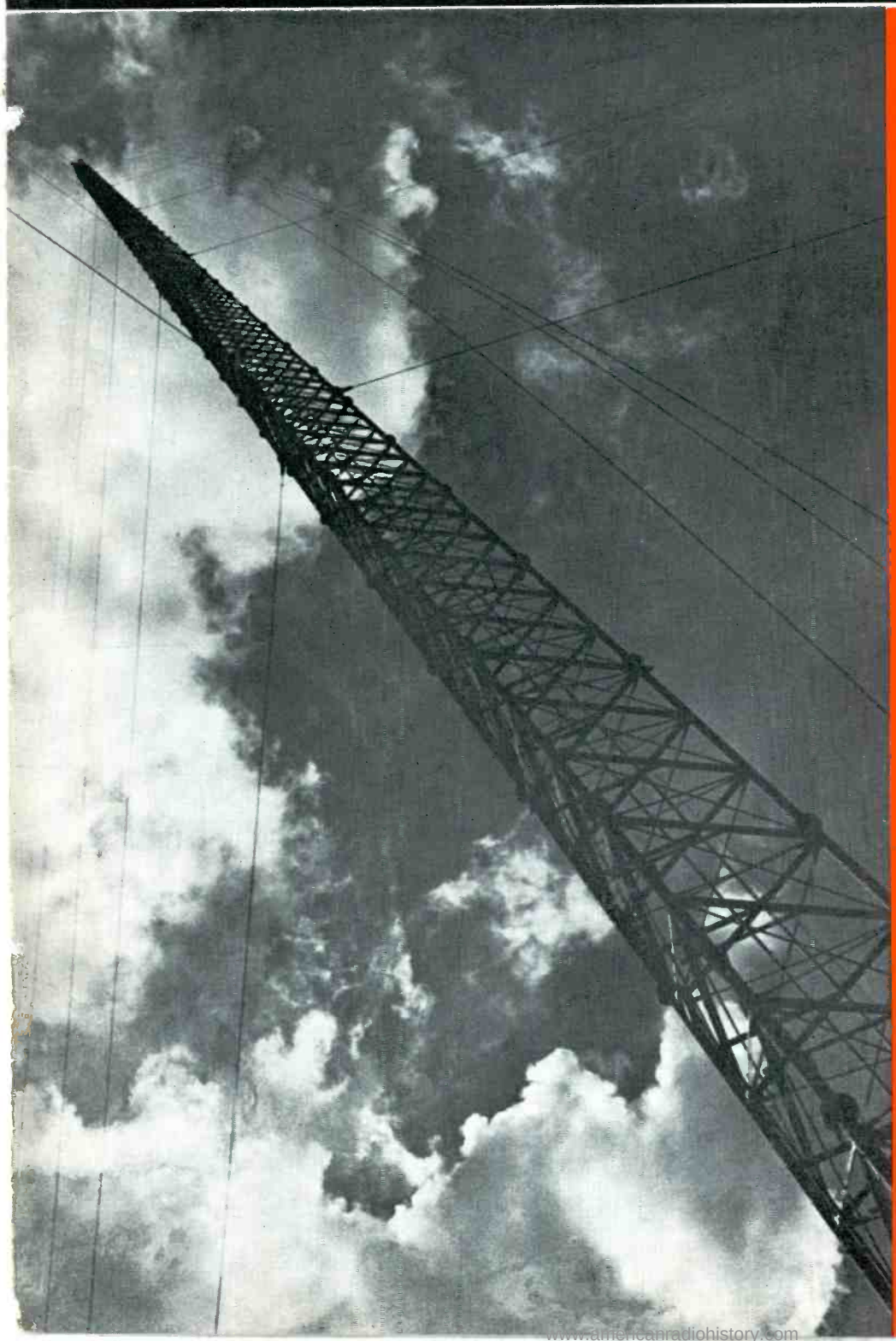
APRIL, 1961

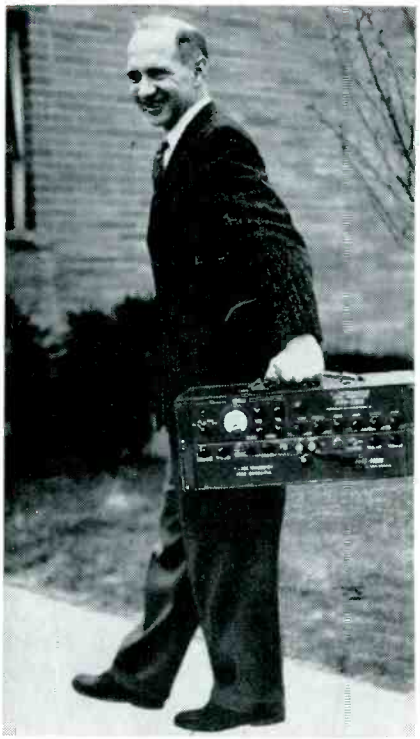
BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY



In this issue:

NEW! FOTO-VIDEO
SYNC GENERATORS & DA'S



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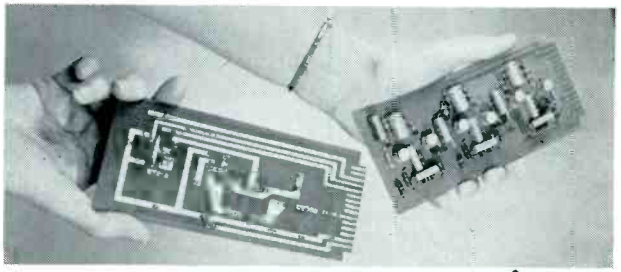

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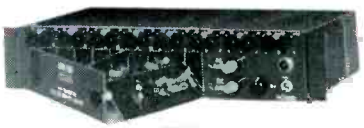

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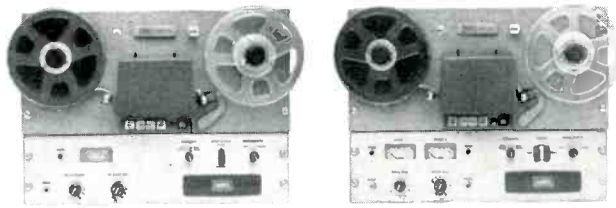

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THE AMPEX 351 MONOPHONIC

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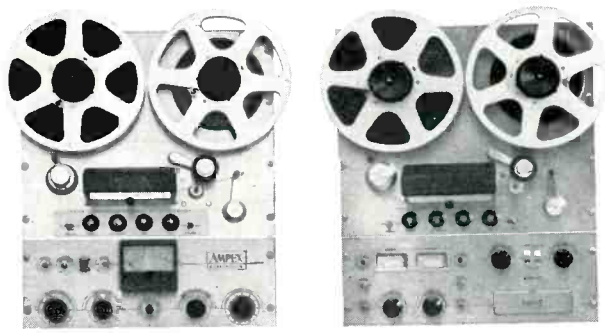

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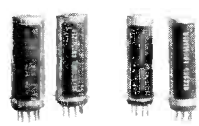

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AM FM BROADCAST ENGINEERING
THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY ®

VOLUME 3 APRIL, 1961 NUMBER 4

Contents

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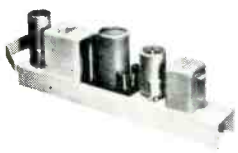

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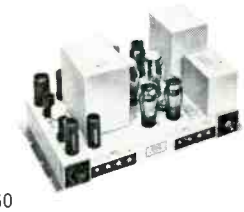

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Sounding Board

Grateful But Not Complete

Thank you for accepting and printing my article ("An Automatic Conelrad Attention Signal Unit") in the February, 1961, iss of BROADCAST ENGINEERING.

By the way, there are two small errors in the parts list on the Conelrad unit schematic. C2 should be .0001mfd instead of .001mfd. Also, there is a condenser *not* marked which should have a value of .001mfd.

EUGENE SEIER
Technical Supervisor,
Station KMMJ
Grand Island, Neb.

Corrected parts list reprinted—Ed.

R 1—47000 ohms
R 2—47000 ohms
R 3—270000 ohms
R 4—2200 ohms
R 5—2 megohms
R 6—47000 ohms
C2—.0001 mfd
C1, C3—.001 mfd
C4—25 mfd
C5, C6, C7—.5 mfd
C8, C9—20 mfd
C10—50 mfd
C11—.01 mfd
*C12—.001
T1—Stancor A3250
T2—TV booster transformer
FS1—3 ampere
SR1—50 ma selenium rectifier
PL1—No. 47 pilot lamp
S1a, S1b, DPST toggle switch
S2—Pushbotton actuate switch
S3abcd—SPDT microswitches
RY1—Remote operated relay

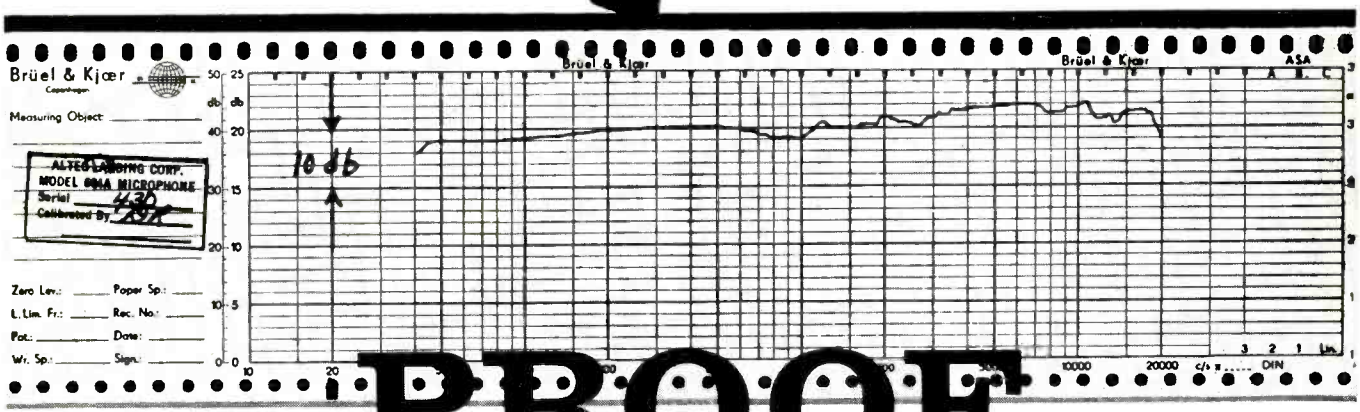
*NOTE: Value for unmarked grid capacitor in article schematic.

At The Tone, The Correct Time Is ? ? ?

