broadcast service.

*By Tony Sands, Chief Meteorologist, and Clyde G. Haehnle, Technical Advisor, Crosley Broadcasting Corp., Cincinnati*

THE Crosley Broadcasting Corp. has been using a Decca Model 40 radar installation for approximately five years in its Cincinnati studios. Its staff of three meteorologists, with a fully equipped weather installation, service the area served by WLW radio and the television stations in Indianapolis, Dayton and Columbus. The U. S. Weather Bureau installed a long range radar about one year ago, at the Greater Cincinnati Airport, but this has not diminished the value of the 120 mile radar installation. Before the weather bureau obtained their own radar, WLW relayed the radar readings at given intervals to the local government office. These radar reports were placed on a national weather teletype network to be used by the severe warning forecast center and the field of meteorology in general; the U. S. Weather Bureau still maintains a private telephone line to WLW's weather station.

Five years ago when Crosley Broadcasting Corp. purchased the Decca Type 40 weather radar system, the engineering department made a site study and found that the roof of the transmitter building atop Mount Olympus provided adequate line of site clearance in all directions. The Type 40 radar operates in the "X" band on 9 kmc with 20 kw peak power. The antenna has a horizontal beam width of  $1.2^\circ$  and a vertical beam width of  $21^\circ$  to the

half power points. Range scales of 10, 30, 60 and 120 nautical miles are provided, these had to be converted to statute miles.

The transmitter, receiver, and power units are located in the penthouse immediately under the scanner, and the PPI display is located in the transmitter room behind the transmitter console. A 12-inch-long persistence display tube is used with a P-7 orange phosphor. This PPI display is picked up by a transistorized vidicon camera and converted to a standard video signal. Numerous problems were encountered with the videcon pick-up until our engineers located a videcon tube with a sharp narrow-band spectral sensitivity matching the P-7 phosphor of the display tube. An interesting point here is that the "stickier" the videcon, the better the picture.

The sync generator at the transmitter site is locked to the main studio sync generator so that the radar display can appear on the switcher as a video source, available for direct take, lap dissolves or special effects.

Weather radar has proven so successful in Cincinnati that we purchased a second Decca Type 40 for installation at WLWA, Atlanta, Ga. This presented a unique problem since the studio location is surrounded by trees. Our engineers felt that the radar scanner could be

mounted on the inside of the 500-foot self-supporting tower at the 190-foot level. Because the antenna aperture is large compared to the leg columns their shadowing effect would not be serious.

We realized at the beginning that an electronic device has a personality of its own and the idiosyncrasies of the device must be ascertained and evaluated to make it fully effective. When the radar was first installed, we informed the public of our installation, its capabilities and our problems. We asked for public assistance in solving the evaluation problem. The public reaction was so great that we were able to select two observers in each county covered by the radar sweep.

The Crosley Broadcasting Corp. has its own airplane and pilot, and we installed a direct air-to-ground communications system between the plane and the weather station (weather reconnaissance). By using the combined services of the public weather observers and the reconnaissance aircraft we were able to adjust the radar to establish true distance and bearing. The tests also allowed the evaluation of power return versus output and the development of a linear evaluation of echo brilliance versus quantities of moisture and turbulence. The full scale testing extended over a six-month period, until a full appraisal of limi-

*(Continued on page 16)*



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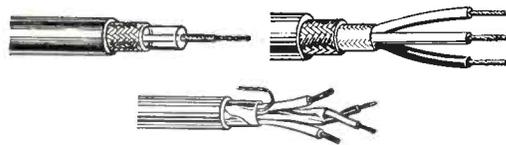


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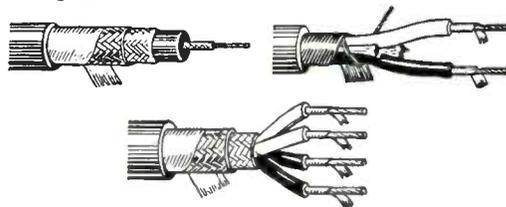
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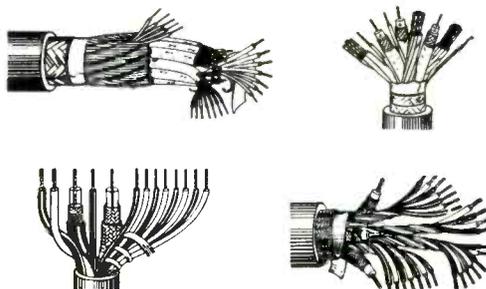
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# Converting FM Broadcast Stations For Stereophonic Transmission

Problems and solutions are presented

By James Gabbert  
Technical Director  
KPEN-Pacific FM Inc.  
San Francisco, Calif.

## EDITOR'S NOTE:

*This article reveals the urgency for the industry to develop measuring procedures and test equipment for accurate compliance of the standards set down by the FCC on stereophonic transmission.*

THERE are two basic methods that can be used to convert an FM station to FM Multiplex Stereo. The first method, which is certainly the most expensive, unless the station is now under construction, is to purchase all new equipment, including a type-accepted stereo transmitter, a stereo console and associated studio equipment. All that is involved in this method besides the monetary investment is the time to install and wire the equipment. For most existing FM operators this method is not the best one because of the large capital investment required for all new equipment, and because the station's existing equipment will generally suffice for FM Multiplex Stereo if a few modifications are undertaken. Before considering new equipment as an "easy out" for the broadcaster with a limited technical staff, it should be remembered that even new equipment has to go through an initial break-in period which always turns out to be very troublesome. For the existing FM station with existing equipment the second alternative of modifying as much of this equipment as possible should be given serious consideration.

The FM broadcaster should fully understand that Multiplex Stereo is a new service to the general public. There will be skeptics among the public and it must be proven to them that the new system really does perform as expected. That's why it is imperative that the broadcaster do everything within his

means to insure superb performance of the FM Stereo System. The conversion of the station consists of three basic steps. The first is the conversion of the transmitter, the second is the proof of performance to insure that the system is working properly, and the third is the conversion of the studio facilities.

The transmitter conversion will depend entirely on the type of transmitter and the complexity of its circuitry. The first step is to find out what type of stereo generator will best perform with the transmitter. The selection will depend on the transmitter and its exciter. The FCC states that in the stereo system the main channel is to be modulated with the sum of the left and right channels of the stereo signal (L+R). The subchannel, which is the suppressed carrier at 38 kilocycles, is to be amplitude modulated with the difference of the left and right channels (L-R).

As mentioned in the stereo transmission standards of the FCC (Section 3.322, paragraph m.) the phase difference between the zero points of the main channel signal and the stereophonic subcarrier sidebands envelope under steady state conditions shall not exceed plus or minus three degrees throughout the audio spectrum. Because of this stringent phase relationship requirement, it is quite apparent that some form of time delay device will have to be incorporated in either the (L+R) or the (L-R) portion of the system. Here the problem is that the

main channel (L+R) and the subchannel (L-R) go through different circuitry before they are mixed; therefore each one has its own phase shift and transit time delay. In some cases this delay will be in the main channel (L+R) and in others it will be in the subchannel (L-R). Because of this requirement it is essential that the FM broadcaster make sure that the stereo generator he selects will work with his existing transmitter. For some broadcasters a new exciter and a stereo generator will be essential.

In converting the KPEN Western Electric 506B-2 10 kilowatt FM transmitter to stereo transmission it was found desirable to replace the existing exciter. The old Western Electric exciter was of the reactance tube type with a motor-controlled frequency stabilizer, and generally was unstable and was of a very antique design. The output of this exciter was  $f/8$  where  $f$  is the carrier frequency. The rest of the multipliers are doubler stages built in the transmitter. To simplify the physical replacement of the exciter a Standard Electronics Serrasoid modulator model number 936 was used as it was specifically designed for this particular transmitter and was of the same physical size as the original one. Thus the exciter replacement was a simple matter of changing units and adjusting the output loading of the new one. Other exciters could easily have been used simply by modifying the multiplier stages of the Western Electric. The

serrasoid type of modulator is the most widely used in present day FM broadcasting. The circuit has an 1/f modulation characteristic as it is a phase modulation process. Because it is an indirect FM or phase-modulated system, the amount of deviation is not directly related to the modulating frequency. Thus in order to convert PM process into the equivalent of direct FM it is necessary to employ pre-distortion of the audio frequency response. In the PM system the amount of deviation produced as the audio frequency rises, increases at the rate of 6 db per octave. Because of this characteristic most of these type modulators have their predistortion-preemphasis built right into an audio amplifier which drives the cathode of the modulator tube.

When transmitting FM stereo the normal audio input of the modulator becomes the input of the (L+R) main channel. As indicated in the FCC stereo standards, it is of necessity that the ratio of L+R peak main channel deviation to the (L-R) peak subchannel deviation under steady state conditions shall be within plus or minus 3.5 per cent of unity throughout the audio spectrum. Upon analysis this presents a problem with the serrasoid modulator because of the aforementioned 1/f characteristic. The solution is to modify the preemphasis network in the modulator. What is required is an absolutely flat response without the preemphasis. This makes it necessary to still employ a certain amount of the audio predistortion to compensate for the effects of the PM system. Minor adjustments to the feedback circuitry will be necessary. A certain amount of cut-and-try after the stereo generator is operating will have to be done to match the response of the (L+R) channel to the response of the (L-R) subchannel.

The insertion of the stereo subchannel and, if used, the SCA subcarrier is accomplished by a phase modulator in the latter stages of the exciter. In the case of the KPEN exciter a Multiplex input was originally incorporated in the design. It consists of a 27 kc to 75 kc subcarrier amplifier and a phase modulator. The other exciters available of the serrasoid type use similar techniques for the subcarrier inser-

tion. This part of the system should give no trouble in stereo transmission.

Figure 1 shows a block diagram of a stereo generator which has been designed to accompany the serrasoid modulator. The left and right audio channels enter the exciter through 15 kc lo-pass filters with sharp cut-off characteristics. The filter is used to remove all components above 15 kc that would interfere with the 19 kc pilot. Following the filters are standard 75 microsecond pre-emphasis networks which are closely matched. After the pre-emphasis both the left and the right channels are run through a matrix. Here the left channel is added to the right channel to give the (L+R) and the right channel undergoes a phase reversal to give the required (L-R). From this point until they are combined in the main exciter they cannot vary more than three degrees in phase shift from each other and their frequency response must also remain within 0.3 db of each other. Great care must be taken from this point on in handling the two channels. The (L+R) then passes through a three-stage audio amplifier with a gain control preceding the first stage of amplification. Following the amplifier stages is a phase reversal switch for the (L+R) and then it passes on to the normal audio input of the main exciter. The 19 kc pilot is inserted following the phase reversal switch.

In the case of this type of modulator the (L+R) channel has to go through a considerable amount of circuitry in the exciter that the subcarrier (L-R) does not. The main channel passes through a multitude

of amplifiers and multipliers. Consequently, there is a certain amount of inherent delay and phase shift in the (L+R) main channel by the time the (L-R) subchannel is phase modulated onto it. To overcome this, a time delay is necessary somewhere in the (L-R) portion of the system. The delay ideally should have an equal response for the whole audio spectrum. Also it should be variable to compensate for changes in various exciters and transmitters. It was found in this system that the low frequency phase relationship was a slight problem, so a low frequency phase adjust was incorporated into the system.

The 19 kc oscillator must meet the FCC requirements of frequency stability as indicated in section 3.322 paragraph b. This means a very accurately cut crystal. From this crystal comes both the 19 kc pilot and the second harmonic for the 38 kc subcarrier. The pilot has to have a phase adjust to insure that it is exactly in phase with the 38 kc subcarrier. A gain adjust is also incorporated to establish the proper deviation of the main carrier by the pilot. It is realized here that these will be incorporated with the stereo generator when it is purchased, but it will be found necessary to adjust these various phases and gains after the installation of the generator into the transmitter.

In order to obtain satisfactory results in multiplexing both stereo and SCA, the transmitter and antenna system must meet certain stringent requirements. This is even more so with FM Stereo as the FCC carefully spells out the minimum engi-

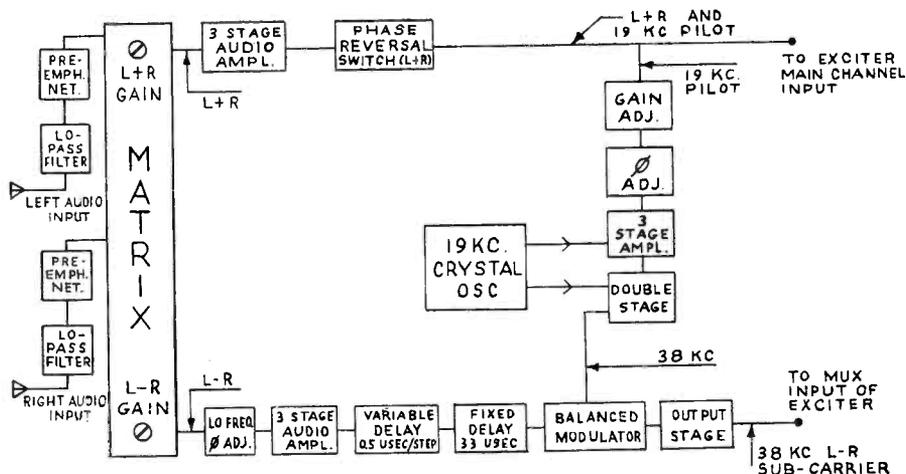


Figure 1—Stereo generator for use with serrasoid modulator.

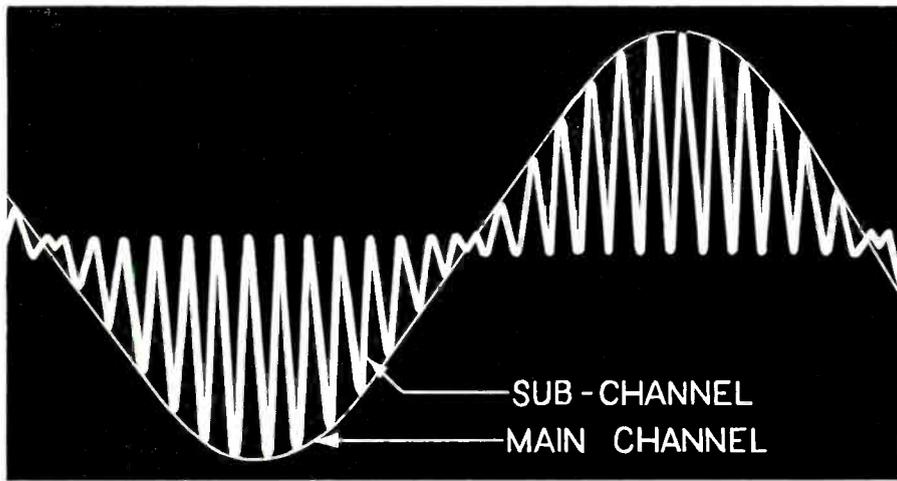


Figure 2—Oscilloscope display of 38 KC subcarrier modulating FM carrier.

neering requirements quite explicitly. The basic problem has been the elimination of crosstalk interference of the main channel modulation products to the stereo subcarrier and conversely the crosstalk of the subcarrier to the main channel. The basic problems in the transmitter revolve around the multiplier stages creating phase distortion and lack of bandwidth. Also, improper or untuned coupling lines between stages will interfere with the relationship of the main channel to the sub, and vice versa. Regeneration in amplifier stages can narrow the bandwidth and appear to raise the Q of the circuit and thus cut off the upper frequency sidebands and introduce a certain amount of amplitude modulation into the system and increase the crosstalk and distortion. The antenna system must be well designed with proper bandwidth and a very low VSWR. The effect of a high mismatch in the antenna system will manifest itself mainly in crosstalk.

At KPEN it was found necessary to make a few modifications in the Western Electric transmitter. These were done in the months prior to the arrival of the stereo generator. The second doubler stage, which used a WE 350A or an 807, was found to be very narrowbanded due to a fairly high Q plate circuit. In broadening this there was a substantial loss in drive to the next stage so that the tube was replaced by a 6146 and the appropriate voltages were changed. After this it was found that the multiplexed signal could be multiplied up to the main carrier frequency of 101.3 mcs.

without any degradation whatsoever. This really was a simple modification requiring a change in tube sockets and using the same plate tank with a swamping resistor across it to lower the Q.

From field reports from other FM broadcasters who had been multiplexing this type of transmitter with SCA service, it was found that the kilowatt driver stage required extremely critical adjustments. This amplifier, utilizing a neutralized push-pull amplifier with the old Western Electric 357-B's, was very inefficient and unstable. At KPEN it was replaced by a very stable grounded grid push-pull amplifier. The tubes selected were the new Eimac 3-400Z zero bias triodes. The modification itself only took six hours total time and required very few components. The same input loop was used and likewise the same tank circuit. The results of the modification were quite apparent when the transmitter was first multiplexed. Using a General Electric BM 1-A frequency and modulation monitor with an oscilloscope connected to the monitor's discriminator the phase relationship of the (L-R) and the (L+R) was measured throughout the audio range from 40 cycles to 15,000 cycles per second from the output of the multiplier stages and then from the driver. There was no change in the performance. The crosstalk was measured and observed on the oscilloscope under the same conditions and again the performance was not affected by the power amplifier stages of the driver. The grounded grid amplifier was so broad that the

plate tuning capacitor could undergo fairly large changes and not affect the crosstalk. This was a vast improvement over the original amplifier. The final amplifier stage in the KPEN transmitter had been previously modified because of tube life problems with the original tube, the ML5541. It was replaced with a ceramic 3CX-10,000A3. This stage, when properly neutralized, presents no problems in multiplexing. The antenna system at KPEN is very unique as it was a custom-designed directional. Its characteristics turned out to be ideal for perfect multiplex operation. The VSWR is less than 1.08. Therefore it presented no problem in the conversion of the station to Multiplex Stereo.

After the exciter and the stereo generator have been installed and matched properly to each other the difficulty then is to adjust the entire system for optimum performance in compliance with the standards set forth by the FCC. This, to date, has presented one of the major problems. There are no receivers that really meet these requirements with sufficient margin to rely on them for a thorough proof of performance. There are no monitors as of yet so separation cannot be measured. To prove the system is working properly it is necessary to measure the phase angle of the (L+R) with relation to the (L-R) subcarrier, the frequency response of both the main and the subchannel, the phase relationship of the pilot to the subcarrier. This has to be done with the station modulation monitor and an oscilloscope plus a specially constructed constant k filter and a demodulator.