In studying the floor plan C on page 23 of the February, 1961, issue (Studio Planning Considerations), I notice that the clock is *not* hung in the direct line of sight of the announcer, in the control room. Our clock had been in a similar location and the announcers could not accurately sight the location of the second or minute hands from such a side angle. We had to rehang our

(Continued on page 56)

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/cm²
Hum: −120 db (Ref.: 10^{-3} Gauss)
Dimensions: 1⅛" diameter at top (1½" largest diameter) 7½" 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 ⅝" −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.

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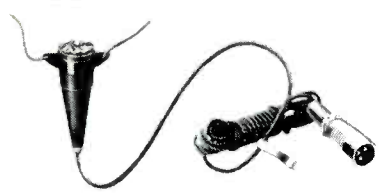
683A DYNAMIC CARDIOID—$66.00 net—Uniform response from 45 to 15,000 cycles with average front-to-back discrimination of 20 db. Design incorporates the new ALTEC "Golden Diaphragm" and exclusive sintered bronze filter. Output impedance of 30/50, 150/250, and 20,000 ohms selectable at cable plug.

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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TELEVISION SYSTEM MAINTENANCE

I. STANDARDS FOR PICTURE SIGNAL ANALYSIS

Proper calibration of test equipment is mandatory for the required precision in TV broadcast equipment adjustment and repair

By HAROLD E. ENNES
(Maintenance Supervisor, Television City, Inc., (WTAE) Pittsburgh, Pa.)

Editor's Note:

The first in a series of general and specific reports on Telecast Systems Maintenance. In this article the author claims basic need for TV stations to own and use suitable secondary frequency standard as an indispensable partner to high quality test oscilloscopes.

A "standard" is that which is established for calibration of an instrument to indicate when (for example) a "volt is a volt" or a "microsecond is a microsecond." This article is not to be considered as any revelation of "standard practice" in the field. The writer is convinced after some 75 contacts (personally and by correspondence) at as many stations that "prevailing practice" is that which exists at the particular station queried. It is realized that some readers may have honest differences of opinion on maintenance techniques. But whatever the technique used, a "standard" starting point must be established for comparison.

To emphasize the particular slant of this material, consider the measurement of corner-to-center resolution of a camera, looking at a studio test chart. It is perfectly valid for the operator to observe this on his monitor and make the necessary adjustments required to obtain best corner focus consistent with good overall focus and shading, since he is concerned with a qualitative ratio rather than an absolute quantity. The maintenance department, however, is charged with the responsibility of preventing performance deter-

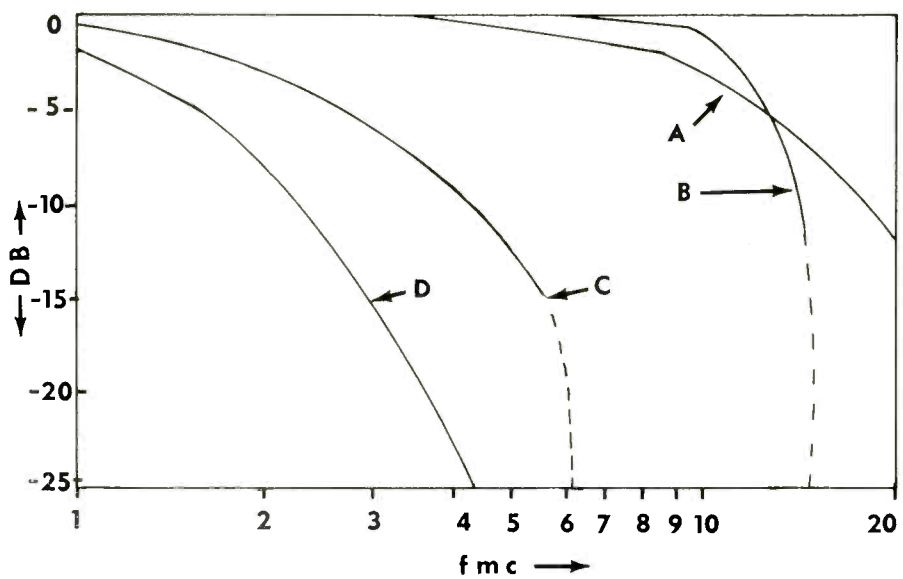

Fig. 1—The four major response curves with which the telecasting industry is concerned. (A). "Gaussian" or "Normal" response. Gradual roll-off. (9 DB/Octave). Rise time approx. 0.035 us. (B). "Flat" response to 5 or 6 mc. More rapid roll-off than curve of (A). Rise time approx. 0.035 us. (C). Old "IRE" curve. Rise time 0.175 us. (D). New "IRE" curve. Rise time 0.3 us.

BW (mc)	RT (us)
1	0.35
2	0.175
3	0.1166
4	0.0875
5	0.07
6	0.058
7	0.05
8	0.0437
9	0.039
10	0.035

TABLE I
Bandwidth-Risetime for k = 0.35 (overshoot under 3%)

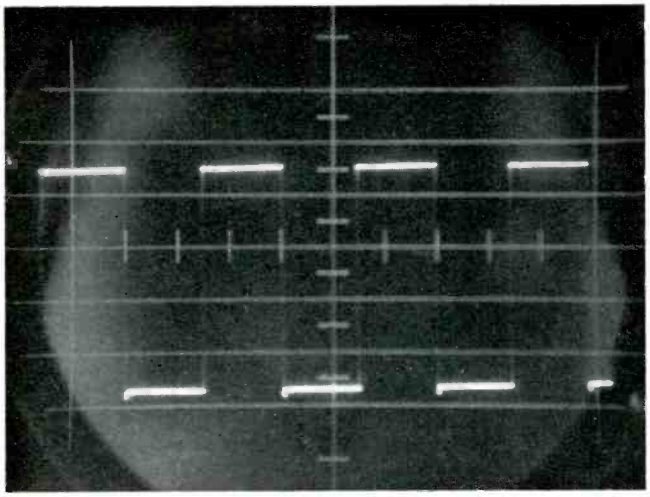

Fig. 2 (a). 75 kc square wave with scope on "Normal" response. Note almost complete lack of overshoot.

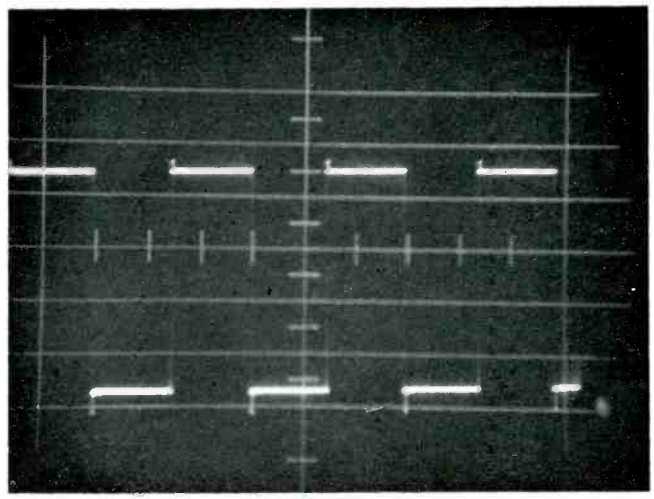

Fig. 2 (b). Same square wave with scope on "Flat" response. Note added overshoot from sharper roll-off.

ioration beyond a limit set at the lower end by FCC Standards and at the higher end by the chief engineer of the particular station. This higher end (as it should be) is usually limited only by the performance specifications of the equipment installed. If corner resolution for a given center resolution and gray scale falls to a value dictated by previous experience for a given pickup tube and camera as being below normal, the maintenance engineer must first know the characteristics of the monitor he is using before a valid measurement can be made. It is entirely possible for a monitor to exhibit 50 or 100 lines (or more) difference in resolving power, either plus or minus, between corner and center of the raster. How to measure this monitor characteristic, as well as more sophisticated techniques of determining the ratio of corner-to-center resolution of a camera will be discussed in a future article.

This article concerns the importance of proper calibration of the oscilloscope, which becomes the primary "standard" of the maintenance department. Due to the predominant use of the Tetronix scope in stations across the country, this unit will be referred to most often in specific applications.

The Oscilloscope Personality

Every scope exhibits its own personality as observed on the CRT. Getting acquainted with the individual scope characteristics is the initial step in "calibration" of the instrument.

Just two basic pieces of information are displayed by the CRT:

(a) Amplitude
(b) Time

"Waveshape" is not really a third basic piece of information, but is simply amplitude vs time. From the interpretation of waveshape is obtained low, medium, and high frequency response, phase distortion, gray-scale response, and the various factors included in transient response such as rise and decay times of pulses, cutoff (ringing) frequency, etc. The amplifier within the scope itself becomes the standard

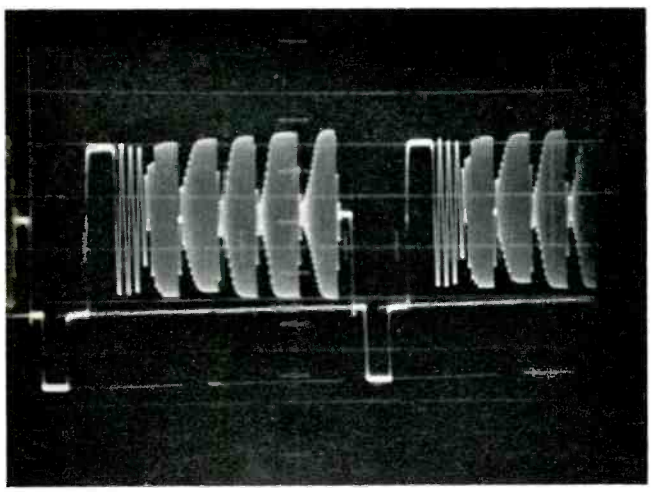

Fig. 3 (a). Appearance of keyed sine-wave burst using "direct" probe across 75-ohm termination. The indication of a rising response with frequency is erroneous. (See text).

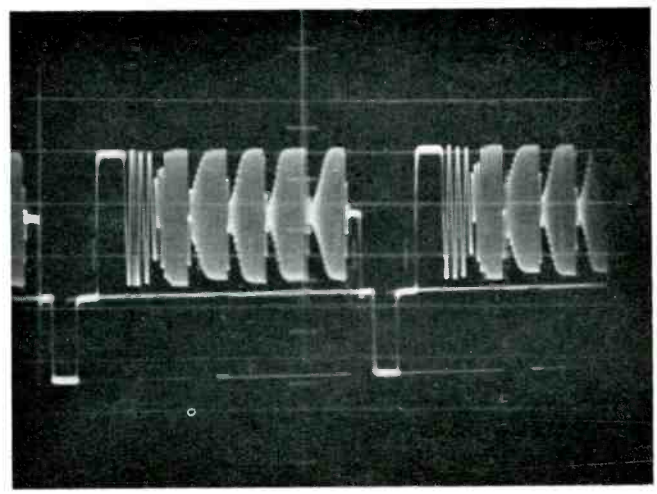

Fig. 3 (b). Same signal as (a) using cathode-follower probe. This indicates proper adjustment of the burst generator provided scope calibration indicates flat response to the highest burst frequency used.