Before the station's performance measurements of the stereo system are done, it is quite advisable to read the FCC's stereo standards, particularly the new section 3.322 Stereophonic Transmission Standards. It will be assumed that the manufacturer of the stereo generator has automatically taken care of meeting these requirements, but it is up to the individual station to prove this in each installation. The test equipment necessary for all of these measurements consists of an audio oscillator, an oscilloscope, a quality vacuum tube voltmeter, a distortion and noise meter, a high quality receiver (the GE BM-1-A

# Langevin

## Breakthrough! ROTARY MIXERS

First basic improvements in mixer design in 20 years • Smooth instrument-type action with feathertouch • Available in single, dual and triple gangs for modern stereo use • Compact design allows replacement of single controls with 2 gang units in FM Stereo conversions • New balanced circuitry for complete cut-off • No maintenance — no cleaning required for decades of noise-free use



SINGLE



2-GANG



3-GANG

### SMOOTH ACTION FOR EFFORT-FREE CONTROL

Only four grams of static friction need be overcome to accomplish rotation of Langevin Mixers. Effortless control is the result of long research into the mechanical requirements of friction-free bearings and brushes along with the employment of modern printed circuit techniques for the contact rows.

### SUPER ACCURACY THROUGH PRINTED CIRCUITS

Correct contact positioning is guaranteed through printed circuitry derived from master layouts made on dividing heads. This insures satin-smooth, low-drag, bump-free action as the control is rotated.

### LONG, TROUBLE-FREE LIFE IN EXCESS OF 100,000 CYCLES

Langevin controls have a noise-free life expectancy in excess of 100,000 cycles. Low, uniform contact pressures decrease wear and give decades of service without cleaning.

### SEALED AGAINST DIRT AND CORROSION

Langevin Mixers are pre-lubricated and sealed against moisture, corrosion and dirt for life-time use. Cycling and accelerated aging tests prove quiet operation for the life of the control.

### GOLD PLATED CONTACTS FOR LOW NOISE OPERATION

All contacts in Langevin Controls are gold-plated. Gold is a noble metal and does not form noise producing oxides. Alloys such as nickel, nickel silver and brass do form oxides, which are insulators and produce noise as time passes. Contrary to popular belief, the gold does not wear off of the contact, but, rather, galls and works its way into the pores of the base metal through usage. This increases conductivity and smoothness with age.

### GENERAL DESCRIPTION

Langevin Rotary Mixers and Attenuators are available in three diameters, as well as in single, double and triple gangs for two and three channel stereo use. Printed circuitry is employed throughout for precision and uniformity. Contact decks are formed of non-hygroscopic phenolic, type FBE. Stainless steel shafts and brass bearings are used for long life, non-seizing properties, and to give friction-free action. Frames are formed of satin-black anodized aluminum. A universal mounting bracket allows replacement of all attenuators and mixers of alternate make because of three different mounting centers provided. These are 1 3/8", 1 1/4" and 1 1/2". All connections are conveniently made to solder terminals at the rear of the control, facilitating wiring and making a neater appearance. An extra "C" center or common terminal is provided on each control to eliminate two wires to the usual "common". This also gives balanced circuitry on the interior of the control, allows maximum cut-off, and eliminates crosstalk. In addition, this makes for easy test and wiring changes. Case grounds on all Langevin controls appear on another terminal, completely separated from signal ground, or "C" common. Controls are sealed against dirt, moisture and corrosion. All units are available with and without detents or Cue Circuit.

### POPULAR TYPES OF ROTARY MIXERS—ALL OTHER TYPES AVAILABLE

The "MX" suffix on these units listed below denotes "mixer" function and these attenuators are not supplied with detents unless specified (no added charge for detents). Units are tapered to infinity, come supplied complete with knob, dial plate etched to suit and universal mounting

Model	Circuit	Steps	DB/Step	Curve	Insertion Loss in DB	Diameter "A"	Length "B"	SINGLE		2-GANG		3-GANG	
								Price, Net	Model	Length "B"	Price, Net	Model	Length "B"
MX-201	Ladder	20	2	A	6	1 1/2"	1 1/8"	12.00	MX-201-2	22.50	MX-201-3	31.50	
MX-202	Balanced Ladder	20	2	A	6	2 1/4"		24.50	MX-202-2	45.00	MX-202-3	66.00	
MX-203	Ladder	32	1 1/2	B	6	1 1/2"		19.50	MX-203-2	36.00	MX-203-3	52.50	
MX-204	Balanced Ladder	32	1 1/2	B	6	2 1/4"		28.00	MX-204-2	51.00	MX-204-3	74.00	
MX-601	"T"	20	2	A	0	2 1/4"		24.50	MX-601-2	45.00	MX-601-3	66.00	
MX-604	Balanced "H"	20	2	A	0	2 1/4"	2 7/8"	57.00					
MX-602	"T"	32	1 1/2	B	0	2 1/4"		28.00	MX-602-2	51.00	MX-602-3	74.00	
MX-605	Balanced "H"	32	1 1/2	B	0	2 1/4"		60.00					

\*With de luxe K-111 WE type mixer knob or K-108 RCA type knob, add \$1.50 (please specify).

### BRUSH CONTACT IS GOLD PLATED

Brush contacts are also formed of gold. Thus, no electrolysis takes place between the contacts and brushes, further insuring quiet operation.

### QUIET OPERATION IN LOW-LEVEL SERVICE

The combination of accurate printed circuitry for uniform contact, non-oxidizing gold and low brush pressures give noise free operation at -130 dbm. This means satisfactory operation before preamplification for low-level service.

bracket. Standard impedance unless otherwise specified is 600 ohms in and out. Other standard impedances of 150, 200, 250, 500 and 600 ohms in or out supplied in any combination if specified at no additional charge; add 15% for impedances in or out not standard to prices shown. Specify if cue position is desired; charge is \$3.00 single, \$6.00 dual and \$9.00 triple gang. If no knob or dial is desired, please specify; deduct allowance of \$0.75 for knob and \$0.75 for dial.

"Over thirty-five years of audio progress"

## Langevin



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Frequency and Modulation Monitor is excellent for this purpose) and the previously mentioned filter and demodulator.

The first measurement should be the frequency response of the main channel (L+R). This is perhaps the easiest measurement to conduct as the procedure is the same as the normal proof of performance measurements. The left or the right channel of the stereo generator should be fed a single audio tone. The response can thus be directly read right off the volume indicator meter of the modulation monitor. During this measurement the 19 kc pilot and the (L-R) subcarrier should be completely removed.

In order to perform the measurements at 25, 50, and 100 per cent modulation, a calibrated attenuator inserted between the oscillator and the input of the transmitter will be necessary to compensate for the pre-emphasis of the audio signal in the transmitter. After the measurements have been conducted by feeding the left channel, the audio input from the oscillator should be fed into the right channel and similar measurements conducted. Then the distortion and noise of the (L+R) main channel should be measured. Like the previous measurement, this one is similar to the normal proof of performance measurements. Again it is very important to remove the pilot and the subcarrier as they will appear at the output of the modulation monitor and cause erroneous readings.

At KPEN it was found more convenient to measure the frequency response of the (L-R) subchannel indirectly since the response of a specially constructed demodulator would not be known, and the principal objective here was to match the response of the subchannel to the response of the main channel. First, the measurement of the main channel was accomplished by using the test set-up mentioned above with the addition of an oscilloscope connected to the output of the discriminator of the GE modulation monitor. The main channel (L+R) is modulated 45 per cent as indicated on the percentage meter of the GE monitor with a 400-cycle-per-second tone. This will appear like a simple sine wave on the oscilloscope. The gain of the (L-R)

is then increased until the amplitude modulated waveform of the subchannel fills in the main channel modulation with the 38 kc carrier which is modulated by the 400-cycle tone. Figure 2 indicates a sketch of this picture. When the subcarrier is also at 45 per cent modulation, the base line of the composite waveform will appear as a relatively straight line. After the (L-R) and the (L+R) gains have been set, they should not be touched again for this measurement. Now all that has to be done is to vary the oscillator frequency and note the change of (L-R) with respect to (L+R) at the required points throughout the spectrum. This measurement can be made in volts or decibels. To be sure that the person conducting this measurement knows what variation to look for, it is desirable to vary the (L-R) subchannel gain 0.3 db with respect to the (L+R) main channel gain under steady state conditions. This variation will then serve as a reference picture. It is then possible to spot-check the whole audio spectrum in a minimum of time.

The distortion set-up, as shown in Figure 3, should consist of the modulation monitor, especially designed constant K derived filter, and a specially constructed demodulator for the subcarrier. The filter should have a bandpass of 23 kc to 53 kc and attenuate rapidly outside this band of frequencies. The distortion and noise meter should be attached to the output of the subcarrier detector. In order to regenerate the carrier, the 19 kc pilot must be inserted to the point where it modulates the main carrier by 10 per cent. If the bandpass filter does not suf-

ficiently attenuate the 19 kc, it is obvious that it will cause false distortion and noise readings. From this point on the measurements are conducted in the normal manner.

The next measurement to conduct in the proof of performance is the measurement of the phase angle between the main channel (L+R) and the subcarrier (L-R). The General Electric BM 1-A modulation and frequency monitor is ideal for this measurement. If this type of monitor is not available, it is suggested that a very broadbanded, well-aligned receiver be used. It is important that the receiver does not contribute any unwanted distortion. The oscilloscope should be connected across the discriminator of the monitor while the oscillator is connected to the input of the left or right channel of the stereo generator. To read phase shift of three degrees between any two quantities requires rather accurate and careful measurement techniques. The most accurate and also the simplest way is to use the tangent of the angle. In the base line of the picture that was obtained previously for the frequency measurement of the subchannel (L-R) there will appear a small quadrature component, 90 degrees out of phase. The ratio of the peak of this out-of-phase component to the peak of the main envelope is equal to the tangent of the phase angle. This can be derived imperically by merely drawing on a piece of paper the various waveforms. First, the main modulation, which is a simple sinewave, then the subcarrier modulation within the main channel envelope. Shift the phase in the drawing and you imme-

(Continued on page 22)

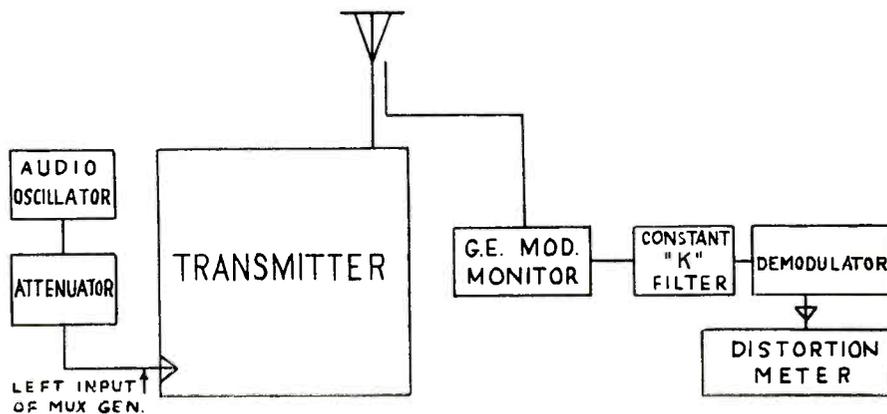
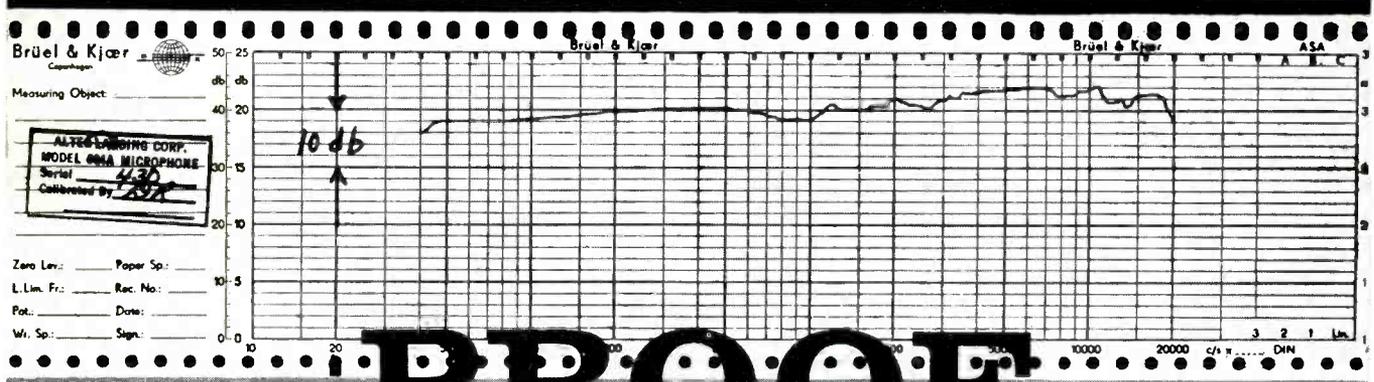


Figure 3—Distortion test setup for stereo multiplexing.



**Frequency Response:** 35 to 20,000 cycles  
**Output Impedance:** 30/50, 150/250 and 20,000 ohms (selection by connections in microphone cable plug)  
**Output Level:** -55 dbm/10 dynes/cm<sup>2</sup>  
**Hum:** -120 db (Ref.: 10<sup>-3</sup> Gauss)  
**Dimensions:** 1 1/8" diameter at top (1 1/2" largest diameter) 7 1/2" long not including plug  
**Weight:** 8 oz. (not including cable & plug)  
**Finish:** Two-tone baked enamel, black and dark green  
**Mounting:** Separate "Slip-On" adapter No. 13338 furnished. Adapter has standard 5/8" -27 thread.



# PROOF

Concrete visual proof of performance is now supplied by ALTEC with each 684A Omnidirectional Dynamic Studio Microphone. This proof—a soundly scientific and coldly unemotional statement of exact performance capabilities—is an individual certified calibration curve that you receive free with each 684A Omnidirectional Dynamic Microphone.

The calibration curve is so precise that the ALTEC 684A is a completely reliable secondary standard for comparison measurement of other microphones. Can you, if you are a professional multi-microphone user, safely operate without such a control standard in your studio?

The ALTEC 684A Professional Microphone shown is a production model chosen at random. Its calibration curve is actual and unretouched. It offers dramatic proof that the exclusive new ALTEC design, incorporating the highly sensitive ALTEC "Golden Diaphragm" of Mylar®, results in an omnidirectional dynamic microphone of remarkable superiority. This superiority will be maintained, year after year, by the exclusive ALTEC sintered bronze filter that positively bars the entry of iron dust and foreign matter. And, as proof of superior value, consider the price: the ALTEC 684A costs only \$81.00 net!

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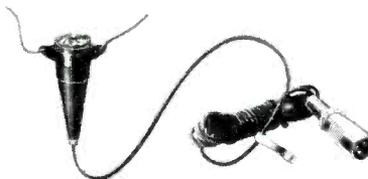
**ALTEC 682A—\$49.50 net**—Featuring uniform frequency response from 45 to 20,000 cycles, the 682A Omnidirectional Microphone incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedances of 30/50, 150/250, and 20,000 ohms easily selected in microphone plug.



**683A DYNAMIC CARDIOID—\$66.00 net**—Uniform response from 45 to 15,000 cycles with average front-to-back discrimination of 20 db. Design incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedance of 30/50, 150/250, and 20,000 ohms selectable at cable plug.



**ALTEC 685A STUDIO CARDIOID—\$96.00 net**—This dynamic microphone offers flat frontal response from 40 to 16,000 cycles with average front-to-back discrimination of 20 db. Design incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedances of 30/50, 150/250, and 20,000 ohms selectable at cable plug. Individual certified calibration curve is supplied with this model.



**ALTEC 686A LAVALIER—\$54.00 net**—Unobtrusive 3-ounce Omnidirectional Lavalier Microphone. Incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter for an exceptionally smooth frequency response from 70 to 20,000 cycles, equalized for chest position. Selectable 30/50 and 150/250 ohm impedances.

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# 8mm MAGNETIC SOUND FILM EQUIPMENT FOR TELEVISION

Small television stations will find the application of 8mm magnetic film equipment a possible answer to the need for immediate playback of important local news events combined with low costs of operation.

By Kenneth Li Donnici

Fairchild Camera & Instrument Corp.  
Yonkers, N. Y.

## The Camera

The Cinephonic 8mm Sound Camera is driven by a 12-volt centrifugally governed motor, powered by a hermetically sealed nickel-cadmium rechargeable battery, which also furnishes power to the transistorized amplifier. A separate stage is provided in the amplifier to permit monitoring sound through a headset. A low-impedance omnidirectional dynamic microphone is standard equipment, as is the monitoring headset.

The camera has a capacity of 50 feet, yielding 100 feet of processed film, and runs at 24 frames-per-second. At this projection rate, uninterrupted screen lengths of 2 minutes and 45 seconds are possible, and after the spool has been reversed in the camera, an additional amount is available yielding a total 5½ minutes of program material from the 50-foot roll of double-8 film. A 400-foot reel, on projection, offers 22 minutes of running time. Fine-grain color film, tungsten balanced, with

an ASA rating of 12 is used. The film is prestripped with magnetic oxide on the reverse side along the edge outside the perforations. The magnetic sound head is placed ahead of the picture aperture, and sound is recorded on the film simultaneously with the action.

## The Processor

The Fairchild Mini-Rapid 16 Processor is a relatively small (13"x13"x27" long) and lightweight (65 lbs.) table top unit, capable of handling up to 400 feet of 16mm (or double-eight) film at a single loading. When double-eight film is used, it is necessary subsequently to slit it to single 8mm width.

This machine, leaderless and self-threading, passes the film through four processing solutions which are normally: Developer, Fixer, and Water rinse (2).

The stainless-steel solution tanks are heated electrically, and thermostatically controlled to permit processing, at elevated temperatures, films with pre-hardened emulsions. A typical example of processing speed and temperature for Du Pont 931A is 105 deg. F. at 6 feet per minute.

Processed film is dried by hot air circulated through the drying chamber unit which contains a 600-watt heater and a 350-cfm blower motor. A thermostat permits regulation of the drying air temperature between 95 deg. F. and 165 deg. F.

## The Projector

The standard Cinephonic 8mm Sound Projector accepts 400 feet of

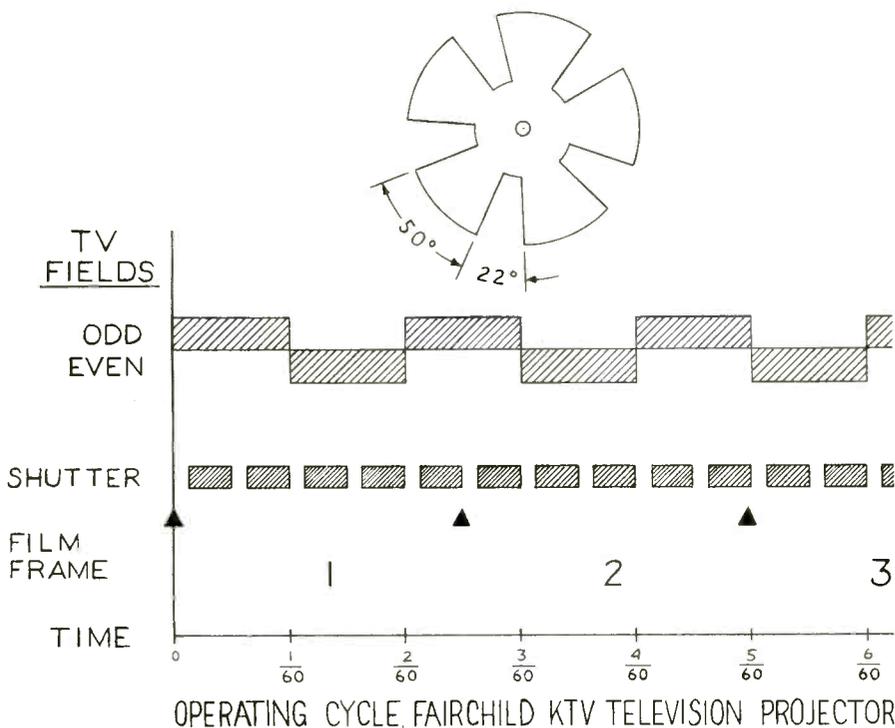


Figure 1

film and uses a 150-watt Tru-flector type lamp yielding the equivalent in light output of a standard 500-watt lamp. Provision is made for playing back films with pre-recorded sound, as well as for adding sound over that already on the film and for complete erasure and recording. The frequency response of the vacuum-tube amplifier is 100 to 6000 cycles, plus or minus 3db and furnishes 4 watts of peak power.

### Television Modifications

This standard machine has been modified for use in television broadcasting in the following manner:

(a) Its shutter has been redesigned to permit projection into a vidicon chain without causing "shutter bar."

(b) A synchronous motor is used in lieu of the standard motor to insure precisely controlled speed. In this connection, miniature timing belts were substituted for the smooth belt drive to the shutter.

(c) Provision is made for picking up directly from the sound head, if desired, or from the last stage of the built-in amplifier.

(d) An accessory remote dimmer control and on-off switch is available.

(e) Various focal length lenses make it possible to use this equipment under conditions determined by physical location. The focal length required is half that used on a 16mm machine located at the same distance from the vidicon face.

The projector shutter has been designed to conform with the requirement of Proposed American Standard PH 22.125, 16mm Television Intermittent Projector for Vidicon Camera Operation, which calls for an illumination period of a minimum of 25 per cent of the television field. It is five-bladed, each blade being 50 deg. wide, with resulting 22-deg. open spaces. An operational representation of the operation of the shutter versus the TV fields is shown in Fig. 1. For purposes of simplification, the transition region between shutter open and shutter closed is ignored, as is the blanking period of the TV field.

Time zero in this plot is chosen as the beginning of the odd TV frame, and also the beginning of the first illumination through the shutter opening. The 24-per-second frame rate of the projector, with five illu-

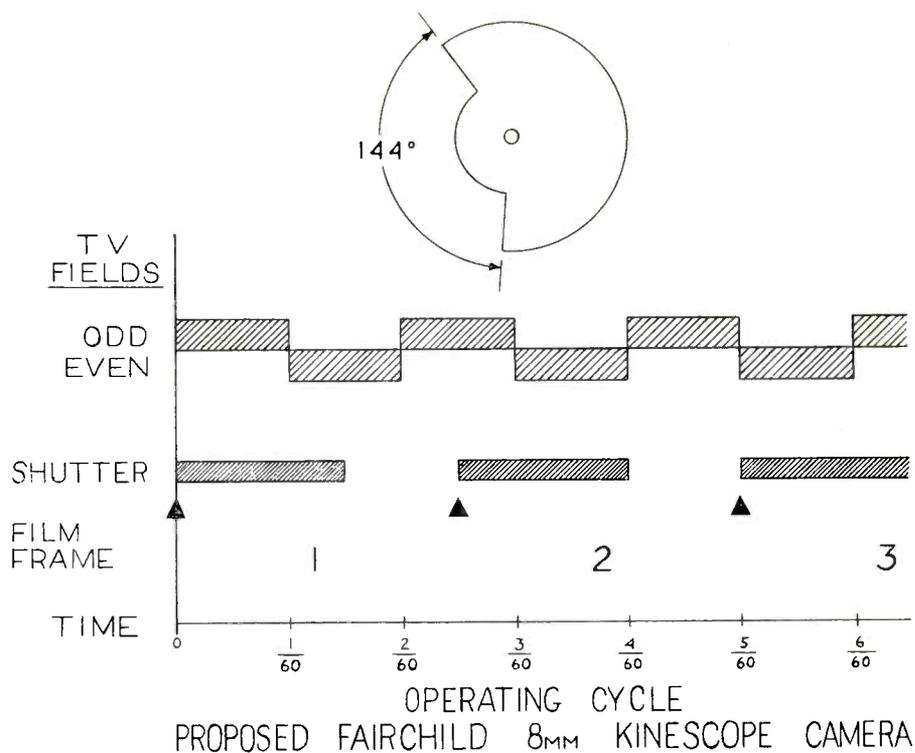


Figure 2

minations per frame, causes each of the TV fields to be illuminated twice. Examination of the plot will reveal that this design meets the requirement that successive television fields receive substantially the same exposure in both timing and intensity to eliminate flicker disturbances. This situation would obtain for any relative position of the shutter and the TV fields. The film pulldown occurs during one of the dark periods.

The projection lamp is mounted in a base which obviates any requirement for individually focussing the lamps as they are replaced. It can be expected that the normal 15-hour lamp life can be extended greatly by a reduction of voltage effected through the dimmer control. Adequate cooling is achieved by means of a centrifugal blower, and no heat-absorbent filters are used.

The dimmer, which varies the voltage to the lamp, will affect the color temperature of the projected light. This should not, however, rule out the use of color film, since gross attenuation of the light could be accomplished by the use of neutral density filters, and the dimmer control used for fine adjustment only. Black and white projection is unaffected by variations of lamp voltage.

The projector's ability to erase, re-record and overlay can be expected to add flexibility in the use of 8mm film in television. For example, unwanted audio can be erased, and post-recorded commentary substituted. Or, for effect, commentary can be added over the existing sound track. In this mode, the erase head is de-energized, and the audio merely "double exposed," the only attenuation of the original track being caused by the bias current of the recording sound head.

With single-system sound film the sound is separated from its corresponding picture by 56 frames (8.4 inches). In terms of time this is equivalent to  $2\frac{1}{3}$  seconds. An approach during filming is to allow three seconds at the beginning and end of each scene. This would avoid sound from the preceding scene being reproduced during the first  $2\frac{1}{3}$  seconds of the new. However, even without such preparation, the relatively short out-of-sync sequence is not necessarily injurious. An essential advantage to the use of this equipment is speed, and ease, in presenting timely information. The problems associated with editing double system recordings, while possibly allowing more sophistication, do require a corresponding increase in the attention to details.

## Weather Radar

(Continued from page 6)

tation and capability could be made. The group of public observers has continued to serve as a constant checking element for radar efficiency, as our engineers continue to improve the system.

Weather radar is only one of the functional tools used in our weather station. The six basic instruments for recording temperature, wind,

pressure, humidity and rainfall are mounted on a convenient panel for visual effect on television and for constant use by the staff of WLW's weather station. Three weather tele-types bring in weather data from weather installations across the North American continent and adjacent ocean areas. These data include statistical information, forecast discussions and observations for not only the surface of the earth, but for levels up to 80,000 feet into the atmosphere. We prepare five complete maps daily for the entire

continental United States and each hour the maps are changed over the Lakes area and Ohio Valley. The forecasts are kept up to the minute, coinciding with incoming weather reports and readings on our weather instruments. (Including instantaneous radar observations). The weather station also has a facsimile service for bringing in weather maps from the U. S. Weather Bureau in Washington (Suitland, Md.). The master analysis center in Washington is staffed by Weather Bureau, Air Force and Navy personnel using world-wide weather data, electronic computers and pictures from the Tiros satellites to prepare charts, diagrams and pictures to be used by weather installations across the United States. The WLW Weather Station is located in the same room as the news department, which proximity offers the meteorologist on duty the advantages of information from the press wire service and the physical assistance of experienced newsmen.

## PIEDMONT & EAST TENNESSEE MULTIPLEXING WITH McMARTIN



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BUSINESS MUSIC, INC. — Rocky Mount, N. C. — Mel Warner		MUSICO CORP. — Greensboro, N. C. H. J. Hill
BACKGROUND MUSIC, INC. — Kinston, N. C. — John King		LEE HARTMAN & SONS — Roanoke, Va. — Lee Hartman
MUSIMATIC — Greensboro, N. C. Herman Hall		WSEV — Sevierville, Tenn. Hugh Trotter
MELODAIRE, INC. — Charlotte, N. C. Seddon Goode		WKPT — Kingsport, Tenn. Robert Ratcliff
WVOT — Wilson, N. C. Harry Severence		MUSITRONICS — Chattanooga, Tenn. Haskell Burden

A dynamic new industry is being built in the Piedmont and East Tennessee by these far-sighted business leaders.

Their selection of McMartin monitors and receivers — the standard of the industry — assures them of unsurpassed performance and reliability.

We salute our long-time friends and continuing associates.

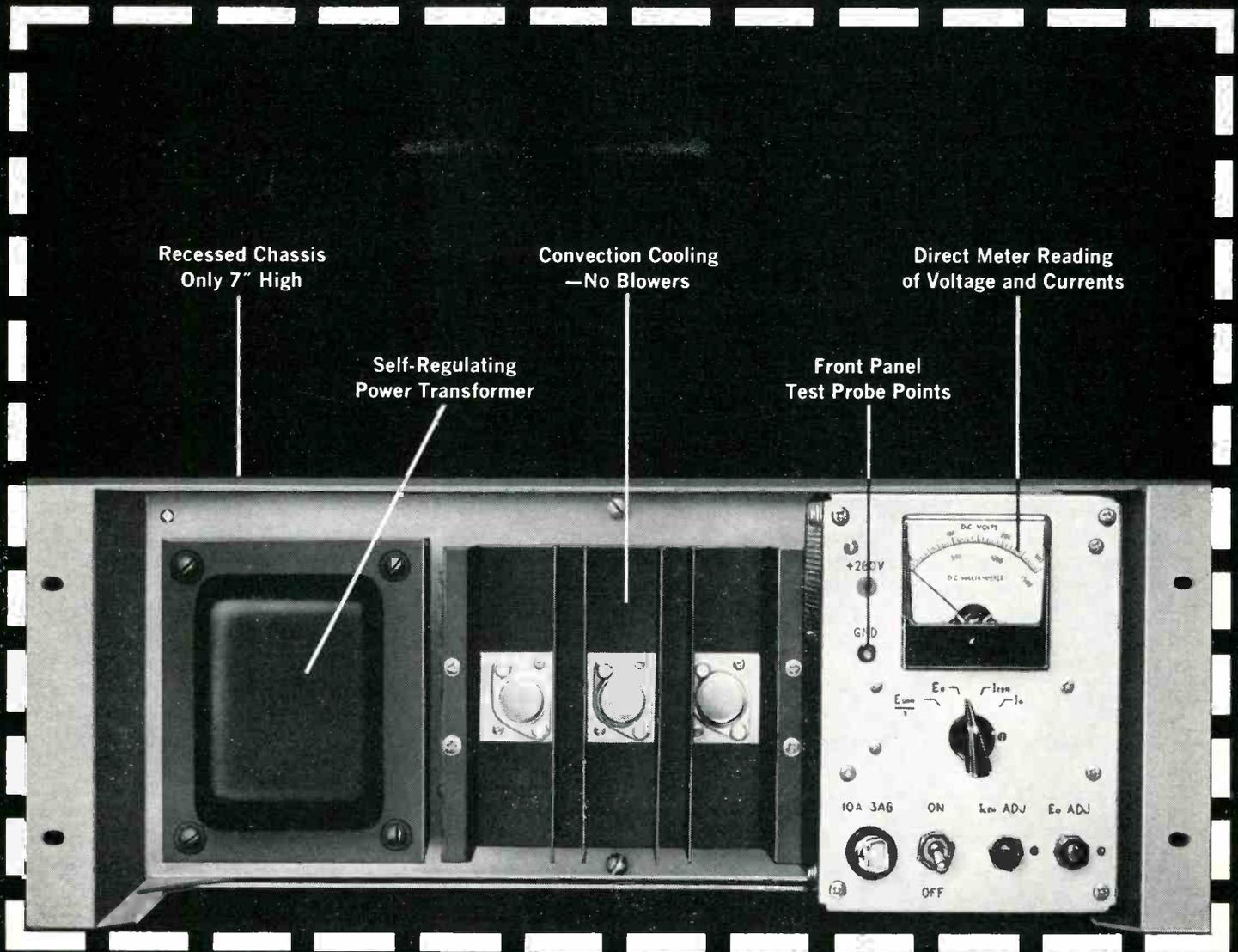
CONTINENTAL MANUFACTURING, INC.

1612 California St., Omaha, Nebraska



The WLW Weather Station is also a broadcast studio, with a broadcast line leading to each of the control rooms of radio and television. Weather programs are presented over the facilities of WLW with a regularity, consistent with good programming. There are 184 programs regularly on WLW Radio and 34 on Television weekly. During a weather emergency a bulletin may be issued immediately and as often as it is deemed necessary in the best public interest. Bulletins have been issued during heavy snows, floods and severe storms, during the past five years. During the five years that we have used weather radar, we issued only six weather bulletins in which no major property damage or bodily injury resulted. There were nine severe local storms in which no advance warnings were issued. Of those storms which were not covered by bulletins, five occurred when WLW meteorologists were not on duty; two were freak disturbances that developed and disappeared in a few moments; two occurred during a period of mechanical breakdown in the radar system.

Broadcasting of radar information to the public is straight-forward from the radio standpoint, but visual



# RCA SEMICONDUCTOR DC SUPPLY

*Half the Size of Conventional Power Supplies!*

You gain at least three advantages with this compact WP-16B semiconductor regulated power supply for TV studios!

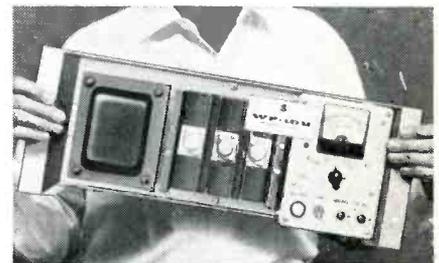
**Requires less than half the mounting space** of latest tube-type supplies—1600 milliamperes at 280 volts in *seven* inches of rack space.

**Higher efficiency** cuts heat dissipation to less than half that of other supplies; reduces air conditioning load; eliminates blowers, lowers maintenance costs.

**Complete short circuit protection.**

You can place a direct short across the output terminals of the WP-16B without damage to the supply or to any of its components. Once the short is removed, the supply automatically returns to normal operation.

A single WP-16B powers a complete TV camera chain... only two units are needed for a color chain. It's an ideal power and space saver for all television uses.



Get this die-cut brochure! It's the actual size of the WP-16B. Compare it with your present power supply—see how much space you can save. It also contains full information and specifications. Write to RCA, Broadcast and Television Equipment Dept. C-367, Building 15-5, Camden, N. J. Or ask your RCA Broadcast Representative for a copy.



The Most Trusted Name in Television

presentation requires the use of special techniques. The most popular television presentation of radar picture involves the placing of plastic overlays, with an area map engraved upon them, over the radar picture tube and placing this picture directly on the air. The overlay method presents contrast of light problems and also precludes the possibility of showing motion or development through the use of art techniques. An effective method of presentation that we have used on the air, is placing the picture of the map of the local area on one camera and then super-imposing the radar picture over that on the air. By watching a television monitor, the weatherman can point to the echoes and draw arrows, etc. This method is effective, but keeping a proper alignment of the super-imposed pictures is a major problem. The most effective and fool-proof method of radar presentation is that of super-imposing the radar picture over a black background and allowing the weatherman to make the outlines of the geographical landmarks on the

background with chalk. This method poses no alignment problems, and allows one to create an illusion of expanding the size of the radar by using a large black background. The methods of presenting radar weather information can vary greatly, but the presentation must be simple and accurate in order to be effective.

Recently, a long range Decca Type MK41-IIA radar system was purchased to replace the Type 40, in Cincinnati. This was done because we were faced with the problem of complete radar coverage of the combined service area of our four television stations in Ohio and Indiana. The new radar, now being installed, has an antenna approximately fourteen feet across with 0.6° horizontal beam width and 2.8° vertical beam width to the half power points. The antenna can be tilted to a vertical angle of 30°. This new system will provide us with a tool to see the weather conditions three hundred miles from Cincinnati and well beyond the combined service area of our four stations.

A broadcasting organization with

trained and experienced meteorologists can render invaluable public service through the use of an effective weather radar. A breakdown of the equipment, without instant and competent maintenance, could cost many lives. It would be impractical for each weather bureau installation to have an electronics engineer on the payroll, but an engineer is always on duty at any substantial broadcast station. The weather bureau has no constant and instant communication with the public, and with delay and relay of information comes the danger of misinterpretation and of being too late. However, once the storms have formed, instantaneous reporting of the severity and movement of the storms in laymen's language, should not be a breach of meteorological ethics, nor constitute a usurpment of the weather bureau's legal responsibility. Under the present weather forecasting and communications system, the Broadcasting Industry is the only organization capable of meeting all the requirements necessary for the ideal severe weather warning system.

## NOW BOTH TO CHOOSE

### Spot-O-Matic

#### CARTRIDGE TAPE EQUIPMENT



(PLAYBACK)

#### TONE CUE

Completely compatible with similar units using tone cue. Offers more reliability thru superior tone cue amplifier and tracking tape guides.

#### STRIPE CUE

Full track heads and reliable cue stripe control offers the most positive action cartridge machine on the market. Superior quality and reliability with economy.

Write **SIERRA ELECTRONIC ENTERPRISES**  
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## SPOTMASTER TAPE CARTRIDGE WINDER



Rugged, dependable and field tested, the all new Model TP-1 Spotmaster Tape Cartridge Winder fills a need in every station using cartridge equipment. Don't limit your cartridge operation by sticking only to stock sizes or tie up your conventional tape equipment to load tape cartridges. The Spotmaster Winder will handle all cartridge sizes. Wind new cartridges or rewind old ones to any length you wish. Model TP-1, \$89.50, with tape counter \$119.50. Write or wire for complete details.

*Spotmaster*

**BROADCAST ELECTRONICS, INC.**  
8800 Brookville Road • Silver Spring, Maryland



## and now there are two!

At last you have a choice when you buy video recording tape. The new one is called Emitape. It was developed in the United Kingdom by EMI, pioneer and developer of the world's first public TV system. It has been proven in tens of thousands of actual telecasting hours. It was most enthusiastically received at the recent NAB Show. The rigid quality control maintained throughout the Emitape manufacturing process assures you of excellent wearing qualities, edge straightness, signal-to-noise ratio and recording performance.