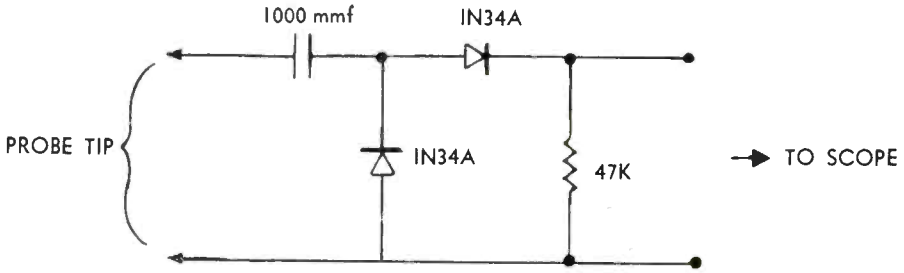

Fig. 4 (a). Simplest type of peak-to-peak video sweep detector probe. Detected output approx. 75% of peak-to-peak value.

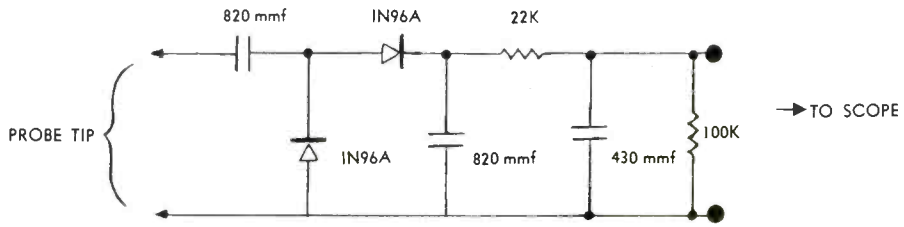

Fig. 4 (b). Probe with additional isolation and filtering. Detected output approx. 50% of peak-to-peak value.

which must be considered in measurements.

Fig. 1 is presented to show four response curves with which the telecasting industry is presently concerned. "A" is the so-called "Gaussian" curve with a roll-off suited for best transient response. This curve has an approximate relationship such that the 0 to 3 db point is equal to the 3 db to 12 db point. This curve might be recognized by users of the Tektronix 524AD scope as being that obtained with the response switch in "Normal" position. (This scope has three switchable responses: Normal, Flat, and IRE.)

Curve "B" is the "Flat" response of the aforementioned unit. The response is relatively flat to 5 or 6 mc. Since the gain-bandwidth product has a fixed upper limit, the roll-off becomes more rapid above this value.

Curve "C" is the old "IRE" response originally adopted for comparative level checks. We are currently in the process of a change-over to the new IRE curve (D) adopted in 1958 as being more indicative of true luminance levels.

In general the applications of the various response curves are as follows:

1. NORMAL (Gaussian roll-off): Most suitable for waveform analysis particularly where transient response becomes a major factor.

2. FLAT (to 5 or 6 mc): Most suitable for single frequency response runs (or keyed sine-wave burst signal) to avoid correction factor in readings.

3. IRE: Most suitable for checking, comparing and adjusting amplitude levels. Most existing equipment installed at present such as scopes and master monitors with an IRE position use the "old" curve. To avoid the inevitable arguments resulting from various interpretations of "peaks" of the higher frequency signal components, the new curve should be adopted as soon as possible. This is of prime importance in color telecasts where luminance levels are critical.

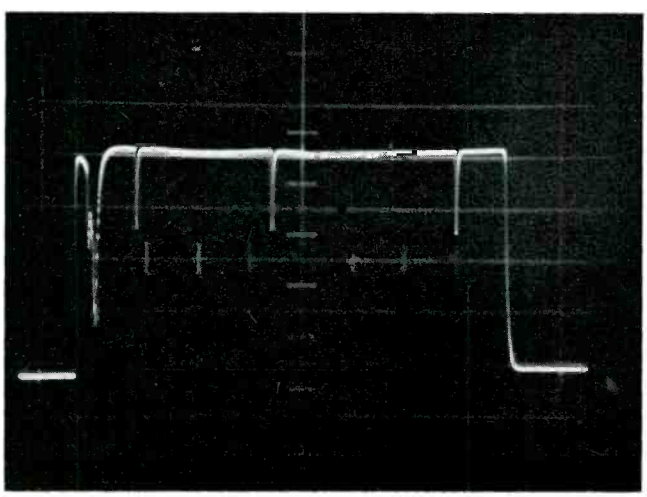

Fig. 5. Detected video sweep. Markers at 1-5-10 mc.

The Bandwidth–Risetime Product

Engineers are quite familiar with the gain-bandwidth product of an amplifier. Of more importance to the user of any given gain-bandwidth amplifier is the bandwidth-risetime product, since this becomes his "standard" of measurements.

This relationship is stated as follows:

$$(BW)\ (RT) = k$$

where:

BW = bandwidth in megacycles (to the 3 db down point)
RT = risetime in microseconds (measured between 10 per cent and 90 per cent of peak value)
k = factor lying between 0.3 and 0.5 depending upon type and amount of high-frequency compensation.

The limit of the factor (k) is that the overshoot on the leading edge be less than 3 per cent. In fact, a system has an equivalent bandwidth and rise time only within the limits of 3 per cent overshoot.

The most typical value for (k) is 0.35, and we may express the equation in all three possible ways as follows:

$(BW)\ (RT) = 0.35$
$(BW) = 0.35/(RT)$
$(RT) = 0.35/(BW)$

Table 1 shows the tabulation of rise time for bandwidths from 1 to 10 mc within the limitations above. Going back to Fig. 1, it may be noted that the 3 db down point of either the "Normal" or "Flat" curve falls in an area which safely indicates a bandwidth of 10 mc. It can be shown from pulse theory that rise time is proportional to the AREA under the amplitude-frequency response curve; hence changing from one response to the other does not appreciably affect rise time. Fig. 2 (a) and (b) illustrates the difference in overshoot of a square wave between "Normal" and "Flat" positions.

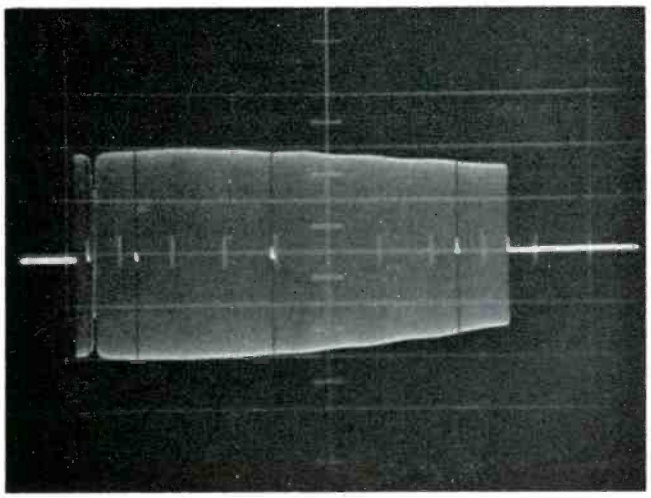

Fig. 6 (a). Same signal as Fig. 5, undetected. Scope on "Normal."

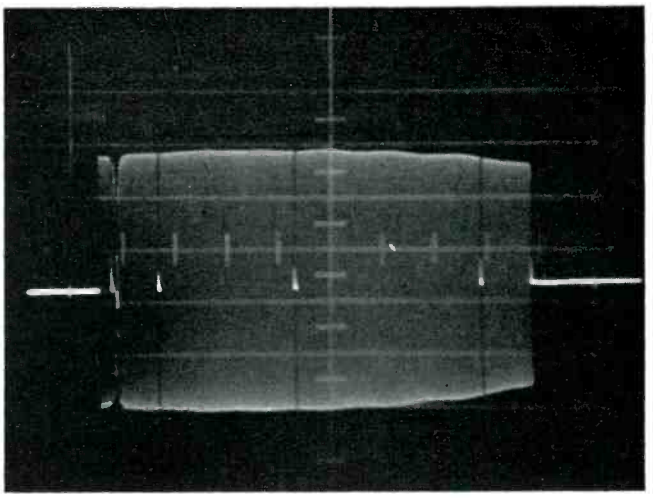

Fig. 6 (b). Scope on "Flat" response.
NOTE: The sweep generator used only sweeps to 10 mc, therefore characteristics beyond this frequency are not displayed.

It is the shape of the curve that is actually being changed when video peaking coils are adjusted. Leading and trailing transients of a rapid transition in picture content must be adequately controlled by the maintenance personnel. Hence his complete familiarity with the scope amplifier characteristic is mandatory.

A good square-wave generator with reasonably fast rise time and flat top is an asset to any maintenance crew. The Tektronix Type 105 with rise time of 0.2 u/sec and a flat top completely free of "wrinkles" is one example. It is important to remember, however, that to measure the exact rise time of a pulse, the scope vertical amplifier must have a rise time of at least 1/5th that of the pulse to be measured. Now the rise time of a scope with 10 mc bandwidth is about 0.035 u/sec. The specified rise time of the aforementioned square wave generator is 0.02 u/sec. To measure this exact rise time, the scope amplifier rise time would need to be 0.004 u/sec or better. A fast rise time pulse is necessary for transient response checks in terms of overshoot or undershoot. Since the square wave generator must be terminated in 75 ohms to preserve rise time, it becomes impractical to check the pulse directly or the CRT since sensitivity is not sufficient for accurate measurement. Hence it is necessary to determine the "standard" rise time (and over-shoot) for any particular combination of generator and scope, before a valid check can be made on external amplifiers or systems.