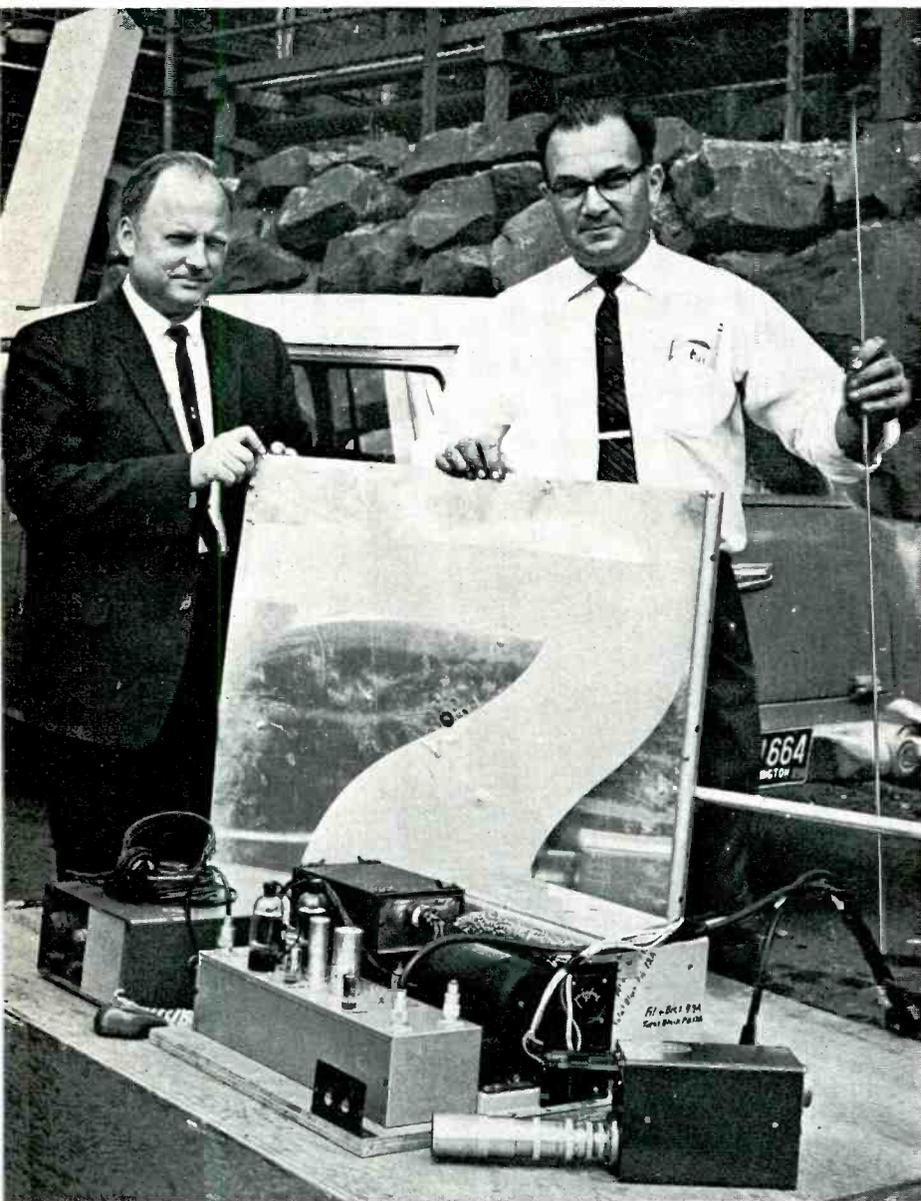
Dropouts average no more than 20 per minute, including defects of less than 6db amplitude modulation depth, and a time

duration of under a few microseconds. Head wear is considerably reduced with Emitape. With most equipment a minimum head life of 150 hours can be expected. Audio head stacks show negligible wear after 500 hours of service. Tape life is also long. The average figure is 100-150 passes.

But get all the facts. Write, wire or call EMI/US Magnetic Tape Division. Los Angeles: 1750 North Vine Street, HOLLYWOOD 2-4909. New York City: 317 West 44th Street, Circle 5-3400. (Also available, from the new General Communications Division of EMI/US: a complete line of TV cameras, solid state distribution and switching equipment.) **Emitape**

# KIRO-TV ENGINEERS DEVISE SMALL

*By Charles Morris  
Chief Engineer  
KIRO-TV, Seattle*



Chief Engineer Charles Morris (left) and Assistant Chief Carl Finch are shown with the components of the helicopter TV station.

THE SMALLEST and lightest-weight television station of its range to be used by a commercial broadcast station was designed and employed by KIRO-TV to cover the World Championship Unlimited Hydroplane race in Seattle this year. This television station was installed in a Brantley B-2 helicopter for the purpose of siting actual positions of boats with respect to each other, thus bringing Northwest viewers a true picture of boat positions during a race.

Charles Morris, director of engineering for Queen City Broadcasting Co., began work on the helicopter TV system in 1959. The system requires a camera chain, transmitter, transmitting antenna within the helicopter with a receiving antenna and receiver, on the ground. Two basic problems were a weight limit of 250 lb. and the limitation of available primary power.

Requirements of each component in the system:

## **Camera Chain**

The camera chain had to generate a picture. It could not use large amounts of power normally required by a studio chain, and it had to be lighter because of weight restrictions. Also, it had to have some sort of view finder. In order to save power, an optical rather than electronic view finder was selected. It was also preferable to have separate power for the camera chain so that it could be removed from the helicopter to be used elsewhere, by feeding video down coax.

The first attempt in the develop-

# AIR-BORNE TV STATION

## Composite Gear Relays Video From Helicopter

ment of this 'copter system was made with studio vidicon equipment with regular field sync generator. Because of the weight and power consumption, this method was abandoned. A transistorized camera chain with self-contained batteries was later developed.

### Transmitter

The small transmitter had to meet weight restrictions and still generate sufficient carrier power to achieve the range needed without requiring excessive input power. It was found that no satisfactory commercial transmitter was available.

A frequency had to be selected at which a reasonable amount of carrier power could be generated efficiently. The 2000 Mc frequency band was the lowest frequency commercially available which could be used, but proved too difficult to generate reasonable power at that frequency, without excessive transmitter input power. Because a non-directional transmitting antenna was to be used, several watts of power were required in order to eliminate the need for directional control of the transmitting antenna. A frequency best-for-the-job was selected and a transmitter was developed and built by KIRO-TV's assistant chief engineer, Carl Finch.

The transmitter was designed to operate on 24 volts dc because this type of power is readily available in aircraft. This eliminated any need for convertors, alternators, etc., although dynamotors were used to supply bias voltages and plate voltages.

### Transmitting Antenna

Many types of transmitting antennas were tried, but best results were obtained from an inverted quarter-wave ground plane. By making the ground plane extra large, the rotor blades of the helicopter were put in a shadow with respect to the driven element of the antenna. This eliminated earlier problems with reflection off rotor blades. Both horizontal and vertical polarization were tried; horizontal polarization was found more likely to cause reflection trouble, especially when close to the ground. Finally, the antenna system was hinged so it would hang below the aircraft skids, providing line-of-sight to the receiving antenna while air-borne. It was retracted manually for landing.

All equipment was mounted on styrofoam padding in order to minimize microphonics and other problems that might be caused by vibration.

### Receiving Antenna System

The receiving antenna system consists of a corner reflector with a half-wave driven element coupled to the receiver and a conventional 300-ohm twin-lead, as short as possible. The receiver is a Conrac AV 12 C containing turret tuner, with one of the tuner sections removed.

Re-designed components were installed to make the receiver operate at the frequency being used. It was found that at this high frequency the receiver was insensitive, so a radio frequency amplifier was constructed. This was inserted in the

receiver between the incoming twin-lead and regular input of tuner, giving considerable increase in the performance of the receiver.

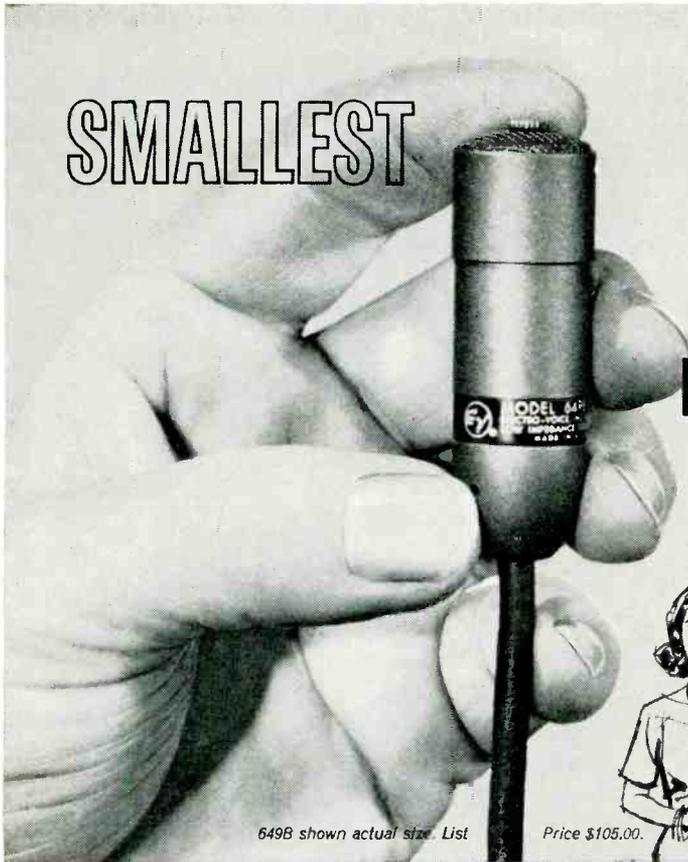
### Testing

The unit was tested for several days from a station wagon. It was then installed in the smallest certificated helicopter in the United States, a Brantley B2, where in-flight tests were made. It was found to give excellent coverage of an area over six miles in diameter. With proper lenses, this system promised to be the only facility for telecasting true positions of the boats for the upcoming Hydroplane Regatta.

Performance of this "less than 100 pound" television station during the 1961 hydro races was excellent. Carrier strength was more than adequate for the entire operation with negligible fades. Despite the non-directional transmitting antenna and the broad pattern of the receiving antenna, no ghosting problems were encountered. The only problem found was a small amount of ignition noise, due to the location of the receiver and the receiving antenna. This problem can be entirely eliminated by better positioning the receiver and using a higher gain receiving antenna system.

Viewer comments to Channel 7, KIRO-TV, were many and glowing. Quote Station Manager Bill Exline, "All in all, the system was an unqualified success. By far, the majority of people who commented on the 'copter coverage said we should have used it more than we did."

# SMALLEST



649B shown actual size. List

Price \$105.00.



This tiny handful is E-V's answer to studio requests for a truly miniaturized dynamic microphone. The Model 649B is just 2¼" long, weighs but 31 grams, yet has the remarkably high output of -61 db! Although just half the weight and bulk of competitive lavaliers, the 649B response is smooth, peak-free and full-bodied so that you can mix its output with that of any standard microphone!

## DYNAMIC LAVALIER!

No fragile "toy", the E-V 649B uses the famous Acoustalloy<sup>®</sup> diaphragm and a sturdy dynamic mechanism that is guaranteed unconditionally for two years except for finish, guaranteed for life against defects in materials or workmanship. It is omni-directional, with response tailored for the slightly "off-mike" location of a lavalier.

A 649B in your studio will give your performers more freedom than they have ever had . . . while you get the fine sound and trouble-free operation that's traditional with all Electro-Voice microphones. Write for complete technical specifications today!

**ELECTRO-VOICE, INC.**, Commercial Products Division, Dept. 1211V, Buchanan, Michigan  
Subscribe today to "Microphone Facts", fact-filled, free series on modern microphone techniques. Request on studio letterhead.

**Electro-Voice<sup>®</sup>**

## Stereophonic Transmission

(Continued from page 12)

diately notice this out-of-phase component. When the picture of the composite modulation on the scope is observed for at least two cycles, the phase shift will appear as a tilt along the base line. When aligning the phase angles the various adjustments of the stereo generator such as the low frequency phase and the time delay should be adjusted for the minimum degree of tilt along the base line at various frequencies. This adjustment should be made before any actual measurements are conducted. At this point it probably will be necessary to vary the audio amplifier stage of the main exciter as previously mentioned, unless both units were factory-adjusted.

To meet the phase angle measurement the maximum tolerance is 5 per cent. If the ratio remains under this figure the unit will meet FCC requirements. For these measurements, the 19 kc pilot should be removed in order not to complicate the picture.

The crosstalk from the subchannel to the main channel, and vice versa, is a simple measurement. The subchannel is modulated 90 per cent and a quality vacuum tube voltmeter or noise meter is inserted at the output of the GE modulation monitor. The measurement is read directly off the test instrument. The main channel crosstalk to the subchannel is done in a similar manner except that the specially-designed filter and demodulator is used. All of the other measurements, such as the suppression of the subcarrier in a quiescent state, can be accomplished with the monitor and oscilloscope.

We have now covered the conversion of the FM transmitter to Stereo Multiplex. If all of these measurements show that the entire transmission system meets or exceeds the FCC's specifications, the conversion has been completed successfully. There undoubtedly will be a few unforeseen problems such as the leakage of undesirable RF into the amplifier stages of the generator, but these problems can be solved in a normal, routine fashion.

Another major and very time-consuming job is the conversion of the studio to broadcast stereo. The stereo studio should have all the facilities of the monophonic studio with all of the necessary production aids to insure proper presentation of stereophonic programming to the public. The console should be a stereo console, *not* a dual channel console. The mixers should be ganged so that the operator will have to move only one control rather than two.

After careful study at KPEN of the audio facilities, it was decided to modify the existing console to stereo. The console is an RCA BC-3B single-channel console. Fortunately its original preamplifiers and amplifiers were on printed circuit boards. These amplifiers and preamplifiers were duplicated, and the new ones were mounted on stand-offs above the existing ones. Dual faders were incorporated into the board for stereo mixers. Another VU meter was inserted into the front panel. Here, for esthetic purposes, the meter was identical to the existing one and placed symmet-

rically so that the console would not have that "modified look."

A split microphone preamplifier was utilized so that the announcer could instantaneously switch to the left, right, or middle of the stereo channel, while speaking. To balance the stereo channels, the main booster and program amplifiers were first adjusted with a single tone, and then each turntable preamplifier was adjusted. Instead of using a single stereo turntable preamplifier, separate ones were used for each channel for each turntable. They were all interchangeable and of the "plug-in" type in case of failures. Care should be taken in the installation of the stereo cartridges in the turntables to make sure the right channel is really on the right and not reversed.

In order to insure proper phasing of the left and right outputs of the stereo console, phase reversing switches were inserted in each outgoing line. Improper phasing in this system will be very obvious to the (L+R) main channel monaural listener.

In the original notice issued by

the FCC it was mentioned that due to the recording techniques of various record companies, some of the recorded stereo material would not be compatible for the monaural listener. This incompatibility would be due to improper phasing of the recordings. A small delay of approximately 12 microseconds with a flat response throughout the audio spectrum can be inserted into one of the lines leaving the audio console. It will compensate for most of the incompatibility of improperly phased records, and it is not a large enough delay to be noticeable to the main channel listener.

In conclusion, a word of caution should be issued to those FM broadcasters who insist on using some form of compression amplifier in their audio system. Many stations in order to sound louder compress their audio up to 20 decibels and sometimes even more. In stereo this compression will be very undesirable as the noise level will be varying per channel depending on the stereo material. If the material has any "ping pong" effects the hiss level introduced by the compression am-

plifier into the silent side of the stereo broadcast will be intolerable. At KPEN no limiting amplifiers are used to guarantee that the listener will receive the highest possible fidelity and best dynamic range.

In a speech given in Chicago at the symposium sponsored by the Electronic Industries Assn., Commissioner Robert E. Lee of the FCC stated, "The Commission is requiring the stations broadcasting this new technique to adhere to very high standards in order to provide the public with the type of service that they are entitled to expect from this new system." Every broadcaster has the direct responsibility to his audience to provide the highest possible standard of technical excellence in the transmission of stereo. The sound should be excellent, the production flawless, and the material compatible to the monophonic listener. FM Stereo is the new sound of broadcasting that has given FM something that AM cannot provide. If properly handled, this new system could easily make FM broadcasting the dominant aural medium in the United States.

## BIGGEST 3-WAY MICROPHONE VALUE!



The new Electro-Voice Model 654A can replace up to three of your present microphones... and do a better job to boot! It's the ideal size for hand-held use—and the Cannon XLR connector ends your cable problems. It's also an easy-wearing lavalier, with wide range and plenty of output. And on a floor or desk stand the 654A is the finest all-purpose microphone you can buy for voice or music. The lanyard and slide-clamp mounting supplied are easy to use and versatile, too.

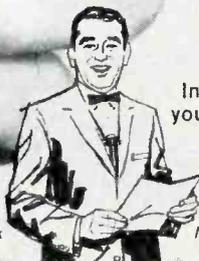
The 654A will give broadcast fidelity for years! Unconditionally guaranteed for two years, except for finish—guaranteed for life against defects in materials or workmanship. The 654A is omni-directional, with E-V's tough Acoustalloy® dynamic diaphragm that will take the hardest accidental abuse, yet still deliver peak-free natural response. New Acoustifoam® filter gives added freedom from "pops" and better reliability than any other filter—regardless of type. New epoxy finish is chip-proof for longer-lasting beauty.

In the studio, or out on remotes, with the E-V 654A handy... you'll do more jobs—better—more dependably than ever before.

Write for complete technical specifications plus name of your nearest franchised E-V distributor, today!

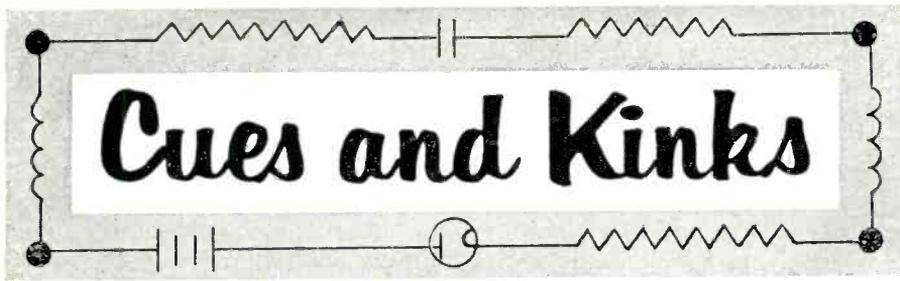
Model 654A includes stand adapter and neck

lanyard. List price \$100.00.



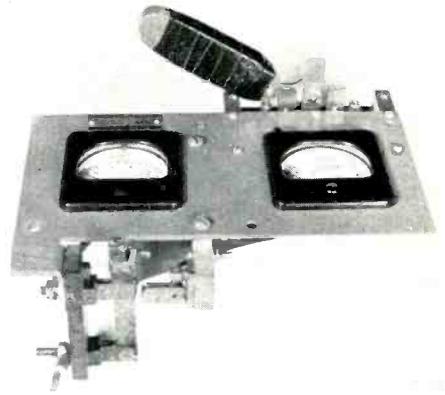
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Subscribe today to "Microphone Facts", fact-filled, free series on modern microphone techniques. Request on studio letterhead.

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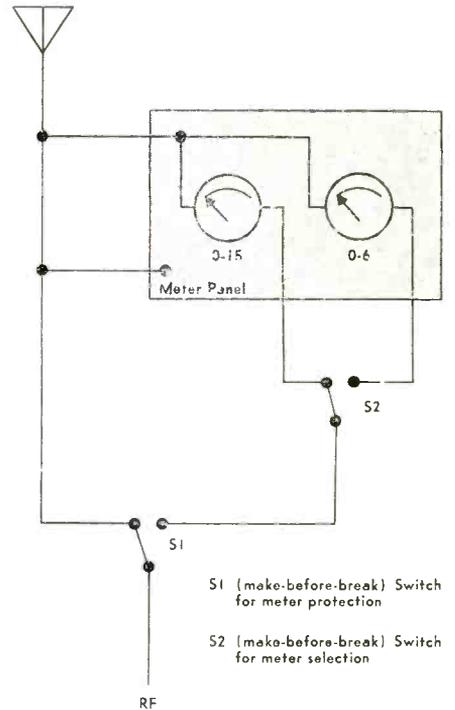
# Cues and Kinks

"Cues and Kinks" is a regular monthly meeting place for the minds and experiences of our broadcast engineers. This area is yours, fellows. Contribute your pet project for the benefit of others. Mail your time-saving, problem-solving circuit or idea to: Cues and Kinks, Broadcast Engineering, 1014 Wyandotte St., Kansas City 5, Mo.



## Two Scale Meter Switch With Built-In Lightning Protection

By Clyde S. Carlson, Broadcast Engineer  
KSAC Radio, Kansas State University  
Manhattan, Kan.



There may be many AM broadcast engineers confronted with the requirement of switching the RF power output of the transmitter into one of two antenna ammeters, one for high power operation and the other for reduced power. The F.C.C.'s operating rules require the meters to be read in the correct upper portion or percentage of the scales. Another difficulty is protecting the meters from lightning damage.

Both of these problems can be overcome by the use of two single pole double throw switches as shown in the photograph and diagram. This apparatus can be constructed from parts usually found in the junk box of most stations.

First, the meter panel was modified by welding on enough additional panel to accommodate the low power

meter at right in photograph. Next, to the original meter shorting switch (shown at bottom in photograph) was added a second element mounted on a half-inch-thick piece of phenolic with switch elements spaced to give a "make-before-break" operation. This switch (S1 in the diagram) removes the meters from the circuit which protects them from lightning. This switch is operated by an insulated push rod (not shown in photograph) and is operated from outside the antenna cabinet.

Switch S2 (top in photograph) was made from an old knife switch with elements mounted on a half-inch-thick piece of phenolic mounted one-half-inch back of meter panel. This switch also is of the "make-before-break" type and is used to change from the high to reduced

power meter. This switch is operated by a lever from within the antenna cabinet but could be constructed similarly to S1 and operated by a push rod from outside.

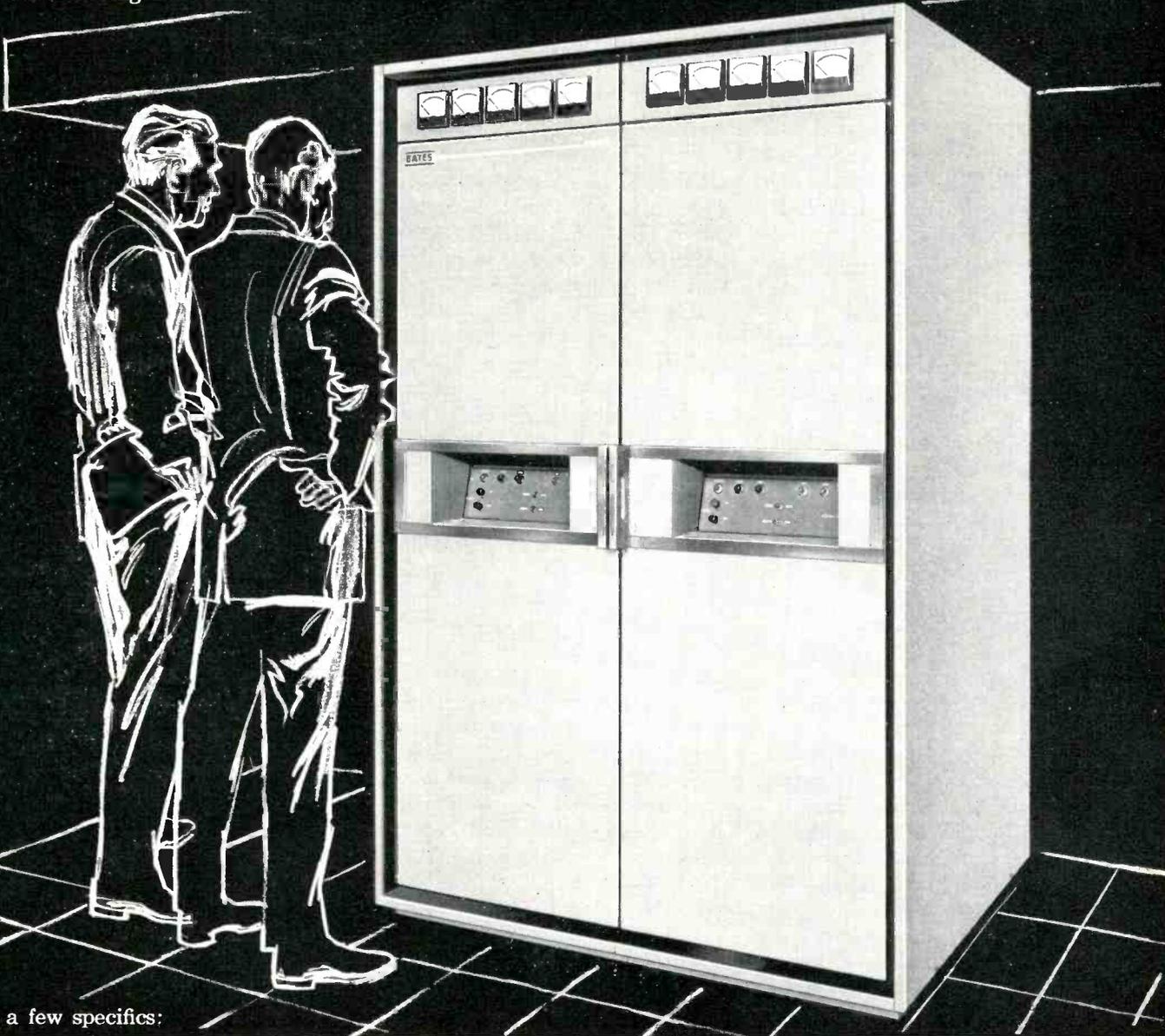
With this type of switching, no problem of RF insulation breakdown is likely to be encountered due to the fact that all elements of the meter panel are at RF potential and no path to ground exists. The meter panel is connected to the antenna as well as one meter terminal of each meter. This brings all elements of the meter panel and switches to the same potential.

There has been no trouble experienced to date switching from 5kw to 500 watts at sundown. It goes without saying that the meters would be subject to possible damage if current readings were taken during lightning discharges.

# ENTIRELY NEW GATES 10-KILOWATT FM TRANSMITTER . . .

## *The Exclusive FM-10B*

New design principles, new standards of production accuracy and rigid performance testing were incorporated in the FM-10B's extensive development program. As a result, few 10-kilo-watt FM transmitters have ever been offered with such integrity of product and with so many outstanding features.



Here are a few specifics:

*For Quieter Operation* — a new cooling system reduces blower noise to a low whispering hum.

*For Increased Reliability* — solid state rectifiers are used in all power supplies.

*For Excellent Accessibility* — the FM-10B has been designed with drop-down front panels and lift-up meter panels.

*For More Efficiency* — the Varia-line tuning of power amplifier has been improved, requiring less driving power.

*For Added Convenience* — all remote control facilities are included as part of the transmitter.

*For the New Look in Contemporary FM Design* — the FM-10B has been styled with a new *shadow-mold* effect.

*For Longer Tube Life* — one Type 4CX10,000D power tetrode is used in the final amplifier.

*For Better Protection* — automatic recycling and VSWR overload circuits are provided.

Gates, a pioneer in the manufacture of FM equipment, now offers a completely new FM line — including transmitters for 5000, 7500, 10,000, 15,000 and 20,000 watts — all with advanced *shadow-mold* styling and the industry's finest engineering features.

Write today for complete technical information — yours for the asking.

**GATES**

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HARRIS  
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CORPORATION

# A TRANSISTORIZED VIDEO DISTRIBUTION

By Ben Wolfe, Chief Engineer, WJZ, Baltimore, Md.

Westinghouse Broadcasting Co., Inc.

IT IS recognized that progress in the field of transistorized circuitry has been rapid and extensive and has permeated almost every area previously dominated by vacuum tubes. The television field is currently undergoing intensive development in semi-conductor application and as the new and better transistors appear a corresponding improvement in circuit performance becomes possible.

Some of the factors which must be taken into consideration in a transistorized video D.A. are:

1. Input and output termination.
2. Frequency response.
3. Differential gain and differential phase.
4. Low frequency tilt.
5. Temperature stability.
6. Noise.

Standard engineering practice dictates that input and output impedances should be 75 ohms so as to conform with current bridging and terminating equipment. This automatically makes interchange and comparison with existing vacuum tube distribution equipment possible with a minimum of circuit

alteration. Low input capacity is of course desirable when using a number of D.A.'s in parallel which in practice is generally the rule rather than the exception.

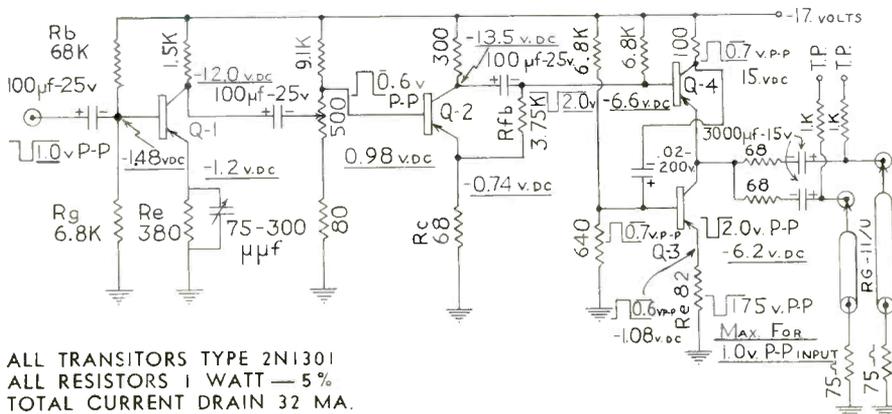
By employing degeneration the input capacity is reduced to low enough values to permit the use of a number of D.A.'s in parallel. To illustrate, without degeneration, the approximate input capacity of a transistor can be determined by the expression  $gf/6.3 \text{ fa}$ . Where  $gf$  is the transconductance for the given transistor and this is approximately equal to 35 millimhos per milliamperere of collector current. \*Since the first stage  $I_c$  is 3 ma. then the input capacity equals  $3 \times .035/6.28 \times 7 \times 10^7$  approximately equal to 230 mmfd. However, the use of degeneration in this stage reduces the input capacity by  $(1 - K_e) C_{be}$ . Where  $K_e$  = emitter gain and  $C_{be}$  is base to emitter capacity.  $K_e = gf R_e/[1 + (gf R_e)]$  and in the case of Q1 is approximately equal to  $.1 \times 380/[1 + (.1 \times 380)] = 0.9$ . Thus the actual input capacity =  $(1 - .9) \times 230 = 23 \text{ mmfd}$ . The frequency bandwidth of the input

circuitry with 5 units in parallel and properly terminated equals  $1.57 C_i R_t$ ;  $1/6.28 \times 120 \times 1/10^{12} \times 75 \text{ ohm} = 17 \text{ mcs}$ . The load line for Q1 may be plotted from the  $I_c - E_c$  curve for the 2N 1301 or approximated by  $R_L = E/2 I_c$  which is 2000 by calculation. Practical measurements indicate that a value of 1500 produces the desired linearity.

The degenerative stage gain of Q1 in terms of forward transconductance ( $gf$ ) is  $K = -gf R_L/[1 + (g_i + gf) R_e]$ . However, the effective input conductance =  $g_i/[1 + (gf R_e)]$  and is small enough to be neglected; thus the actual expression for all practical purposes becomes  $-gf R_L/[1 + (gf R_e)]$ . However, the actual dynamic load resistance of Q1 must take into consideration the input loading effect of Q2. This is approximately 580 ohms. Thus the dynamic  $R_L$  equals  $1500 \times 580/[1500 + 580] = 400$  (approximately). The stage gain of Q1 then equals  $.1 \times 400/[1 + (.1 \times 380)] = 1.1$  (approximately).

It was desired to hold total leakage current effects to a minimum. A good rule of thumb equation for temperature stability is  $R_e (R_b + R_g)/H_b R_g = \text{less than } 0.6$ . Thus the Q1 stage is  $380 (68 \times 10^3 + 68 \times 10^2)/68 \times 10^2 \times 68 \times 10^3 = \text{less than } 1$ . The same temperature stability approach is followed in Q2. Actually fairly good temperature stability can be achieved by making the ratio of the emitter resistance to the parallel combination of  $R_b$  and  $R_g$  as low as possible. The base current  $I_b$  can be determined by dividing the collector current by the ac Beta which =  $I_c/\text{ac Beta}$ .

In attempting to achieve a high order of linearity an additional



ALL TRANSISTORS TYPE 2N1301  
ALL RESISTORS 1 WATT — 5%  
TOTAL CURRENT DRAIN 32 MA.

A transistorized distribution amplifier that can be built for \$35 and gives 2 volts output with only 1 per cent square wave tilt, power requirements are negligible.

\*Ref.: Keats Pullen — Handbook of Transistor Circuit Design (In Press).

# AMPLIFIER

By using transistors a low cost, highly efficient distribution amplifier can be built for approximately \$35, and will provide more than adequate output with response to 9 MC and very little low frequency tilt.

feedback loop is employed in Q2. The stage gain without this loop is again approximately equal to  $-gf RL / [1 + (gf Re)]$ . Since the loading effect of the following cascaded stage is negligible and  $I_c = 10$  ma. (approximately), it follows that  $K = .35 \times 300 / [1 + (.35 \times 68)] = 4$  (approximately) without additional feedback. The voltage of the loop feedback equals:

$$E_{fb} = \frac{Re}{R_{fb} + Re} = \frac{68}{3750 + 68} = .02$$

and the gain reduction =  $1 / [1 + (VG \times E_{fb})]$ .

Numerically then  $1 / [1 + (4 \times .02)] = 1 / [1 + .08] = .92$  therefore  $.92 \times 4 = 3.7$  gain with feedback.

As mentioned previously the last stage transistors Q3 and Q4 are cascode connected. In this stage it is desirable to know the source impedance. If  $gf$  is determined, then

the source impedance is simply  $1/gf$  and since  $I_c = 13$  ma. then  $gf$  is approximately equal to  $13 \times .035 = .455$  therefore  $1/.455 = 2$  ohms (approximately). A 68 ohm resistor is used for proper line termination match; coax to be terminated in 75 ohms at receiving end thus net terminated dynamic  $RL = 37.5$  ohms. The output voltage gain available from the emitter follower cascode stage =  $-gf RL / [1 + (g_i + gf) Re]$  and as before  $g_i$  is negligible therefore  $k = -gf RL / [1 + (gf Re)]$  and is  $.455 \times 37.5 / [1 + (.455 \times 82)] = .45$ . The gain figures throughout agree substantially with the measured value.

The maximum collector power dissipation of the 2N 1301 transistor is given by the manufacturer as 150 mw and is not exceeded in any of the stages. However, to further minimize temperature changes a small fuse clip should be used as a

heat sink. Since there are no peaking coils used the only alignment necessary is to vary Q1 emitter bypass capacitor to obtain the flattest high frequency response. The total current drain is approximately 32 milliamperes. The measured noise, using a wide band Ballentine Noise Meter, is 63 db below 1 volt peak-to-peak output.

The amplifier will handle peak-to-peak video signals from 0.2 volts to 2 volts. The frequency response is plus or minus 0.5 db from 9 cycles to 9 MC, with a low frequency tilt for 60 cycles square-wave which is no more than 1 per cent maximum.

This is an economical DA to construct; the total cost of the parts is approximately \$35.00. The unit has been on test for the past three months and has performed within the specifications set forth in this article.

TABLE 1—SYMBOLS

Cbe . . . . .	Base to emitter capacity	Q1 . . . . .	Input transistor
Ci . . . . .	Actual input capacity	Q2 . . . . .	2nd stage transistor
E . . . . .	Supply voltage	Q3 and . . . . .	Last stage transistors
Ec . . . . .	Collector voltage	Q4 . . . . .	Last stage transistors
Efb . . . . .	Value of feedback voltage	Rb . . . . .	Base to negative supply resistor
fa . . . . .	Alpha frequency cut-off	Re . . . . .	Emitter resistance
gf . . . . .	Forward transconductance	Rfb . . . . .	Feedback resistor
Ib . . . . .	Base current	Rt . . . . .	Terminating resistance
K . . . . .	Stage gain of degenerative amplifier	Rg . . . . .	Base to ground resistor
Ic . . . . .	Collector current	RL . . . . .	Load resistance
Ke . . . . .	Emitter gain	VG . . . . .	Voltage gain

# LEADING BROADCASTERS ENDORSE



## 1 Kw TRANSMITTER

- ★ "It is, without a doubt, the nicest looking transmitter on the market, and it has a most desirable arrangement of parts."  
—CONSULTANT
- ★ "Again I want to say that I think that our selection of the Bauer transmitter was a wise decision and already other people in the broadcasting industry in this area have shown an interest in the transmitter and we are glad and proud to show it to them."  
—KTOC, JONESBORO, La.
- ★ "It was a real pleasure for me to test out the Type 707 transmitter in Tacoma, and your organization is to be congratulated on the excellent design of this unit."  
—CONSULTANT
- ★ "56 spare time hours to build —45 minutes to check out—it's terrific!"  
—KRRX — San Jose, California
- ★ "The transmitter checked right out. We were all pleasantly surprised with the performance."  
—WDIG — DOTHAN, ALA.
- ★ AND MANY MORE.