The total rise time of a pulse through a series of cascaded stages is equal to the square-root of the sum of the squares of individual stage rise times (assuming overshoots less than 3 per cent). For example, an amplifier with a rise time of 0.02 u/s feeding an amplifier with, say, 0.04 u/s rise time, the total rise time is:

$$RT_t = \sqrt{(0.02)^2 + (0.04)^2} = \sqrt{0.002} = 0.045 \text{ u/s}$$

Understanding of this relationship enables the maintenance engineer to estimate closely the condition of his test equipment even though an extremely wide bandwidth scope is not available or necessary, provided he is certain of the scope characteristics. It also emphasizes the better-known premise that an amplifier output must be directly compared to the scope display at the amplifier input, properly terminated, rather than any assumed condition. Every time the

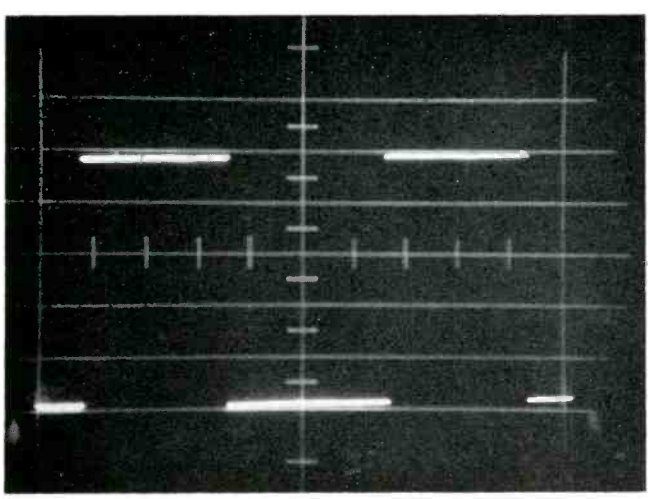

Fig. 7 (a). 60-cycle square wave with scope on dc position.

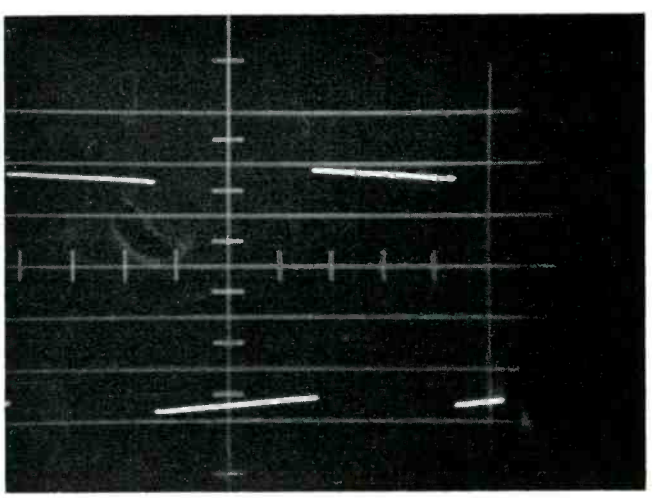

Fig. 7 (b). 60-cycle square wave with scope on ac position.

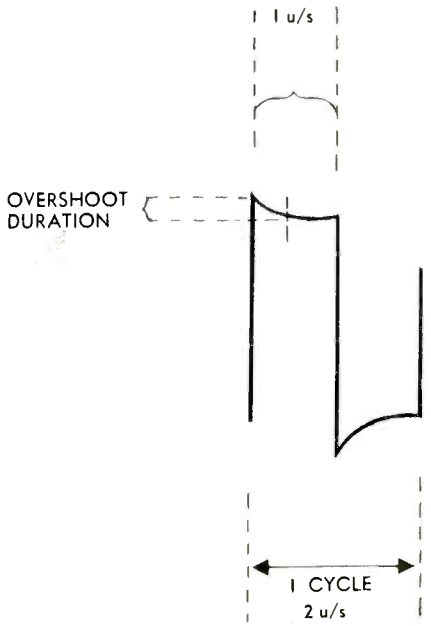

Fig. 8. Vacuum tube "cathode interface" distortion of a 500 kc square wave.

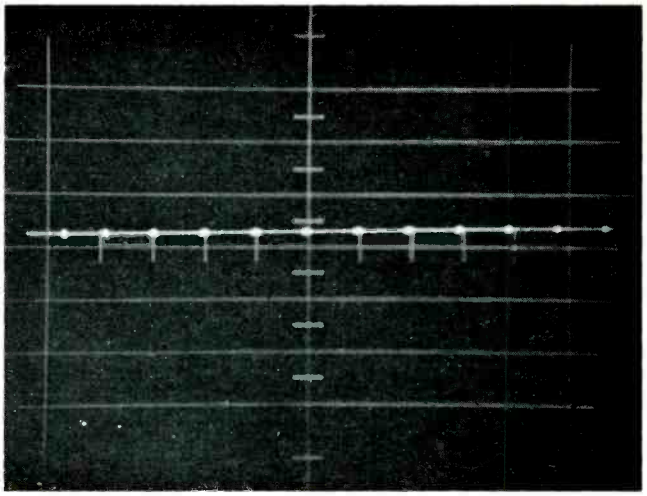

Fig. 9. Scope sweep with one micro-second markers to observe sweep linearity.

test signal is transferred to another stage or amplifier with different cabling, capacities, etc., it is important to check the input display at the point of connection so that the output can be properly interpreted.

Scope Probes and Initial Calibration

The "direct" scope probe, due to capacitive loading effects, is severely limited in application to TV equipment maintenance even though applied directly across 50 or 75 ohm terminations. It should *never* be used where frequency response or transient response is a factor, and is therefore limited to certain applications where the IRE response is used. Fig. 3 (a) shows the display of a keyed burst signal with a direct probe across a 75 ohm termination. Actually the display obtained will depend upon length, type, and condition of the cable used; one probe could show a decided roll-off of higher frequencies, while another could indicate roll-off at lows. Similarly, pulses would have varying rise-times and overshoots depending upon duration and repetition rates. Fig. 3(b) is the display obtained with a cathode-follower probe across the same termination. Use the direct probe only where IRE response is used and no probe loss can be tolerated as in checking for the presence of extremely low-level signals. It has no place at all in scope calibration.

For most applications, the ten-to-one capacity divider probe should be used. For a scope with 1 megohm input shunted by 40 uuf capacity, the simplest 10/1 probe consists of a series of 9 meg resistor shunted by a trimmer capacitor of 3-12 uuf. When connected to the scope, the input impedance from the probe tip becomes 10 megohms shunted by approximately 12 uuf. The trimmer capacitor is adjusted such that the R-C product is equal to the R-C product of the scope input so that the voltage division is independent of frequency. This is done by touching the probe to the scope calibration pulse output or a square wave generator set to about 1 kc, and adjusting the trimmer so that the leading edge is not rounded on the top (undercompensated) or does not overshoot (overcompensated). This adjustment should be checked often and must always be checked when placing on a different scope even though of the same make and model number. Frequency response and transient response of the scope itself should be checked with this probe so that all variables are calibrated.

An important point to remember when using the 10/1 probe is that the preamplifier will normally be used ahead of the main vertical amplifier in such scopes as the Tektronic 524AD. This is necessary since most performance tests are made

Transistor Inhibition Gate Circuit

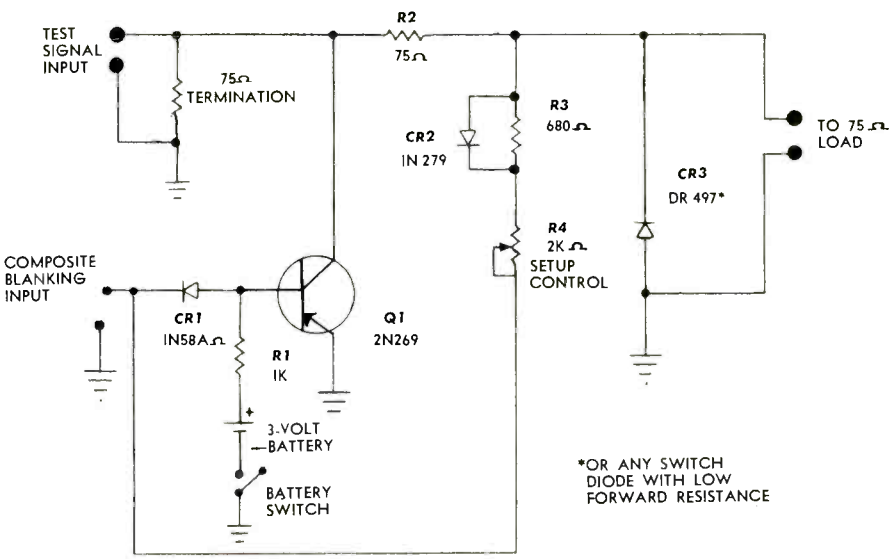

Fig. 10. Simple gating circuit to obtain keyed test signals.

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on standard 1-volt (peak-to-peak) signals across 75 ohms and the 10/1 voltage division requires the extra gain. It is therefore imperative that single frequency response runs and square wave response tests of the scope be made at 1-volt levels in 75-ohm terminations, so that the same scope attenuator settings occur as will be used on equipment checks.

The cathode-follower probe overcomes the foregoing limitation. A typical CF probe has an input impedance (connected to the scope) of 40 megohms with 4 uuf shunt capacity, with a gain slightly less than unity. Thus the preamplifier need not be used across normal 1-volt terminations. It does, however, have limitations of its own as follows:

A. Depending upon design and voltage used, a signal amplitude of about 5 volts undirectional (10 volts p-p) is maximum that can be handled without compression. Thus the probe is not normally used in servicing equipment where higher signal levels occur, unless an additional voltage divider probe is attached to the CF input.

B. Due to design limitations on input time-constant, low-frequency square wave response is poor (about 20 per cent tilt on 60-cycle square wave).

C. Since a dc voltage appears at the cathode output, the dc input of the scope cannot be used.

A logical step-by-step initial calibration of the scope can be outlined as follows:

1. *Video Sweep-Detected.* Terminate the video sweep generator directly at the generator output connector in 75 ohms. Use a video detector probe (Figs. 4(a) and 4(b)). The probe of (a) will read about 75 per cent of actual p-p output signal, while the higher isolation probe of (b) will read about 50 per cent of actual. Adjust the output amplitude for 1 volt, which will read approximately 0.75 v on the (a) detector or 0.5 v on (b), and adjust scope gain for a convenient scale, (Fig. 5). This enables a check of the flatness of the sweep generator itself, since the detected sweep envelope does not depend upon high frequency response of the scope. The Tektronix may be used on any response position; or a scope very limited in response can be used, provided it has

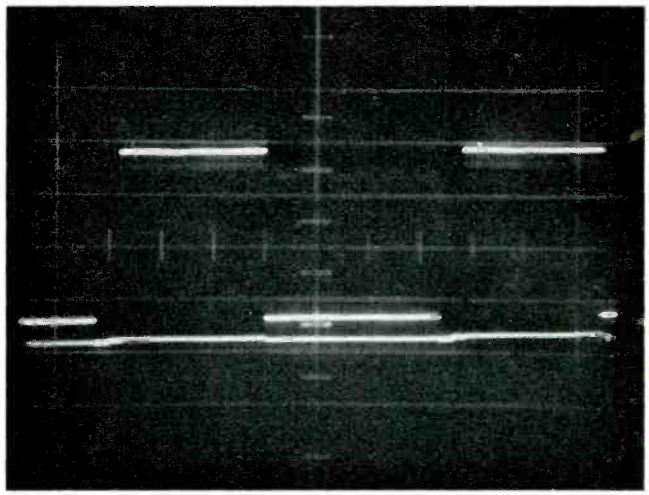
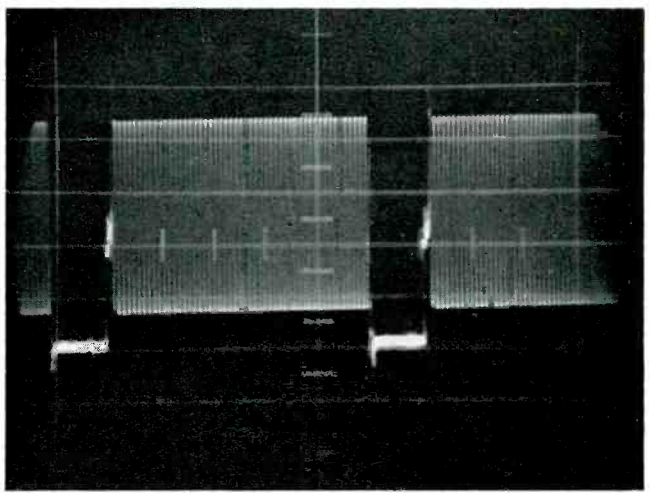
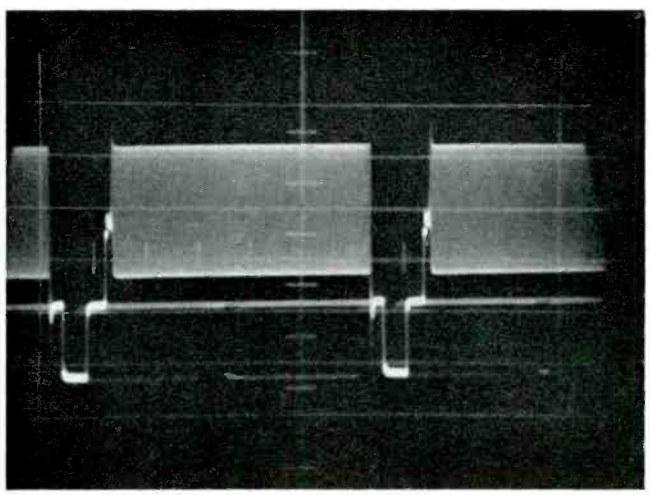


Fig. 11.
Output of Fig. 10 gating circuit for:

(a).
60-cycle square wave



(b).
Sine wave, 1 mc



(c).
After sync insertion

Simple Differentiating Network

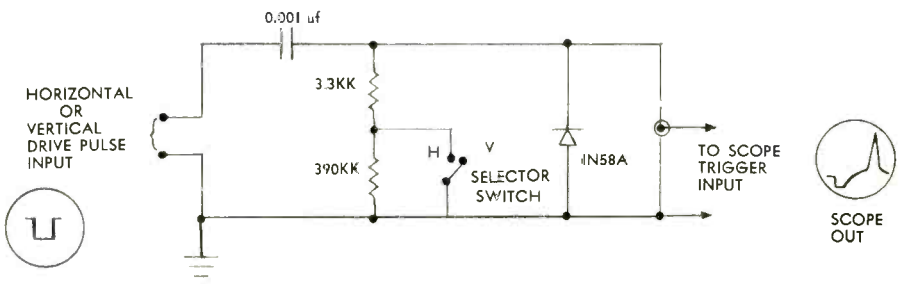


Fig. 12. Differentiating circuit to obtain positive synchronizing trigger from trailing edge of horizontal or vertical drive. The switch enables selection of proper time constant (H or V).

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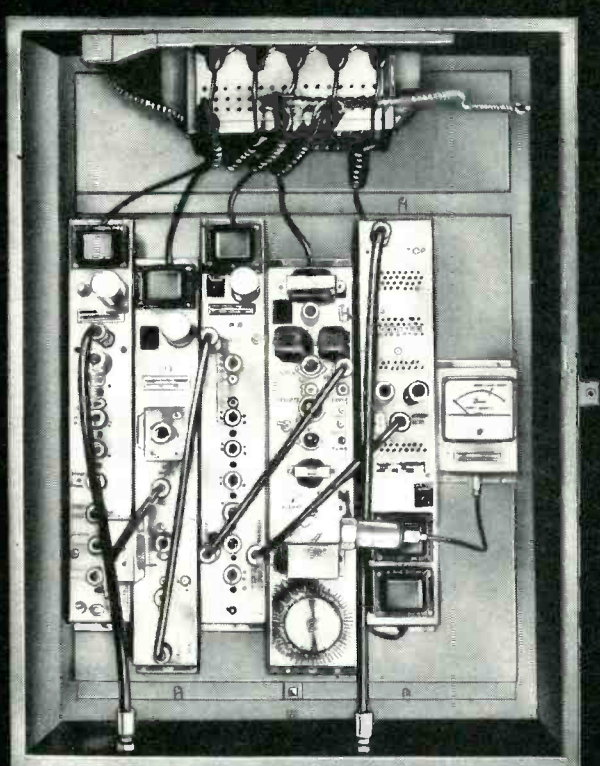

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High Band	6 db ±1 db
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Dimensions of Housing	35" x 28" x 10½"
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reasonably good low frequency square wave response. If the video sweep generator cannot be made perfectly flat as observed on the scope, the deviations must be plotted as a correction factor for equipment checks.

2. *Video Sweep—Wideband.* (This should only be observed after determining the flatness of the sweep generator as in Step 1.) Although used only in very special cases (and with extreme care), the RF envelope may be observed directly without detection. It does serve as a "quickie" check on scope amplifier response (Figs. 6(a) and 6(b)) but is valid only if the probe to be used for equipment checks is used on the scope, and the same amplitude signal is used so that the scope compensated attenuator is on the same position as will be used. It is good engineering practice to run these checks with all probes in stock, and through the scope preamp as well as to the vertical amplifier input. Use varying levels from the sweep generator to enable use of convenient scales on the scope with different attenuator settings. This will pinpoint any attenuator position that might be incorrectly compensated. An attempt to employ correction factors for different attenuator settings becomes both cumbersome and inaccurate in system measurements.

Normally there will be some correction factor when using the preamp as when feeding the vertical amplifier direct. Plot these responses either on a graph or by tabulation in peak-to-peak values. Normally when using video sweep the detector probe is used. The wideband display serves as quick check of scope response to single frequency sine waves or similar applications such as keyed sine wave bursts. (Fig. 3.)

3. The most accurate method of obtaining scope amplifier frequency response is to run single frequency sine wave checks over the range of 100 kc to 10 mc. The same generator and probes should be used for scope calibration as will be used for system checks. Commercial sine wave generators such as the Hewlitt-Packard 650-A incorporate a frequency-compensated metering circuit on the output to enable holding a constant input to the scope or equipment at all frequencies. If a generator of this type is not available, a VTVM with good response to 10 mc can be used across the terminated generator output. As in Step 2, it is good practice to check all probes and all attenuator settings apt to be used in system checks. When the calibration is posted on the scope, the particular generator, meter, and probe should be identified unless all such items have been found to be directly interchangeable. Such checks should normally be made about twice yearly, or at any time that considerable maintenance (tube or component changes, etc.) has been required on the scope or signal generators.

4. *Low Frequency and Transient Response.* Determine the rise time and per cent overshoot of the square wave as read on the scope, both through the preamp and main amplifier, at the frequencies normally used. This writer most often uses 60-cycle, 75 kc and 500 kc. Unless a fast rise time generator is available, higher frequency square waves (above 75 kc) are not particularly useful since for response checks at highs the rise time of the pulse must be faster than the rise time of the amplifiers to be checked. Keep in mind the discussion associated with Fig. 2. A 60-cycle square wave fed to the dc position of the Tektronix 524AD should have an absolutely flat top as shown by Fig. 7(a). Fig. 7(b) shows the normal amount of tilt introduced by the input coupling capacitor when on ac position. Remember that the last two (highest gain) positions of the above scope are ac only since the preamp is used on these positions. An adjustable grid time constant (Low-Frequency Compensation control) is used in the preamp which should be adjusted per manufacturers instructions. On any scope employing either external or plug-in preamps, always include these units for all scope calibration procedures.

It is possible for a wideband scope amplifier to exhibit a leading edge overshoot from a vacuum tube defect known as cathode interface. Low frequency phase shift results from series resistance and capacitive bypassing effects of a chemical interface layer forming between cathode sleeve and the oxide cathode coating. Since some tubes have been known to develop this characteristic in less than 500 hours of operation,

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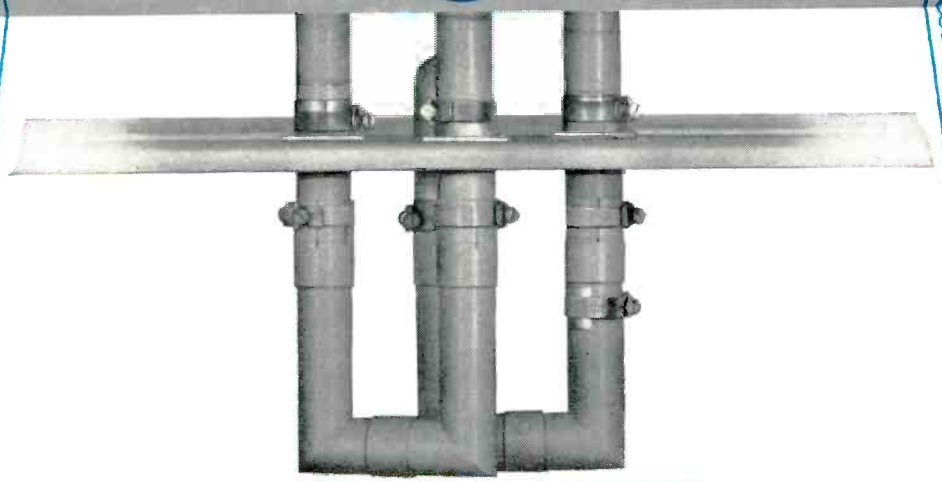

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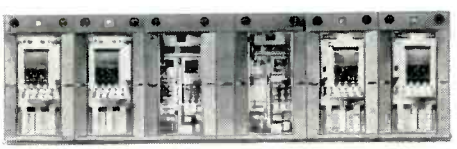

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the scope should be checked about every two months for this tube defect as follows:

A. Adjust the frequency of the square wave generator to 500 kc. The waveform should have a rise time of 0.2 u/s or less.

B. Adjust the time base so that several cycles of the square wave are displayed. If an overshoot appears with a duration of 0.2 to 0.6 u/s, (see Fig. 8) chances are good that one or more tubes in the vertical amplifier have cathode interface. (Overshoot duration or time-constant is the time required for the overshoot to decay to the final flat top value.) A 500-kc square wave has a complete cycle in 2 u/s, thus a pulse width of 1 u/s as shown by Fig. 8. The overshoot duration will normally be between 20 per cent and 60 per cent of the total pulse width when cathode interface is present. As a double check, plug the scope into a variac and increase the line voltage to the upper limit allowed. If cathode interface is present, the increased tube heater voltage will reduce overshoot, and a decrease of line voltage will increase overshoot.