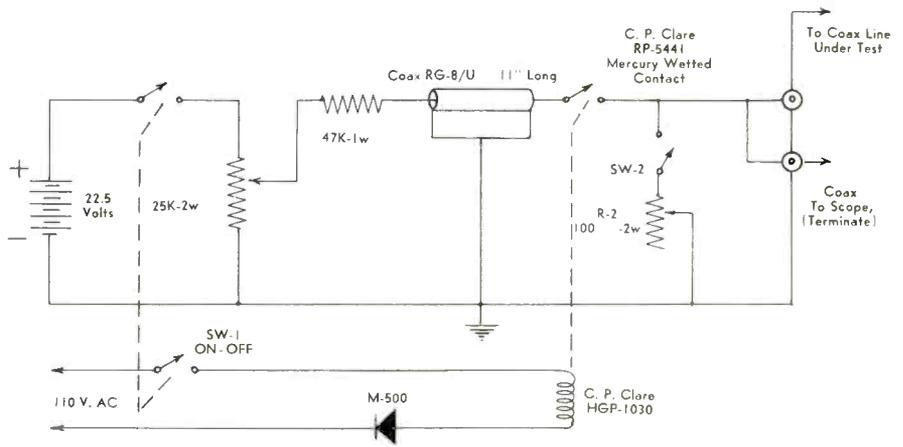
They are all talking about the Bauer Model 707 1000/250 watt AM transmitter available either factory assembled or in KIT form.

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ELECTRONICS  
CORPORATION  
1663 Industrial Rd. • San Carlos, Calif.

PROFESSIONAL PRODUCTS IN KIT FORM



D. C. PULSE GENERATOR—20 Millimicrosecond

## The 20 Millimicrosecond DC Pulse Generator

By Ben Wolfe, Chief Engineer  
Westinghouse Broadcasting Co., Inc.  
WJZ-TV, Baltimore, Md.

WITHIN the past year or so Donald W. Peterson of the R.C.A. Laboratories outlined a system of pulsing transmission lines, a test which has extraordinary merit. The dc pulser that is described is a very economical way of making use of one part of this pulsing technique.

About a year ago, WJZ-TV completed a 20 millimicrosecond pulser at a cost of \$35.00. This pulser can be used with any Tektronix Oscilloscope with a time base of .1 microsecond to 1 microsecond. Since most of the oscilloscopes used in TV stations have a time base of .1 microsecond, it is felt this unit can be conveniently used to assist in localizing difficulties in coax transmission lines and in video cables using RG-8/U, RG-11/U, etc.

Special care should be exercised in the handling of the mercury wetted contact relay, keeping in mind it should be mounted, with the associated relay coil, in a vertical position only. The relay and the coil are purchased from the C. P. Clare Co. for approximately \$7.50.

A guide for footage and time follows. The table is based on feet per centimeter for a given time per centimeter.

Feet Per CM	Base Time/CM
491.0	1 sec.
245.5	0.5 sec.
196.4	0.4 sec.
98.2	0.2 sec.
49.1	0.1 sec.
24.55	0.05 sec.
19.64	0.04 sec.
9.82	0.02 sec.
4.92	0.01 sec.

Time of these readings includes traveling time of pulses both ways in the transmission line. Should this device be used to check RG-8/U or RG-11/U cable, remember to multiply the footage per centimeter by the appropriate propagation factor. In measuring 3 1/8-inch or 6-inch copper line, this factor may be neglected. After the main pulse and proper sweep widths have been obtained on the scope, increase the vertical amplitude sensitivity approximately 40 db, so that a continuous inspection of the line is completely discernible. In the event there are discontinuities other than a real short or open, the increased sensitivity will show them as a bump larger in amplitude than normal. A dead short circuit will be indicated by a high amplitude negative pulse and an open circuit by a high amplitude positive pulse.

# Industry News

## ITT Appoints Two Regional Sales Representatives

International Telephone & Telegraph Corp., 320 Park Ave., New York 22, N. Y., has announced the appointment of two regional sales representatives for the semiconductor department of the ITT Components Div.

Cary Chapman Co., 301 E. 10 Ave., Hialeah, Fla., will handle the division's complete line of selenium, tantalum, silicon and imported products in Florida. R. T. Mathews & Co., 1435 N. Hudson Ave., Chicago, Ill., will handle the company's tantalum capacitor line, including its new straight-wall wet tantalum capacitor, and complete line of home entertainment and industrial selenium rectifiers in Illinois, Wisconsin and the Michigan peninsula area.

## Almo Radio Appointed Distributor for Gonset

Almo Radio Co., with headquarters in Philadelphia, has been appointed distributor for Gonset Communications Equipment, Burbank, Calif. This includes the sales on Gonset's two-way radio, designed especially for businessmen, as well as the construction and maintenance of transmitting towers. Almo also will handle other Gonset equipment.

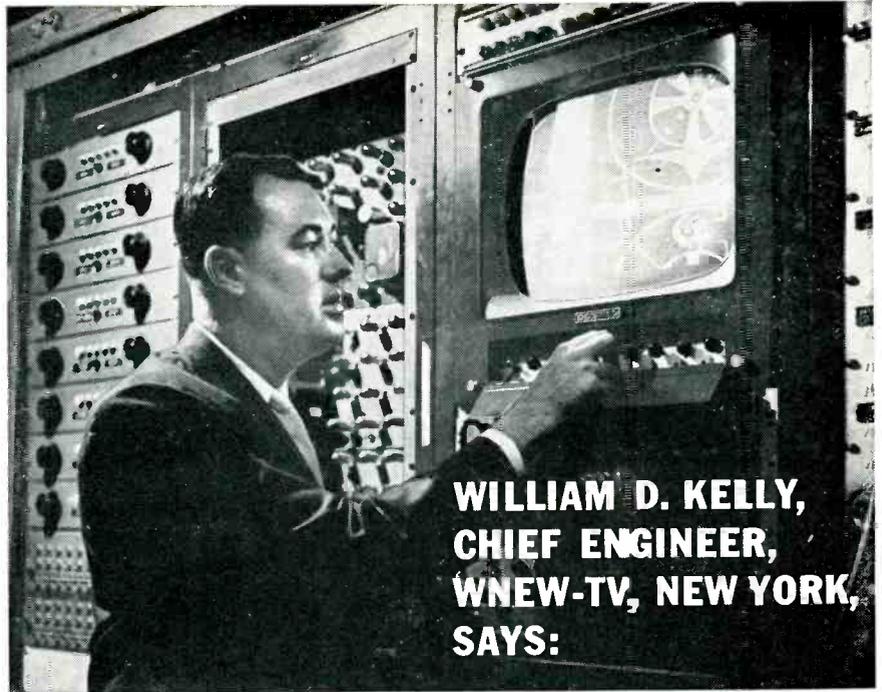
Morris Green, president of Almo, said acquisition of the Gonset line will mean expansion of his company's technical staff. A highly specialized project, it will take six months to get it off the ground, said Green. All technicians and salesmen will attend classes relative to the line, and Gonset will send factory-trained engineers to Philadelphia to conduct the school.

## New Advertising Post For Bruce Marr

Bruce Marr has joined the advertising department of Pacific Mercury Electronics and Thomas Organ Co., Sepulveda, Calif., as assistant sales promotion manager.

Marr leaves his position as assistant advertising manager of Monarch Electronics, North Hollywood, Calif. Earlier he was with the Inland Broadcast Co., operators of four radio stations in the Northwest.

December, 1961



**WILLIAM D. KELLY,  
CHIEF ENGINEER,  
WNEW-TV, NEW YORK,  
SAYS:**

"It's a big help in examining our video signal to assure perfect synchronization and to quickly determine the quality of the sync pulses," Mr. Kelly adds. "This is by far the most versatile and useful monitor we have ever used."

The new Conrac fully regulated monitor will display either sync or normal picture at the flick of a switch. The 3-position, front-panel switch permits selection between normal picture, pulse cross, and pulse cross expanded. In the last position, vertical expansion of approximately five times shows each horizontal line clearly. In both pulse cross positions, video is inverted (black is white) and auxiliary brightness is provided. Thus, pulse cross brightness can be preset at a different level from that employed when viewing the normal picture.

Mr. Kelly's appraisal of this monitor and his experience with other Conrac monitors is not unusual. Consistency in quality, dependability, and versatility are Conrac characteristics known and preferred wherever a need for monitors exists in the broadcasting industry.

**FROM 8" THROUGH 27", BROADCAST AND UTILITY, EVERY CONRAC MONITOR HAS A COMBINATION OF UNIQUE FEATURES.**

- ★ Video response flat to 10 megacycles
- ★ DC restorer with "in-out" switch
- ★ Selector switch for operation from external sync
- ★ Video line terminating resistor and switch



CONRAC MONITORS ARE DISTRIBUTED BY RCA, GENERAL ELECTRIC, AMPEX, AND VISUAL ELECTRONICS

**CONRAC** **DIVISION** Glendora, California  
A DIVISION OF GIANNINI CONTROLS CORPORATION

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Standard Lengths  
In Three Cartridge Sizes:

**Model 300** —with up to 300 feet of single coated tape

**Model 600** —with up to 600 feet of single coated tape

**Model 1200** —with up to 1200 feet of single coated tape

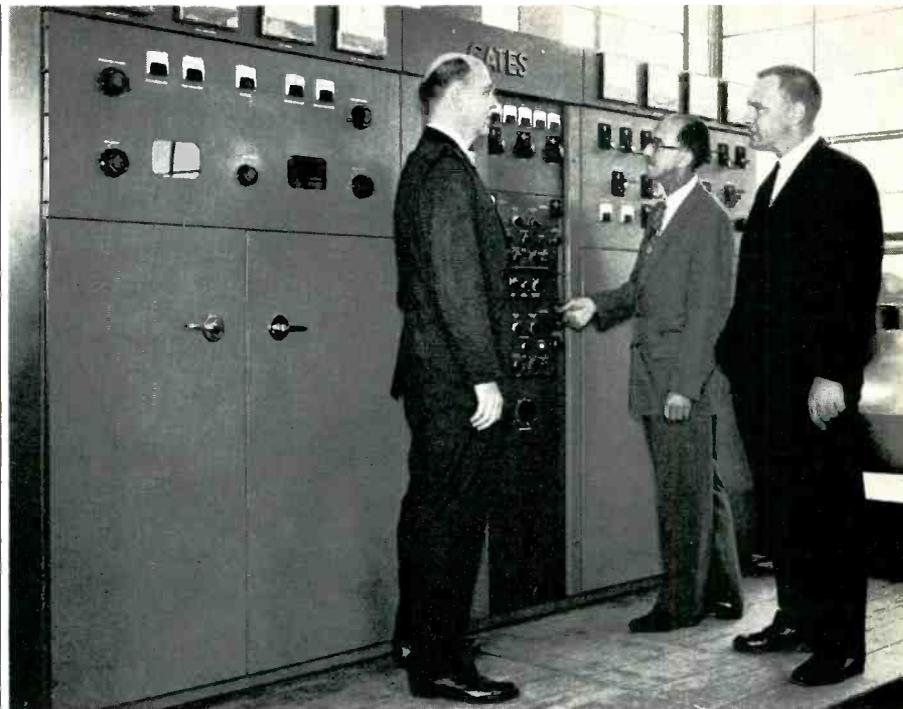
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CORPORATION**

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Inspecting a Gates 50,000-watt short-wave broadcast transmitter, one of eight designed and built for the United States Information Agency to relay Voice of America Broadcasts, are (l. to r.) J. W. Smith, Gates engineering manager; Leslie Petery, project engineer; and Robert Kuhl, government contracts manager.

## Transmitters Delivered to USIA

Two new Gates 50,000 watt short wave broadcast transmitters built for the United States Information Agency were shipped in September to the Voice of America's consolidated East Coast broadcast facility near Greenville, N. C.

Gates Radio Co. reports that six additional 50,000 watt transmitters —comprising a total order of eight —are scheduled for shipment within the next few months. Four of the remaining half dozen will also be located at the Greenville installation, while two transmitters will be delivered to the Voice of America station near Monrovia, Liberia, in Africa.

These high frequency transmitters are the first available 50 kilowatt models designed to meet the rigid specifications for the suppression of harmonic and spurious radiation, while at the same time being tunable through front panel controls over the entire range of from 3.9 to 30 megacycles. USIA specifications required that the harmonic and spurious radiation be attenuated at least 80 db.

Another important engineering consideration is that the transmitters can be adjusted from one operating frequency to another, such as the normally required day-night frequency change, within a maximum of three minutes.

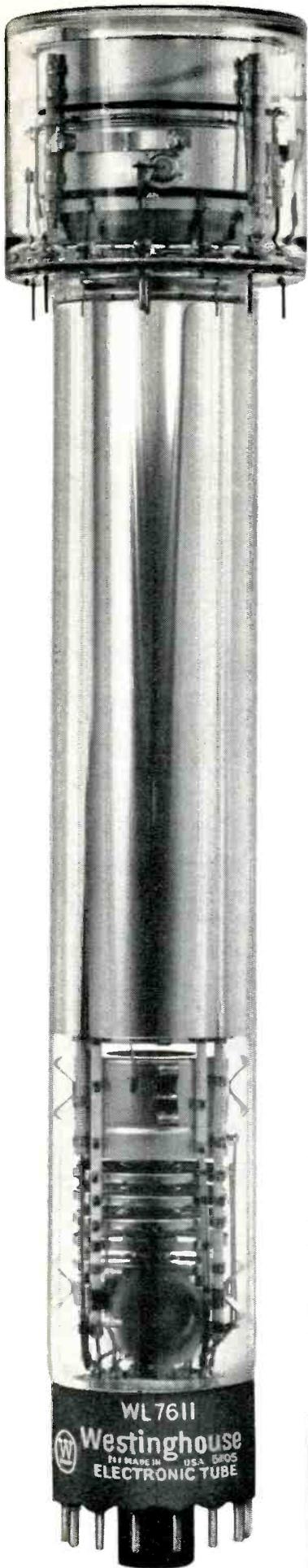
### Allerton Retires from NAB Research Department

The National Assn. of Broadcasters, 1771 N St., N.W., Washington, D. C., has announced the retirement of Richard M. Allerton as manager of the research department.

Allerton had headed NAB research activities for the past 10 years, and before that had had wide experience in marketing, research and corporate financing.

### Polarad Appointment to Stanley Schwalbe

Polarad Electronics Corp., 43-20 34 St., Long Island City, N. Y., has announced the appointment of Stanley Schwalbe as manager of engineering planning. In this position, Schwalbe will supervise costing, budgeting and scheduling of research, development and production programs for the Defense Products Div.



THERE'S NEW **POWER** IN WESTINGHOUSE TUBES

## new WL-7611 image orthicon— longest life of any commercial orthicon!

Warranted for 1000 hours, the new WL-7611 image orthicon is interchangeable with 5820A/5820. ■ Throughout tube life WL-7611 gives constant picture quality—free from after-image, picture-sticking, raster burn . . . and at no sacrifice of resolution, gray-scale, noise or shading. Spectral response is comparable to that of the human eye. Sensitivity is equivalent to an ASA exposure index of more than 500. As little as 10 foot-candles of illumination are required to obtain outdoor or studio pictures suitable for telecasting. And stable operation is attained over a very wide range of light levels. ■ Only Westinghouse has this high level of quality, the same quality in all Westinghouse products. ■ Available for immediate delivery from your Westinghouse distributor. Or write on your company letterhead: Distributor Sales Section, Westinghouse Electric Corp., Elmira, N. Y. *You can be sure . . . if it's Westinghouse.*



# Westinghouse

# Industry News

## AIEE-IRE Groups Consider Consolidation

First steps to consider consolidation of the two largest engineering societies in the world—the American Institute of Electrical Engineers and the Institute of Radio Engineers—have been taken. In a resolution passed by the boards of directors of both societies, a committee has been formed to determine the feasibility and form of such consolidation.

The proposed new organization would be international in scope and involve 150,000 engineers, scientists, educators and industrialists.

The resolution pointed out that "the advancement of the theory and practice of electrical and radio engineering and the educational and scientific objectives of both Institutes may be better served by merger or consolidation . . . into one organization in which all present members would be included, and in which they would enjoy the same

rights and privileges now conferred on them by their separate organizations."

The resolution further stated that the boards of directors of the two Institutes deem it advisable, in accordance with the stated objectives of each society, "to move actively toward the consolidation of the activities and organization" of the IRE and AIEE, "by consolidation or otherwise, provided that the legal and operational problems incident to such consolidation can be satisfactorily resolved."

Both societies appointed members to the committee "which shall be authorized and directed to undertake such studies as they shall deem necessary and appropriate to determine the feasibility, practicability and form of such consolidation." The committee is to submit a report to the Boards of both societies not later than Feb. 15, 1962, for their approval "with a view to submission to a vote of the memberships of the two Institutes and consummation, if so approved, by Jan. 1, 1963."

AIEE was organized in 1884 and

has approximately 70,000 members from the United States and Canada. IRE, organized in 1912, has a total membership of 91,000 and is international in scope. Approximately 6,000 members now belong to both societies.

Both organizations have headquarters in New York, AIEE in the new United Engineering Center, 345 East 47th St., and IRE at 1 East 79th St.

## CCTV, Broadcast Tape Interchange Demonstrated

Ampex Corp. recently demonstrated a procedure for interchange of recorded material between its new single-head, helical-scan, closed-circuit Videotape recorder and its conventional four-head broadcast machine.

Company engineers stated that any recording made on the single-head, helical-scan VR-8000 can be played back on a VR-8000 and dubbed on a VR-1000 series (four-head) broadcast recorder equipped with Intersync TV signal synchronizer. The resultant tape played back on an Intersync-equipped VR-1000 recorder will meet FCC requirements in all respects, and can be used for on-the-air broadcast. Conversely, tapes recorded originally on a VR-1000 series machine can be played back on a VR-1000 recorder and dubbed on a VR-8000 for closed-circuit presentation.

## Honeywell Promotes Three To California Posts

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has appointed two branch industrial sales managers and an account executive in three California cities.

The new industrial sales managers and branch offices they head are Donald B. Sharman, San Francisco, and Jack Phillips, San Diego. William N. Wallace is the account executive for scientific sales with offices in Santa Clara.

Sharman, with Honeywell since 1951, succeeds the late Ralph Brogie. Phillips and Wallace, both of whom joined the company in 1954, fill new posts.

## Dayco Electronics Named as Warranty Service Station

Dayco Electronics, Inc., 309-11 Turk St., San Francisco, Calif., has been named as a new warranty

## Spot-O-Matic

# STEREO

CARTRIDGE TAPE



Playback/Record  
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Now Stereo Broadcasters can unleash their imaginative talents to create beautiful stereo commercials and program aids on cartridge tape. Spot-o-Matic cartridge equipment offers reliability never before available, and audio quality that will please the most critical.