When this occurs, it is best to replace all tubes (in the vertical amplifier) with new ones, then substitude the old tubes one at a time while observing the square wave.

Discard any tube that tends to show this effect. Leave the variac toward the lower limit of line voltage (108 to 110 v) to emphasize the effect of cathode interface.

The Sweep Time Base

Recognizing the importance of pulse frequencies and pulse durations in telecasting, it is rather startling to realize the number of stations that invest in expensive oscilloscopes with no thought whatsoever to a secondary frequency standard. Actually, in many applications the scope is worth only as much as its accuracy, and a suitable secondary frequency standard is an indispensable partner. The accuracy of the time base and the marker generators (where used) should be checked at least once a year, or whenever it appears necessary. For example, if two scopes are available (such as one each at studio and tmasmitter) they may be checked against one another for any discrepancy.

(Continued on page 34)

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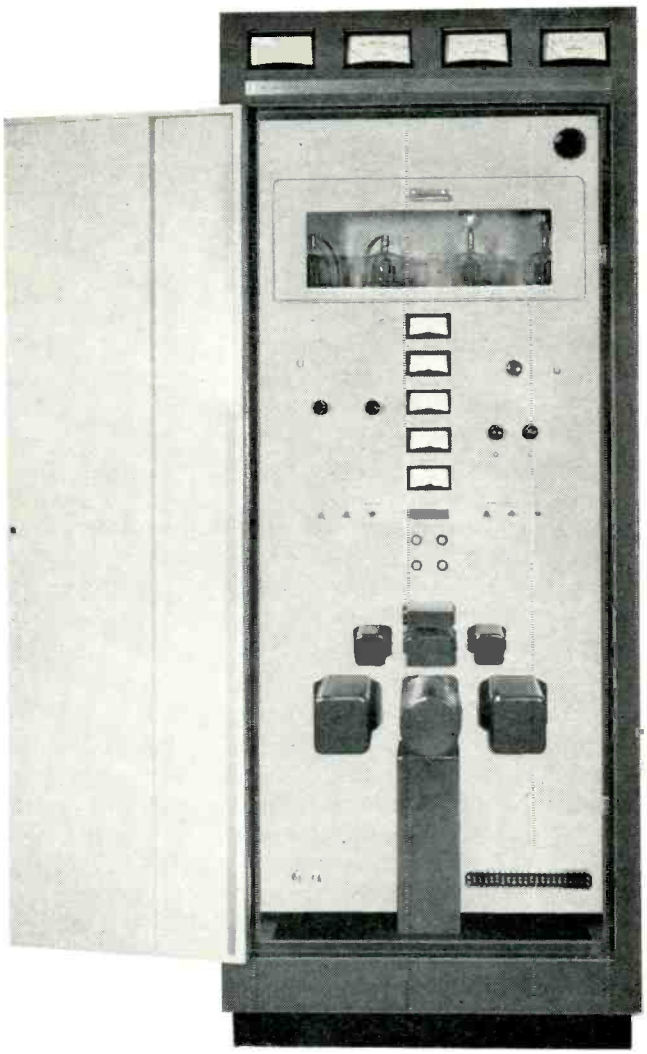

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DESIGN CONSIDERATIONS For Radio

Recent FCC ruling allows FM transmitters to multiplex remote meter readings. This article concerns bandwidth, filters, the proper use of spectrum, requirements of STL equipment associated with radio remote control systems

In part I of this article the author discussed the basic concepts involved in the operation of a remotely located FM broadcast transmitter over a Studio-Transmitter Link (STL). The general requirements for the control, the telemetering of transmitter meter readings, and the program conveyance were reviewed as well as some of the more subtle aspects of radio remote control operation. In the concluding part of the article, specific engineering details covering the equipment design will be considered.

Spectrum Considerations

As shown in the basic block diagram in Part I of this article, a radio remote control system involves engineering considerations for both the STL and main FM broadcast transmitters. The frequency spectrums of these transmitters are similar insofar as the program material is concerned. However, the STL transmitter must also convey all of the control tone frequencies, and the FM transmitter must transmit a separate subcarrier for returning the metering information. Figures 5a and 5b show the frequency spectrum of the two transmitters for a remote FM broadcast transmitter operating in accordance with Figure 1 (Part I). Because of the difference between the bandwidth of the STL and main FM transmitting channels, the respective modulation indexes will not be the same. However, it is important to observe that signals impressed upon the STL which are not to be rebroadcast must not cause interference with the signals transmitted by the main FM transmitter. Various schemes are available for the transmission of the main and sub program material to the remote transmitter. However, the system shown in Figure 5a is quite effective and does not require additional channelizing equipment. The control tones are sandwiched between the upper main channel audio frequency and the lower end of the multiplex spectrum. The metering subcarrier is best located in the low end of the multiplex-spectrum, as shown in Figure 5b. From a bandwidth consideration, the metering subcarrier need occupy only a small portion of the spectrum as the rate of information being telemetered is essentially static in nature.

Control Techniques

An inexpensive and reliable means of controlling the remote transmitter is accomplished by using a sequence of simplex control tones. As shown in Figure 5a, the 5 kcs band

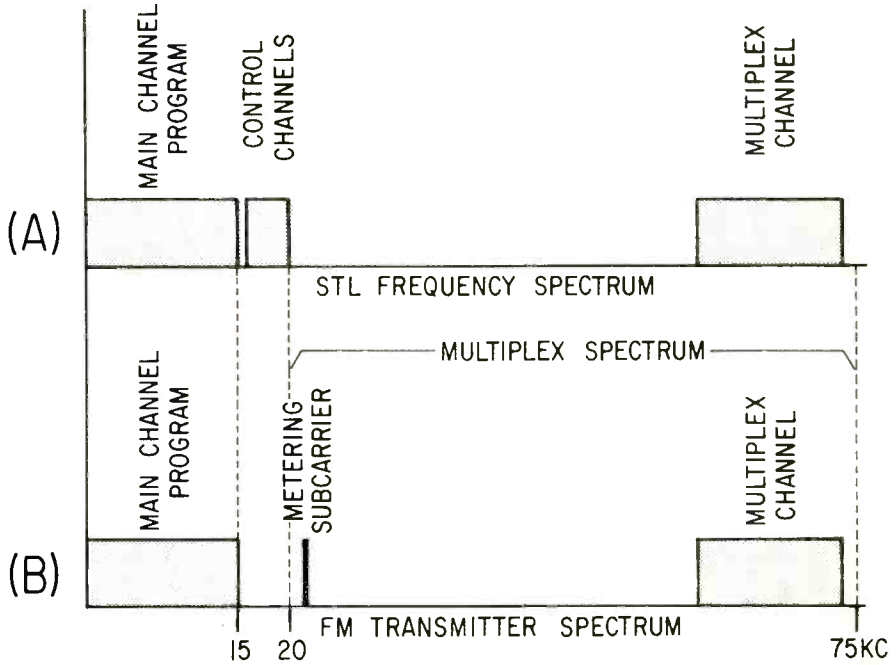


Figure 5. Frequency spectrum for the (a) STL and (b) main FM transmitter in a typical radio remote control system.

EDITOR'S NOTE:

This is the second and last of two articles. Remote control by use on radio is designed for FM transmitter sites where location is undesirable for telephone lines. Part I of this article was published in the March, 1961, issue of Broadcast Engineering.

Remote Control Operation

PART II

By JOHN A. MOSELEY

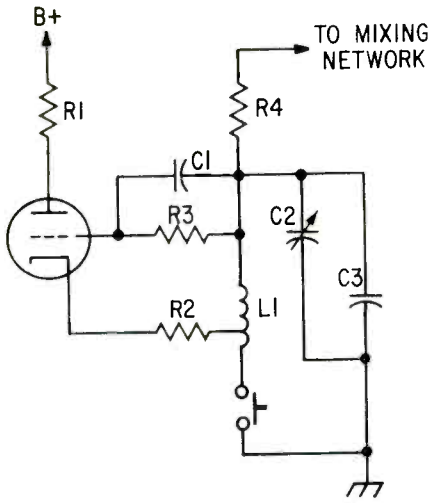


Figure 6. Schematic diagram for a control tone oscillator.

between 15 kcs and 20 kcs is a convenient spectrum in which to place the tones. With the use of stabilized toroidal inductors and capacitors, oscillators can be made to exhibit ± 0.2 per cent frequency stability under broadcast operations. The use of crystal controlled sources adds cost as well as imposing rigid stability requirements on the detecting circuits at the remote transmitter site if the full advantage of crystal control is to be realized. Figure 6 shows a typical oscillator circuit. A small portion of the tuning capacity is made variable to allow for normal manufacturing tolerances in the tuned circuit elements. Experience has indicated that in a properly designed system the circuit shown will not normally require adjustment after the initial installation. The Studio Unit shown in the photograph (Figure 2, Part I) employs four oscillators equally spaced in the 17 kcs to 20 kcs range. Three oscillators provide for 10 channels of raise-lower (on-off) control while the fourth oscillator is an independent channel for switching any function deemed necessary by the broadcaster. It can, for example, be associated with Conelrad alerting system and can automatically remove the remote FM broadcast transmitter from the air without relying on the operator's presence. The main feature of this channel is that it can be operated at any time regardless of the position of the stepper switch.

By the use of a larger multiple point stepper switch, additional control channels may be included. However, as mentioned in Part I, an excessive number of control channels can lead to operator confusion. In wire systems it is possible to include a feed-back loop which will provide automatic synchronization between the stepper switch at the remote transmitter and the stepper switch at the studio. To accomplish this with a radio remote control system would necessitate returning a pilot subcarrier back to the controlling point which would consume a certain modulation percentage of the main FM transmitter. The bandwidth of the control channel and the reliability of stepper switches are such that this return loop becomes unecessary.