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Classified  
Ads  
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They  
Get  
Results!

service station for Magnecord tape recorder-reproducers built by Midwestern Instruments, Inc., Tulsa, Okla., according to an announcement by Paul R. Bunker, Magnecord sales manager.

**Ampex Names Charles Norton Regional Marketing Manager**



Charles E. Norton has been appointed regional marketing manager, Latin America, for Ampex International ac-

pex Corp., an International

In his new be responsible activities association, sale an pany's precise tape, and oth Latin American area.

**New Technician For Adler Vi**

Harold W. to the new assistant to general manager electronics, Inc. customer liaison products division served as engineer during his

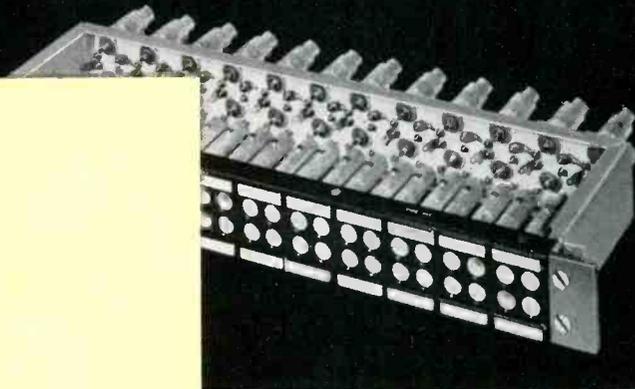
**Jack White I Circuit TV Sa**

Jack M. pointed by General nical product west district circuit television White succeeds has moved to quarters sales N. Y.

**ITA Appoints International**

ITA Electri pointed Western national distributor pany's complete equipment, it Paul Comstock and director of

# NEMS-CLARKE AUDIO, VIDEO and RF JACK PANELS FOR 70 OHM AND 50 OHM LINES



back space and made of high quality Nems-Clarke Jack Panels are compatible with electric equipment.

Panel provision can be made on the sub-panel Amphenol connectors and plugs – to suit any lines when necessary. Heat-treated contacts assure long, maintenance-free service. Flush types are available.

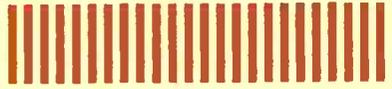
The Nems-Clarke 125 Field Intensity Meter is a portable instrument for measurement of radio signal intensities in the band from 1.5 to 30 MHz. It is used to measure transmitter harmonic distortion and pre-license requirement of stations licensed in the NAB Engineering Handbook.

**Jack [A Significant Step Forward]** The new Nems-Clarke Jack provides coaxial patching for 50 OHM lines are used—with fairly little space where a number of "normal through" connections are required.

Jack is designed, since looping is constant and can be eliminated by insertion of a plug from front of jack panel. Jack instantly restores "normal through" connections. Jack has VSWR of less than 1.15:1 in

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# Industry News

## GEL Appoints Two New Sales Representatives

General Electronic Laboratories has announced the appointment of two new sales representatives to handle the company's 1KW, 15KW and 30KW FM broadcast trans-



Langford

Leedham

mitters, FM multiplex and stereo equipment and rust remote control systems.

Jack P. Langford of Joplin, Mo., has been appointed to cover Kansas, Oklahoma, Arkansas and Missouri, and Robert C. Leedham of Cleveland, Ohio, will handle Ohio, Michigan and western Pennsylvania.

## Price Increase on RCA Broadcast and TV Equipment

A five per cent price increase in equipment manufactured by the Broadcast & Television Equipment Div. has been announced by Radio Corporation of America. The price adjustment, effective Nov. 1, covers transmitting, studio and relay equipment used in the radio-television broadcasting and closed circuit TV industries.

C. H. Colledge, division vice-president and general manager, said

the new prices were made necessary by increased engineering and manufacturing costs involved in turning out the more complex equipment required by current high standards of broadcasting performance.

## IRE Appoints W. Reed Crone Student Affairs Secretary

The Institute of Radio Engineers has appointed W. Reed Crone to the newly-created post of student affairs secretary. Crone will serve as a member of the IRE headquarters staff in New York to coordinate and guide the IRE program of activities and services for its student membership. He will also be concerned with the publication of the IRE Student Quarterly, as well as the activities of the 212 student branches.

## Formation of Mectron Auto-Dryaire, Inc., is Announced

Announcement of the formation of Mectron Auto-Dryaire, Inc., to manufacture and sell Auto-Dryaire dehydrators, was made by Saul Esocoff, president.

Effective immediately, all inquiries concerning Auto-Dryaire dehydrators and replacement dehydrator parts formerly supplied by Communications Products Co., Inc., should be directed to the firm's offices at 501 E. First Ave., Roselle, N. J. No change has been made in catalog or drawing numbers.

## High Power FM Transmitters For Raleigh, N. C., Station

One of the highest power FM transmitters built will be put into operation at WRAL, Raleigh, N. C.

ITA Electronics Corp. president, Bernard Wise, said "WRAL will

have the most powerful FM voice in the Carolinas, and will have much greater coverage with the new 35KW transmitter than would be possible with lower power equipment."

## TV Automation Equipment At WDSU-TV, New Orleans

Visual Electronics has announced the installation of a Visual 6000 television program automation system at WDSU-TV, Channel 6, New Orleans, La., television station. The equipment was placed in operation in mid-summer.

The purpose of the equipment is to provide smooth programming especially during the active station break period, and at the same time reduce the technical operator's work load. This is done by automatically switching video and audio signals on the air in accordance with the station's program schedule. The equipment also turns on projectors and switches multiplex mirrors as called for, and rolls film projectors and video tape machines ahead of time by a specific number of seconds so that their speeds can stabilize and then switches them on the air, the manufacturer states.

The system uses punched paper tape to control the program for a full day and is designed to provide a master control display of the upcoming program contact approximately 30 minutes ahead of time. Self-checking features are said to be in operation at all times to provide automatic, error-free operation.

The Visual 6000 TV program automation system was developed by Visual Electronics' engineers working with prominent broadcast station engineers over the past four years.

## Spot-O-Matic

SE-5 portable audition unit

LIGHTWEIGHT PORTABLE AUDITION UNIT FOR SALESMEN OR PRODUCTION PERSONNEL. FOR USE WITH ANY FIDELIPAC CARTRIDGE SYSTEM. PRICED AT JUST \$145.00.



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BROADCAST ENGINEERING

# Product News

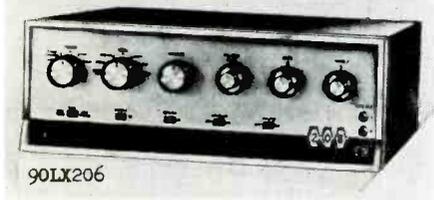


## NEW COLOR TV UTILITY MONITOR

The model 312-A1 color TV utility monitor, a completely self-contained instrument designed to provide 21-inch high quality color or monochrome picture viewing, has been introduced by Electronics Div., Telechrome Mfg. Corp., Amityville, N. Y.

Separate audio circuits and speaker are provided in the cabinet for monitoring the audio portion of a program, and connections are also provided for an external speaker. Housed in an attractive cabinet, the monitor may be used in control rooms, transmitter monitoring points, or in prestige locations such as clients or viewing rooms.

The unit is designed so that all set up and adjustment controls, with the exception of on-off tone and audio level, are located behind a spring-loaded access door on the front panel. All of these controls are clearly marked but cannot be tampered with by unauthorized personnel, the manufacturer states. Individual primary purity color switches as well as a color-monochrome switch are also provided.



## NEW 50-WATT STEREO AMPLIFIER

Radio Shack Corp., 730 Commonwealth Ave., Boston 17, Mass., has announced the new Realistic deluxe model TA-208 transistorized 50-watt stereophonic amplifier.

Advanced features include mounting of all basic elements forward on a printed circuit board; separation of rear output sections to avoid cross coupling; placement of main heating elements to channel air flow and provide proper heat dissipation; and ac and dc isolation for shock hazard elimination.

The TA-208 employs 18 transistors, plus two driver and one rectifier transformers, and is housed in a modernistically designed

case measuring 15 inches wide, 5 inches high and 10 inches deep. Additional features include superior frequency response, hum and noise level, and sensitivity. Equalization is  $\pm 1$  db (NARTB, RIAA) with deviation not exceeding  $\pm 1$  db from 20 cps to 20 kc at an output of 2.0 volts.



## NEW PULSE GENERATOR

A pulse, combining fast rise time with low jitter and high repetition rate, is provided by a new pulse generator being offered by Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.

The new generator, model 213A, is said to form a pulse having a rise time of approximately 0.2 nanoseconds (always less than 0.5 nanoseconds) and a width of approximately two microseconds. Either posi-

tive or negative 0.5 volt peak pulses trigger the generator at rates up to 100 kc, and the generator may be triggered directly from the sync pulse output of a model 185A or 185B sampling oscilloscope. The manufacturer states that at a rate greater than 100 kc, the instrument free runs. Jitter is said to be less than 20 picoseconds when triggered by a model 185 scope.

Designed to drive a 50 ohm system, the model 213A may be used to measure the step response of sampling oscilloscopes and other fast circuits, as well as analyzing cable characteristics, and determining the switching time of transistors, computer memory elements, etc.

## VIDEO TAPE EDITING BOOKLET

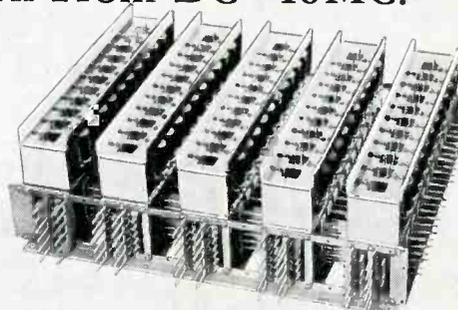
Minnesota Mining & Mfg. Co., Dept. E1-18, St. Paul, Minn., has issued a new booklet titled "Techniques of Editing Video Tape."

The 30-page, 8 by 10 format publication is a pictorial review of ideas being used by video tape editors to build shows from tapes, locate splicing points, and create special effects. Also discussed are the various methods of editing tape—direct cutting, double-system, and frame-by-frame—and such special effects devices as VideoScene, Super-Wipe, Zoom Keyer, and Inter-Sync.

## WAFIRE SPEAKER CATALOG SHEET

Advanced Acoustics Co., 67 Factory Place, Cedar Grove, N. J., has announced a new two-color catalog sheet covering descriptive material on the new Wafaire Bi-Phonic Coupler full-range, thin speaker system. Full specification data, descriptive material, prices, etc., are provided. Free reprints of technical articles covering the Bi-Phonic principle can also be obtained upon written request.

## This H-F Crossbar Switches 300 Video-Pulse Circuits with Negligible Crosstalk and Less Than 0.1 DB Distortion From DC - 10MC.



This unique\* switch behaves electrically like a matched coaxial line . . . from DC-10MC. You need no longer accept compromise performance in audio/video or high-frequency switches. 20 million operations/circuit are guaranteed—100 million are common.

The inherent versatility of the matrix format poses a real intellectual challenge. Care to accept it? Ask for Bulletin 60-115.

\*Cunningham designs are protected by U.S. and Foreign Patents.

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Be sure to obtain price quotations and engineering assistance for your complete tower needs from America's foremost tower erection service.

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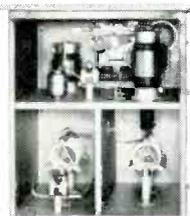
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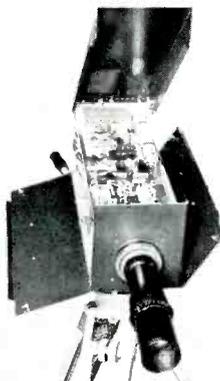
☐ SUBSIDIARY OF LING-TEMCO ELECTRONICS, INC.

## Product News

### NEW BROADCAST TRANSMITTING EQUIPMENT

Collins Radio Co., Cedar Rapids, Iowa, has introduced a new line of broadcast transmitting equipment featuring new cabinet styling with easy accessibility to all components within the transmitter.

The new line includes the 20V-3, 1000/500/250-watt AM transmitter, which features low noise level; high-capacity blowers mounted on the RF and audio chassis to force air directly on the tubes for longer tube life; the 81M phasor, which is custom-designed for each installation and uses phase T shifting networks; the 830B-1, 250-watt transmitter with self-contained multiplexing equipment and FCC approved stereo-multiplex system; the 5,000-watt, 830E-1 FM transmitter, which is made up of a 250-watt driver (830B-1) and amplifier. The stereo-multiplex system and multiplexing equipment are available as accessories for the 830E-1.



### V-600 IMAGE ORTHICON TV CAMERA

The V-600 Image Orthicon television camera, designed for live-image or closed-circuit monochrome use at 600-line minimum resolution, is being offered by Foto-Video Electronics, Inc., Cedar Grove, N. J.

The new camera weighs 25 lb., occupies 2 cu. ft. of space, and can be fitted with either the conventional studio lenses or a variety of Zoomar lenses. Features of the new unit include extremely high sensitivity and extended range.

### NEW RIGID LINE CATALOG AVAILABLE

A 20-page catalog covering rigid coaxial transmission lines and associated equipment was recently distributed by Andrew Corp. of Chicago. With over 25 years of design and production experience in the field of RF transmission, Andrew offers a selection of 50-ohm line and fittings in the size range from 7/8 to 9 inches. A new 3 1/2-inch coaxial transfer switch is introduced in Catalog R.

The catalog is available upon request from Andrew Corp., P. O. Box 807, Chicago 42, Ill.

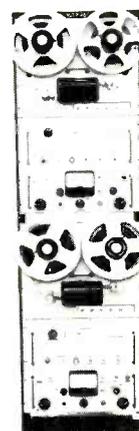
### BROADBAND VERTICAL RADIATOR

The Trylon broadband vertical radiator has been developed by Wind Turbine Co., West Chester, Pa., for omnidirectional and multifrequency service offering power handling capacity to 150 kw or more, and constant input impedance over a wide frequency range without the need of impedance-matching equipment.

The gain of the new unit is said to be identical to that of a conventional vertical radiator, rising somewhat when antenna height approaches 5/8 of a wavelength at which point most of the radiation is still in a horizontal plane, in a circular pattern. Due to the special design of the outer periphery, the input impedance is extremely constant, the manufacturer reports.

The new radiator is designed for a 50 or 70 ohm coax line, and its standing wave ratio remains less than 2 up to high frequencies. For an SWR of 2, the frequency range covered can be 3 to 1, and for a maximum allowable SWR of 2.6, a frequency range of 4.4 1/2 to 1 is covered.

Trylon broadband vertical radiators are available for a large range of cutoff frequencies such as 2 to 6 mc., 4.5 to 13.5 mc., 11 to 33 mc., or similar ranges. They have wide use for police, railroad, Marine, transportation or commercial transmitting and receiving; as broadband directional arrays or direction finders; for broadcasts from the same tower by several stations; and other multi-frequency applications.



### BI-DIRECTIONAL MAGNETIC RECORDER

A new bi-directional, four track magnetic tape recorder, said to be capable of recording and reproducing four hours on a single 7-inch reel of 1/4-inch tape, or eight hours on a 10 1/2-inch reel of 1/4-inch tape, has been announced by Telectro Industries Corp., 35-16 37th St., Long Island City 1, N. Y.

Model 2157 consists of a professional-type, bi-directional tape-deck, a control unit and a record-reproduce pre-amplifier. Change in direction of recording and playback is accomplished automatically every hour with 7-inch reels, and every two hours with 10 1/2-inch reels. At the same time the proper recording head is also automatically selected. The entire recording operation may be remotely controlled, and is equipped with automatic alarm and reset facilities.

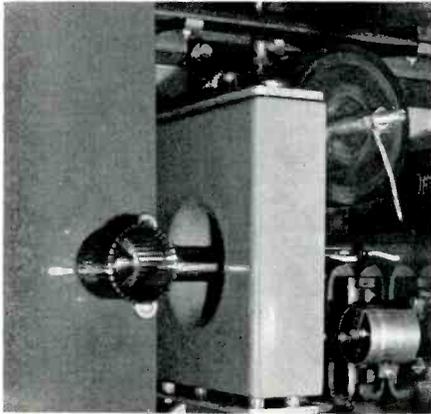
### MODEL AR-1 AUDIO RELAY

Teletronics Engineering Co., 4688 Eagle Rock Blvd., Los Angeles 41, Calif., has introduced the model AR-1 silence sensing circuit designed to provide a precision variable holding time of 0.75 seconds.

Specifications include input signal level 0.005 volts to 20 volts; release time adjustable from 100 milliseconds to 75 seconds; pull-in and release time independent of input level; pull-in time less than five milliseconds; consistent drop-out time for precise automation control or carrier keying; input level control to permit setting threshold above noise level; frequency response flat (3db) 700 to 2500 cps; high impedance (20 K bridge) isolated input; input signal indicator; DPDT relay contacts rated at 2

**BROADCAST ENGINEERING**

amps, 115 volt, ac; rack mounting 5 1/4 inches high, 19 inches wide; ac input, 108 to 125 volts, 25 watts.



#### LINE OF TRANSFORMERS

A line of transformers for precision measuring of the amplitude and waveform of electronic currents at voltages up to 300 KV has been developed by Pearson Electronics, Inc., 707 Urban Lane, Palo Alto, Calif.

The units are used with a standard oscilloscope for monitoring currents from milliamperes to tens of thousands of amperes. Applications include measuring amplitude and waveform of radio transmitter equipment from a few hundred cps to many megacycles, and monitoring currents in high or low voltage devices, such as klystron tubes, magnetrons, radar modulators, traveling wave tubes, and particle accelerators.

The specifications feature fast rise-time (20 millimicroseconds), low droop (0.1 per cent to 0.0005 per cent per microsecond, depending on model), high output amplitude accuracy ( $\pm 1$  per cent,  $-0$  per cent), and ability to monitor currents at voltages up to 300 KV, according to the manufacturer. Overall dimensions are 8 x 2 3/4 x 9 1/2 inches.

#### MAGNETIC TAPE FOR AUDIO MARKET

Burgess Battery Co., Div. Servel, Inc., Freeport, Ill., is producing recording tapes for business, home, broadcast and laboratory use.

The manufacturer reports that performance tests show that the tape has signal output strength regulated to less than a half decibel of variance, and is so uniform that splices can be made in musical selections from different reels recorded at different times without any perceivable variation in volume or tonal quality.

A special acicular iron oxide powder is used, filtered down to a particle size of five microns or less. The needle-shaped particles are then dispersed by a new process that separates the particles without shattering them. Acetate or Mylar plastic is used as the base for the tape and they are precoated to eliminate any stray imperfections, it was further stated.

#### NEW PIXICAM TELEVISION CAMERA

Marsan Industries, Inc., American Telecircuits Div., 49 Edison Place, Newark, N. J., has introduced a new television camera, the Pixicam, which uses a new type, 2-inch camera tube, trademarked the Pixicon.