A control tone can be detected and made to operate a relay with a circuit such as shown in Figure 7. Two high-Q synchronously tuned circuits are employed to obtain overall operating Q's in excess of 100. Too much selectivity will reduce the allowable frequency drift of both the control oscillator and selective filter circuits. After filtering, the envelope is detected and furnishes a positive voltage to off-set the negative bias on the relay tube. A test point is included to provide an indication for tuning the control tone oscillators to the proper frequency. As may be seen later, it is possible to apply this test point voltage to the metering subcarrier input for relay to the controlling studio by the main FM transmitter. Under these conditions the studio operator can watch the tuning results directly and not rely on the voice communications circuit for tuning directions.

Metering Methods

The over-all performance of a radio remote controlled transmitter is keyed to the linearity and stability of the method of telemetering the transmitter meter readings to the controlling studio. The system employed in the equipment shown in the photographs in Part I of this article utilizes a voltage controlled subcarrier oscillator to provide FM/FM telemetering. A circuit similar to the phase shift oscillator recently described[1] can be made to exhibit linearities in the order of 0.1 per cent and short time stabilities of ±0.005 per cent. Under operating conditions the frequency of the metering subcarrier is determined by the value of voltage impressed at the input terminals. Excellent performance can be obtained with as little as 2 per cent shift in the subcarrier frequency. For example, a metering subcarrier at 21 kcs need only be shifted a total of 400 cps. Since the frequency of the information being telemetered is extremely low in frequency, the bandwidth of the metering subcarrier is limited to the range corresponding to the maximum frequency shift.

The amount of injection of the metering subcarrier on the main FM transmitter is usually set between 5 and 8 per cent. This will leave from 25 to 22 per cent of multiplex modulation capability for other mul-

tiplex activity and still comply with FCC Regulation 3.319c which presently allows a total of 30 per cent. Because of the absence of audio modulation in the metering system, sub to sub and sub to main crosstalk caused by the metering subcarrier is nil.

The use of audio frequencies on the metering subcarrier adds circuit complexity, but does alleviate to some extent the frequency stability requirement of the subcarrier source. The stability and linearity tolerances, of course, on the audio frequency generator for the metering information will remain the same. When it is necessary to use 65 kcs to 67 kcs for the metering subcarrier, the use of audio frequency modulation is to be preferred over the frequency shift method. This metering method will seldom be used, however, as the bandwidth capability of the higher subcarrier frequencies is more profitably employed with revenue producing programming.

The type of detection circuit used for the metering subcarrier depends upon the type of modulation employed. In the case of frequency shift metering, two types of circuits are most prominently available. These are the untuned types, or pulse counters, and the tuned circuits, such as the Foster-Seely phase discriminator. The pulse counter type exhibits excellent linearity but does not produce a large output voltage with a narrow subcarrier deviation. This then requires a dc amplifier which is not subject to drift. The tuned circuit type does produce a large output signal which can directly operate a sensitive meter movement. By using a power discriminator tube, such as 6AQ5 or 6CL6, and with heavy resistive damping, a satisfactory linearity over a frequency band of at least three times the swing of the subcarrier can be obtained. A small variable capacitor can serve to tune the discriminator and will compensate for system drift.

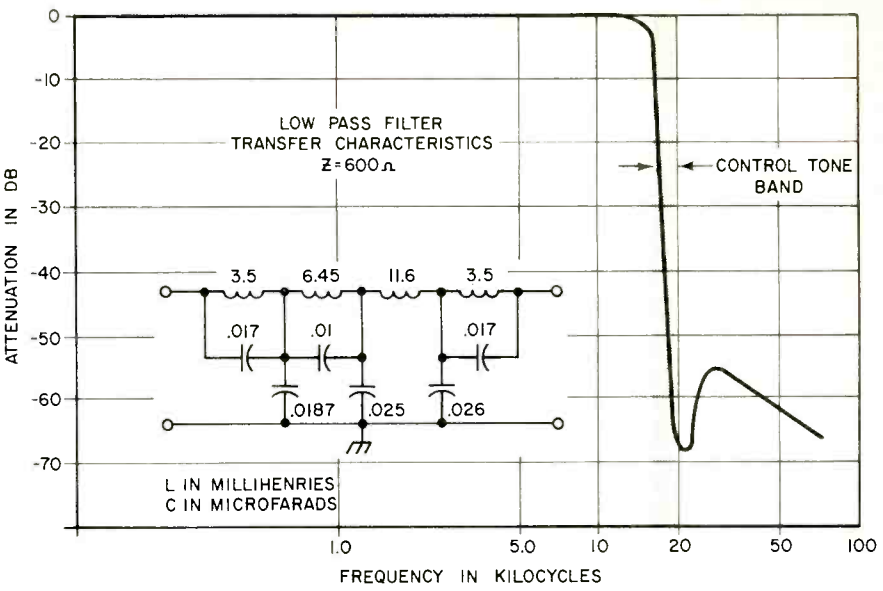


Figure 8. Response of a typical filter used to remove main channel harmonics from control channel spectrum.

When audio frequencies are used to telemeter the remote transmitter, essentially the same alternatives can be selected for recovering the metering information.

Calibration

Any metering system must be capable of being calibrated prior to taking meter readings. Whether a frequency shifted subcarrier or a tone modulated subcarrier is employed, the same procedure applies. In the calibrate position of the control system, a reference voltage, preferably derived from a stable mercury battery source, is placed on the input of the voltage controlled subcarrier generator or tone oscillator. Removing this voltage and grounding the input terminals with a relay operated by either the raise or lower control channel will enable the operator to make an over-all gain and centering adjustment. Once this has been done, voltages proportional to transmitter functions can be applied through contacts on the stepper switch to the metering subchannel. These voltages can be adjusted at the transmitter to give the proper reading on the studio meters. Here the need for adequate communication between the two locations is apparent. This system of calibration will not allow the operator at the studio to make individual metering adjustments, rather only the basic over-all centering and gain settings.

With the type of telemetering employed, it is possible to feed the output of the test point (see Figure 7) on the control tone detecting circuit into the voltage controlled metering subcarrier so the operator at the studio location can accurately set the trimmer capacitor on the respective control tone oscillator.

Filtering Requirements

Certain musical selections, more noticeably those featuring muted brass instruments, are rich in harmonics. With the standard pre-emphasis network employed in frequency modulation, these harmonics can contain enough energy in the control tone spectrum to cause spurious operation of the relays in the transmitter control unit. A low

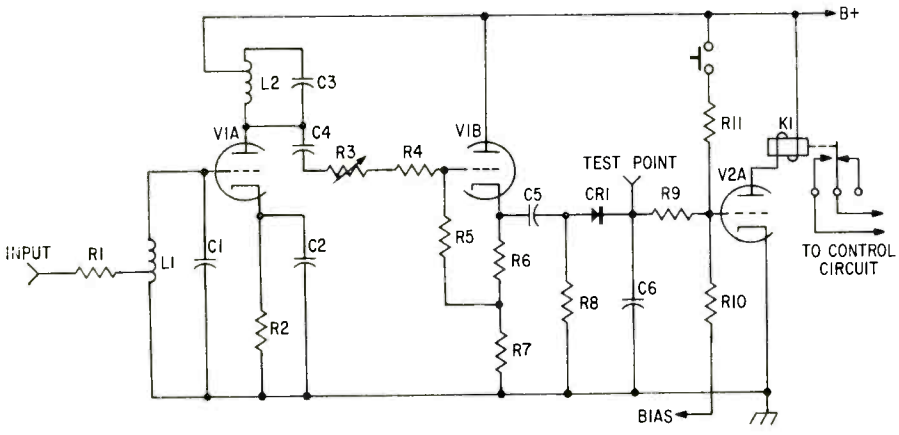
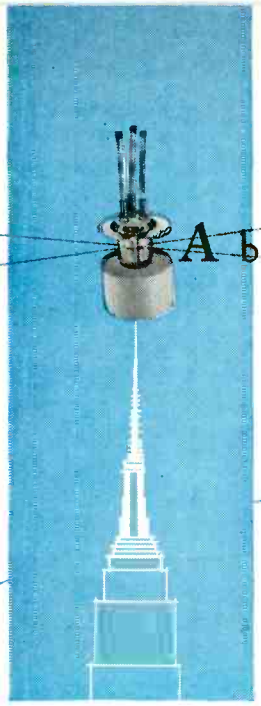


Figure 7. Control tone filter, detector, and relay tube circuitry.



A brand new tube for TV transmitters

Amperex® 7900

4 KW RF Power Triode

...specifically designed to solve your short-life problems in TV transmitter applications

This new forced-air-cooled triode was developed to replace conventional 2½ to 3 KW RF power types, to provide optimum reliability and long life in the VHF TV bands. This degree of reliability has been achieved by virtue of the 7900's platinum grid—resulting in lower drive power requirements—by means of its 4 KW plate dissipation—and through its brazed and silver-plated radiator design and external glass structure, providing minimum air back-pressure and cooler operation. The 7900 is, moreover, accurately dimensioned for use in many existing cavities. For 'built-in' long life in new equipment, and for replacement purposes, we recommend your consideration of the 7900. As always, application engineering assistance is available.

RF Power Amplifier, Class B TV Service

Typical Operation at 220 Mc in an Approved Cavity

DC Plate Voltage	4500 volts
Negative DC Grid Voltage	130 volts
Peak RF Grid Voltage (sync)	450 volts
DC Plate Current (sync)	1.75 amps
DC Grid Current (sync)	approx. 0.35 amp
Power Output (sync)	approx. 5.6 KW

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pass electric wave filter inserted between the output of the studio control console and the mixing network for the control tones will prevent accidental relay operation. Figure 8 shows the transfer characteristic of a typical low pass filter designed to pass the full audio range and to attenuate spurious signals in the control tone band. The small insert gives the component values for a 600-ohm unbalanced filter. For maximum attenuation it is recommended that toroidal inductors be employed in the construction of the filter and that electrostatic shielding be used between the elements to minimize extraneous coupling between the input and output terminals.

Similar filtering requirements are present in the Transmitter Control Unit to prevent the main channel audio from overloading the selective tone filters. And further, filtering may be needed in the Studio Control Unit to eliminate the program from producing low level cross-modulation products in the meter detecting circuits. The employment of effective filters in radio remote control equipment will enable the control tones and metering subcarriers to modulate, respectively, the STL and FM transmitters at a lower level than would be possible without the use of good filters.

STL Considerations

The design of the STL follows the same requirements for any well engineered FM transmitter. The power level required is usually between 4 and 10 watts. Antenna gains can be utilized to make up for deficiencies in RF power. Generally 4- to 6-foot parabolic antennas exhibiting gains from 18 to 23 db are employed. Solid dielectric transmission line, such as RG-17/u and RG-8/u, can be used if loss can be tolerated. Otherwise, air dielectric lines are used with an increase in initial cost.