According to the manufacturer, any standard television set can be used to receive the pictures from the television camera, utilizing any unused TV channel on the receiving set. The equipment is said to employ electrostatic focusing and deflection principles. In addition to providing output

signals at both video and RF channel frequencies, the Pixicam is designed to add sound automatically to the picture from a standard microphone, tape recorder or record player.

The Pixicam, model EC1, is said to be capable of 400 lines of video resolution, employs a seven-tube circuit and operates from 110-volt, 60-cycle ac power lines.

#### NEW MULTIPLEX ADAPTOR

H. H. Scott, Inc., Instrument Div., 111 Powdermill Rd., Maynard, Mass., has developed a new multiplex adaptor. The model 335 R, a professional version of the company's 335 component adaptor, is for the stereo multiplex system approved by the F.C.C., and can be rack-mounted for professional applications.

The 335 is a self-powered external adaptor, and plugs into any H. H. Scott wide-band FM or AM-FM tuner. Connections can be made in moments without affecting tuner alignments, the manufacturer states. The unit is of wide-band design, which is said to give lower distortion than is possible with conventional narrow-band design.

#### NEW POLARAD HANDBOOK

Polarad Electronics Corp., 43-20 34 St., Long Island City 1, N. Y., is offering a new edition of the Spectrum Analyzer Techniques Handbook, which gives detailed measurement techniques using the spectrum analyzer, together with a history and general theory of operation of these instruments. A portion of the handbook describes and lists the specifications and applications of spectrum analyzers currently available, including the new lightweight, transistorized model SA-84T.



#### COLORTRAN CINE-QUEEN LIGHT UNIT

The new ColorTran Cine-Queen, wide-flood lighting unit for the motion picture, TV and industrial photography fields, has been developed by Natural Lighting Corp., 630 S. Flower St., Burbank, Calif.

The unit employs the new 1,500-watt G.E. lamp which produces a rectangular area of flood illumination at 3350K color temperature from any 120-volt ac or dc power source. The manufacturer reports that no converter is needed with the new light because of the pre-boosted filament construction of the lamp.

The Cine-Queen is said to draw 12 amps from the circuit in use and produce light equal to a standard PAR 64 medium boosted flood. The housing is designed to assure sufficient cooling of the lamp, and additional refinements include swivel mount and insulated control handle.

## THE TELE-COMMUNICATIONS PORTA-CASTER

Model 675



Size: 15" x 19" x 4 1/2"

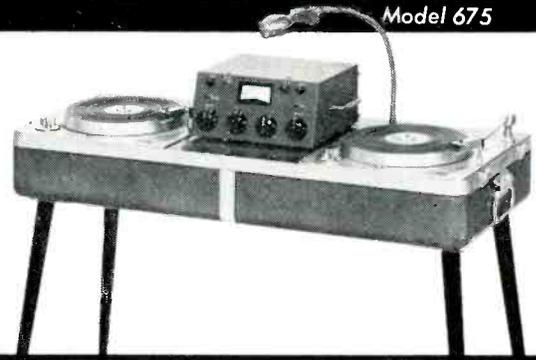
Weight: 90 lbs.

Console only 13 lbs.

Cabinet: Grey unbreakable fiberglass and aluminum with removable legs and cover.



Console completely self-contained (including monitor amplifier) and may be removed for remote broadcasts.



**A COMPLETE, COMPACT  
TRANSISTORIZED PORTABLE UNIT  
FOR STUDIO OR REMOTE USE**

#### INPUT CONTROLS:

2 Turntables with cue position, 1 Microphone Control with two inputs, 1 Remote Control with high level inputs.

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1 Line Output, 1 P.A. Output with control, 1 External Speaker Output, 1 Phone Output.

#### EQUIPMENT:

Includes 2 Rek-O-Kut, Rondine B-12 Turntables, 2 Presto PA-1 Tone Arms (with snaplock), 2 G.E. Type 4G-050 Triple Play Cartridges.

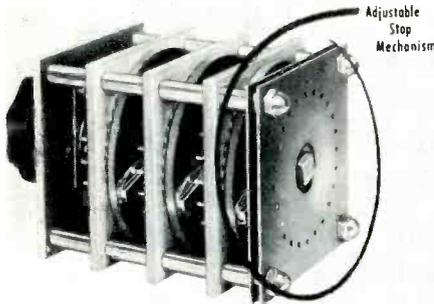
FOR INFORMATION CONTACT

**TELE-COMMUNICATIONS CORP.**

AN AFFILIATE OF TELEBROADCASTERS, INC.

50 DRUMM STREET, SAN FRANCISCO, CALIFORNIA • YUkon 2-4314

# Product News



## ADJUSTABLE STOPS FOR PRECISION SWITCHES

Langevin, Div. Sonotek, Inc., 503 S. Grand Ave., Santa Ana, Calif., has added adjustable stops to its precision instrument switches.

The stops are said to provide selection of any number of positions on any location in the contact array. Two removable stop pins can be set with the fingers in pre-drilled holes in two adjacent plates on the rear of the switch. Stop adjustments can be made after switch is wired and mounted into equipment. Tool required is an ordinary socket wrench.

Langevin will send on request a 24-page brochure, "Guide to Choosing Precision Instrument Switches." The brochure shows standard switches using fine silver brushes and contacts designed for dry circuits; contact resistance is 1.2 milliohms  $\pm$  .2 milliohm.



## REMOTE CONTROLLED LENSES

New, remote controlled lenses for combat, surveillance and camera locations inaccessible for manually-operated cameras have been announced by Television Zoomar Co., 500 Fifth Ave., New York 36, N. Y.

The Super Universal Zoomar, model B, is designed to permit zoom, speed of zoom and focus to be controlled at any distance from the camera. The unit has an overall zoom range with converters of 2½ to 72 inches, and will mount on all 3 and 4½-inch image orthicon cameras. The size of the lens has been reduced and the weight remains the same. The remote-controlled unit has no RF noise and low audio noise, the manufacturer states.



## STATIC STARTER FOR MOTORS

Designed to help eliminate extraneous noise on movie sets and in television studios, a new motor starter without any moving parts has been developed by Westinghouse Electric Corp., General Purpose Control Dept., Buffalo, N. Y.

The new device, called a static starter, is designed to replace the conventional electro-mechanical or ignitron contactors now in use. The silent feature is accomplished with a silicon-controlled rectifier as the main power switch. The Trinistor device, like the silicon cell of which it is a derivative, is said to block conduction in the reverse direction, but to provide complete control of conduction in the forward direction.

Standard starter designs are applicable to 20-hp motors across-the-line, and up to 75-hp motors with reduced voltage starting. The new product is modular in concept and is said to offer extreme reliability because there are no moving parts and it is arc-free.

## Q.T. FOR TWO-WAY RADIO

Outercom Electronics Corp., 502 Charlotte-town Mall, Charlotte, N. C., has announced the optional inclusion of the Q.T. tone squelch for its two-way radio communications, which is designed to permit the base station operator to exclude all extraneous calls on his receiver. The receiver remains quiet until selected mobile units call in.

When a microphone button on a mobile unit is depressed, a reed oscillator initiates a tone burst on one of four pre-determined frequencies, which activates a resonant reed relay in the base station receiver. The base receiver is energized for five to ten seconds (time adjustable) and then automatically returns to the quiet position until over-ridden by the base station operator. The five to ten second time constant permits uninterrupted activity on the part of the base operator until such time as he desires to answer the call.

Advantages of the new unit include no added power drain on the mobile units; built-in design which precludes the use of accessory add-on boxes; and simplified circuitry. A desk microphone, incorporating a two-position bar switch, is optional. The first position initiates conventional squelch for over-riding the Q.T., and the second the transmitter.



## HIGH-GAIN TV RE-BROADCAST RECEIVER

A new high-gain television re-broadcast receiver that is said nearly to triple the effective receiving distance of a TV station, has been announced by Dynatech Corp., 471 NE 79 St., Miami, Fla.

According to the manufacturer, the TVR-1, aside from augmenting sensitivity, will also permit matching the distribution network of any CATV system to the receiver itself by compensating for variations in picture quality, thus providing pictures having better contrast, more detail, and improved synchronism. The unit features a selective TV receiver with a stabilizing amplifier of the type used by broadcast stations, and will handle both color and black and white telecasts.



**Save 30%** on 4-Track  
Stereo Music on Tape!  
Empty 3 in. Plastic Reels 7c ea.

**BARGAIN PRICES!** Send for our **FREE** Tape Recorder/Blank/Pre-recorded Tape Catalog #B-3

### SAXITONE RECORDING TAPE

\* Oxide guaranteed not to rub off or squeak—or money back. Compare ours with other "Bargain" tape. You'll find it's more than just "price" when you deal with us. We are original pioneers in the tape recorder business and our reputation means everything to us.

600' Acetate (plastic), 5"	.75
600' MYLAR 5" reel	.95
900' MYLAR (Polyester), 5"	.99
1200' MYLAR, 3/8 mil, 5" reel	1.18
1200' Acetate (plastic), 7"	1.19
1200' MYLAR, 1 1/2 mil. (Strong)	1.68
1800' Acetate (plastic), 7"	1.79
1800' MYLAR, 1 mil. thick, 7"	1.99
2400' MYLAR, untensitized, 7"	2.69
2400' MYLAR, tensitized, 7"	2.99

Studios, Large Users Even Lower. **PLUS POSTAGE.**  
Also—Scotch, Irish, Audio, Reeves, Ampex and Sarkes-Tarzian magnetic tapes, milks, audiocassettes, needles, etc. We'll surprise you with our quotations!

### SAXITONE TAPE SALES

(Division of Commissioned Electronics Company, Inc.)  
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### NORELCO SPEAKER

Famous AD3800M, twin cone 8" (75-19,000 cycles) discontinued model, former list 16.00, usual net 9.90 going at 3.73 plus postage, (8 for 27.85). Other Norelco speaker sizes at bargain prices. Send for **SPEAKER SPECIFICATION SHEET.**

**NEW!**

**HIGHER GAIN SERIES  
FM ANTENNAS  
DESIGNED FOR MULTIPLEX STEREO**

Write for Details.

**JAMPRO ANTENNA CO.**

7500 14th Ave.  
Sacramento 20, California



**TUBE TESTER WITH SOCKETS**

Seco Electronics Inc., 5015 Penn Ave. South, Minneapolis 18, Minn., has announced a new model tube tester available with sockets for all the newest tubes. The model 107A takes nine-pin novars, 12-pin compactrons, new 12-pin tubes, and nuvistors, in addition to all standard domestic and foreign tube types.

The new model is said to retain such features as the dynamic mutual conductance test on pre-wired chassis, the cathode emission test by free point selector system, and the grid circuit test with "electron-eye" tube.

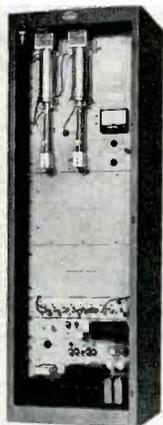
**RADIO-ELECTRONIC MASTER CATALOG**

United Catalog Publishers, Inc., 60 Madison Ave., Hempstead, N. Y., has announced the availability of the 1962 edition of Radio-Electronic Master catalog.

Virtually all standard radio, TV, audio and electronic products sold through distributors are included. More than 175,000 items, with specifications and prices, are featured throughout the 1,600 pages, and over 12,000 illustrations.

The reference volume meets the requirements of those who buy, sell, specify, design and service electronic parts and equipment. For rapid reference, the products of

315 electronics manufacturers are organized into 32 product sections, and a detailed index pinpoints the products displayed.



**NEW UHF TV TRANSLATOR**

A 20-watt translator for extending TV coverage beyond distance and terrain barriers has been developed by Adler Electronics, Inc., 1 Lefevre Lane, New Rochelle, N. Y.

Known as the UST-20, the automatic heterodyne repeater is said to pick up VHF TV signals off-the-air and convert them to a UHF channel for rebroadcast. Designed to provide good reception over larger areas than earlier 10-watt models, the UST-20 requires no operator and is turned on and off by the originating station signals. It rebroadcasts both color and monochrome.

**NEW SERIES FM TRANSISTORS**

A series of five PADT germanium alloy-mesa RF transistors for FM and AM home and portable radios has been announced by Amperex Electronic Corp., 230 Duffy Ave., Hicksville, Long Island, N. Y.

Three of the group comprise a high frequency FM kit: the 2N2089, 2N2090 and 2N2091 are respectively an RF amplifier, oscillator-mixer and an IF amplifier. The fourth, the 2N2092, is a universal type for use in the standard broadcast and short-wave bands up to 6 mc in all stages from RF through IF. The fifth, the 2N2093, is identical to the 2N2092 except for a higher 2-volt emitter breakdown voltage (BV<sub>ebo</sub>) figure for use in auto radios. The 2N2093 need be used only in the RF stage.

All five types are mounted in hermetically sealed, standard TO-7 cases which are internally shielded. Grounding this shield minimizes collector-base capacitance and capacitive coupling to nearby components.

**MOTION PICTURE EQUIPMENT CATALOG**

Gordon Enterprises, 5362 N. Cahuenga Blvd., North Hollywood, Calif., has announced a new motion picture equipment catalog covering all phases of commercial and industrial motion pictures, television and photo instrumentation. Comprising more than 100 pages and 300 illustrations, the literature includes considerable reference material, as well as charts, graphs and curves.

**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; regrounding, 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

QUICK Q AUTOMATIC SPOT ANNOUNCING PLAYER—recorder units. A rugged, compact, self-cueing tape cartridge machine for Radio Broadcasting stations. Saves time, confusion, money on spot commercials — music — announcements — background. The C. H. Alvord Company, 1000 Farmington Avenue, West Hartford, Connecticut. 12-61 1t

**HELP WANTED**

Television Field Broadcast Engineer — 1st phone, VHF and TV transmitter operation, installation and maintenance experience. Considerable travel involved, some foreign. Send resume to: Mr. D. K. Thorne, RCA Service Company, Cherry Hill, Camden 8, New Jersey. An Equal Opportunity Employer. 12-61 1t

Needed, first class engineer—Good salary. Write WNKY, Box 248, Neon, Kentucky, or call 7714 or apply in person. 12-61 2t

**BUY, SELL OR TRADE**

Will buy or trade used tape and disc recording equipment — Ampex, Concertone, Magnecord, Presto, etc. Audio equipment for sale. Boynton Studio, 10 BE Pennsylvania, Tuckaohoe, N. Y. 10-61 6t

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- SYNCHRONOUS MAGNETIC FILM RECORDER/REPRODUCER
- MAGNETIC TAPE RECORDERS
- NEW—THE portable MINITAPE synchronous 13 lb., battery operated magnetic tape recorder for field recording.

**THE STANCIL-HOFFMAN CORP.**  
 845 N. Highand, Hollywood 38, Calif.  
 Dept. B HO 4-7461

NEW IMAGE ORTHICONS FROM RCA

# *Now...Studio Color Pickup at*



# *Black-and-White Light Levels*

Now, RCA cuts the studio lighting costs for color TV . . . with new RCA-4415 and 4416 Image Orthicons! These highly sensitive tubes permit studio color pick-up with standard black-and-white lighting. This eliminates high scene-lighting temperature, the need for extra air-conditioning facilities, and many of the other lighting costs formerly associated with indoor color pickup.

## **Supplied in Matched Sets of Three**

These new precision Image Orthicons are supplied in sets of three—two 4415's for the red and green channels and one 4416 for the blue. Their closely matched characteristics assure uniform sensitivity and background over the entire scanned area. Matched sets equipped with deflecting yokes and focusing coils having precision construction and axial alignment with respect to each tube are recommended for color cameras utilizing simultaneous pickup. In such cameras, these tubes produce superior pictures in color receivers and high-resolution pictures with normal tone

rendition in black-and-white receivers.

## **RCA Field-Mesh Construction**

These new Image Orthicons offer all advantages of new RCA field-mesh construction which makes possible excellent registration of the three color images. Edge effects, such as exaggerated borders between high-contrast objects, are greatly reduced. "Beam-bending" from the charge pattern on the target is minimized and the over-all beam trajectory and corner focus are improved.

For full details on the new RCA Image Orthicons, check with your RCA Broadcast Tube Distributor.

The 4415 and 4416 are but two of RCA's broad family of image orthicons. Others include:

**RCA-4401-V1:**  
For remote B&W pickup at extremely low light levels—down to 10 footcandles.

**RCA-4401:**  
For low-light level color pickup—studio or outdoor. Available in sets of three having matched characteristics for maximum performance in color cameras.

**RCA-7513:**  
Featuring special precision construction and new RCA field-mesh design for high-quality color or B&W TV.

**RCA-7293-A:**  
A field-mesh image orthicon having an image section designed to prevent high-light ghosts. Field-mesh design to improve corner focus and prevent port-hole effects. For B&W studio and outdoor pickup.

**RCA-7295-A:**  
A 4 1/2-inch diameter field-mesh image orthicon with high resolution and very high signal-to-noise ratio, designed for tape and B&W studio broadcast use.

**RCA-7389-A:**  
A superior-quality field-mesh design 4 1/2-inch image orthicon, with extremely high signal-to-noise ratio, for tape and exceptionally high-quality B&W studio pickup.

**RCA-5820-A:**  
For studio and outdoor pickup in B&W. The "standard" of the industry. Whatever your TV camera requirements, there's an RCA Image Orthicon designed to meet them.

RCA ELECTRON TUBE DIVISION



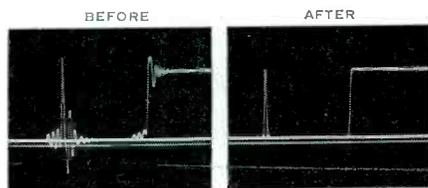
The Most Trusted Name in Television



*...clean-up video distortions easily*



Photos, taken a few seconds apart, show how the Model 20/20 cleans up smears, overshoots, ringing and other waveform defects.



Waveform correction is illustrated by before-and-after photos of an expanded portion of Sine<sup>2</sup>-test signal. The Model 20/20 can be used with any desired test signal for pre-broadcast, or on-the-air correction.

At the recent NAB show, Telechrome demonstrated a remarkable new device, the Model 20/20 Time Domain Equalizer. If you saw it in operation at the show, you were, no doubt, amazed at the ease with which it corrected streaking, smearing, ringing and overshoots. If you have antenna mismatch problems due to icing, etc., inadequate transmitter phase correction, video tape degradation, distortions on remotes or STL links, or, in short, almost any video distortion problem, let us demonstrate the 20/20 to you and your staff.

*Prove the value of the 20/20 at your own facilities for on-the-air or pre-broadcast signal corrections.*

The 20/20 requires no special signals or set up, so a few minutes of your time is all that is necessary to produce the picture that is worth the proverbial thousand words. For your demonstration contact H. Charles Riker, Vice President Marketing. No obligation of course.

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