The principal requirement of the STL, however, is the absolute necessity for excellent modulation characteristics. The main advantage of using an STL is the elimination of multiple program and control wire lines. Combining these signals onto one STL places rigid specifications on the response and distortion of the modulator, and special care must be taken in view of multiplexing. If excessive control requirements are imposed along with several multiplex channels, the broadcaster should consider carefully the use of two STL circuits. This is especially true of AM-FM operations where multiplex operation is planned for the FM transmitter.

Conclusion

The various interrelations between the program, control, and metering operations of a radio remote control system are summarized by the block diagram shown in Figure 9. The complete requirements for a radio remote controlled FM broadcast transmitter are co-ordinated by integrating Figure 9 with the over-all system diagram of Figure 1 (Part I).

Radio remote control of an isolated transmitter has been proved to be a practical, economical means by which the FM broadcaster can enlarge his listening audience and increase advertising income. Once this method of operation is understood from a systems and logistics viewpoint, radio remote control presents the broadcaster with a challenge to exploit fully the advantages of a mountain top location.

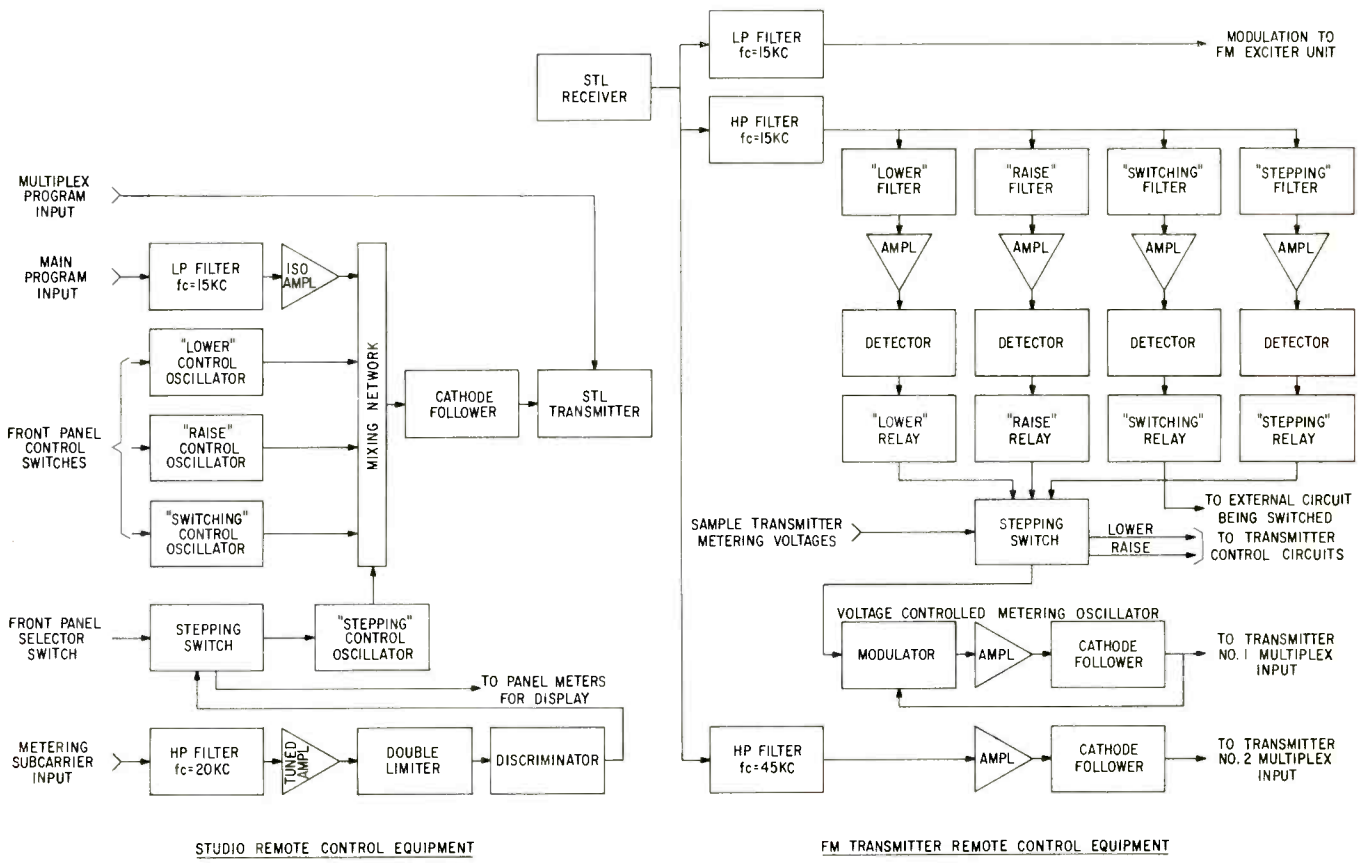

Figure 9. Flow diagram of control and metering signals.

Stay on the air with CBS Instrument Tubes especially designed for broadcast replacement

These CBS Instrument Tubes are the first specifically designed for utmost reliability as replacements of commonly used broadcast receiving tubes. The "new-concept" tubes incorporate many of the advanced features of military types, without costly ruggedization controls not required for broadcast use. In addition, they offer important new controls for tight, stable characteristics and long life.

Note the features of CBS Instrument Tubes. Check the types you need... order them from your local distributor.

Unique Features

- 10,000-hour warranty
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CBS 7728	replaces	12AT7
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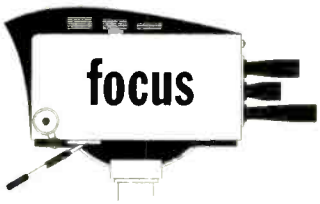
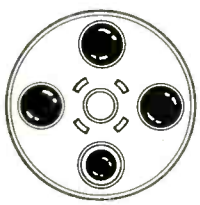


THE NAB '61 CONVENTION

A preview, in four parts, of the 39th annual meeting of the National Association of Broadcasters, Washington, D.C., May 7-10



Part 1—An editorial forecast of equipment and trends.

Automation is likely to show as a major trend in the Exhibit Hall at Washington's Shoreham Hotel this May, during the 39th Annual Convention of the National Association of Broadcasters.

With the growing number of present and future AM broadcast properties nearing 4,000, FM stations close to 1,000, and television outlets up to 600, these electronic advertising media are approaching a profit squeeze. Therefore, complete automation of broadcasting offers a principal opportunity for cost reduction.

Both engineers and managers will view more program automation equipment on display this year at the convention. AM and FM radio broadcasting field will be the target of many manufacturers, new and old. You will see variations, in some cases, of gear designed last year. But, all in all, you will feel the impact of new trends and developments. You will find a new variety of choice, design, and specifications. Transistors, miniaturized units, higher reliability, less operation costs will be the key words this year. You will see new names, and companies with enlarged product areas. Automated program service firms will occupy greater total exhibit space than last year. Service and sales representatives will be more aware of stiffer competition, hence increasing the need for showmanship in selling.

Television production will also show a growing development in automatic switching, time counters and program memory units. As in other fields, TV gear will show transistorized components in greater proportion. Printed circuit plug-in modules are promised. Automatic TV program and billing logging units will attract the eye of management.

Automatic transmitter logging and control will again be exhibited in hope of some favorable Government decision.

Manufacturers of transmitters will promote higher power FM, less space requirements, fewer tubes, solid state high voltage rectification, remote control facilities, and lower initial costs.

Also, for the first time, directional FM broadcast antennas will be presented.

New developments in FM multiplexing will prove that the field is out of the experimental stage and down to the business of profit making. Greater stress in multiplexing will be in improved instrumentation, in new transistorized receivers, and in less overall maintenance. You can expect to see expanded uses of this relatively new art.

The recent releases by both majors of a new, reduced price magnetic tape television recorder, for closed circuit, education, military and the non-broadcast industry will create conversation and fire imagination at the 39th Annual Convention.

LOOKING AT THE LOG

Governor Leroy M. Collins, President, National Assn. of Broadcasters.

Merrill Lindsay, Co-Chairman, 1961 NAB Convention Committee, Executive Vice-President, WSOY (AM-FM), Decatur, Ill.

Dwight W. Martin, Co-Chairman, 1961 NAB Convention Committee Chairman, Board of Directors, Modern Broadcasting Corp., Baton Rouge, La.

Part 2—Facts and figures of NAB conventions, past and present.

QUESTIONS AND ANSWERS ON NAB CONVENTIONS

WHEN DID THE CONVENTIONS BEGIN?

The first NAB Convention was held in New York City in 1923.

HAVE THEY CONTINUED YEAR AFTER YEAR?

With the exception of the 23rd NAB Convention in 1945, they have continued yearly. Although the 1945 Convention was not held, it was counted numerically.

IS THERE A RECORD OF ATTENDANCE THROUGH THE YEARS?

There has been no record kept of attendance figures until quite recently. In 1960, there was a total attendance of 2,960 registrants.

WHAT WAS THE BREAKDOWN OF ENGINEER AND MANAGEMENT/ OWNERSHIP IN 1960?

Registration of engineering personnel totaled 594. Registration of management personnel totaled 1,991 last year.

IS THERE A RECORD OF EXHIBITORS IN THE PAST?

There is no extended record of exhibits. This year there will be more than 50 exhibitors and is claimed as the largest in history.

HOW ARE THE LOCATIONS OF THE CONVENTIONS CHOSEN?

Location is named by a vote of the Board of Directors.

WHEN WAS THE NAB CONVENTION LAST IN WASHINGTON, D. C.?

In the spring of 1955.

WHERE WILL THE 1962 CONVENTION BE?

The 1962 NAB Convention will be held in Chicago.

WHO IS ON THE PRESENT CONVENTION COMMITTEE?

Merrill Lindsay, WSOY, Decatur, Ill.; Dwight W. Martin, WAFB-TV, Baton Rouge, La.; Campbell Arnoux, WTAR-TV, Norfolk, Va.; Thomas C. Bostic, KIMA-TV, Yakima, Wash.; Henry B. Clay, KTHV, Little Rock, Ark.; Robert T. Mason, WMRN, Marion, Ohio; C. Wrede Petersmeyer, Corinthian Broadcasting Co., New York, N. Y.; Odin S. Ramsland, KDAL, Duluth, Minn.; W. D. "Dub" Rogers, KDUB-TV, Lubbock, Texas; and Jack S. Younts, WEEB, Southern Pines, N. C.

WHO IS THE PRESENT CONVENTION COMMITTEE CHAIRMAN?

There are two co-chairmen: Mr. Lindsay and Mr. Martin.

THE CONDENSED AGENDA FOR THE CONVENTION

For Management and Ownership:

SATURDAY: Registration and non-scheduled events.

SUNDAY: Registration, exhibits open, FM Day and non-agenda events.

MONDAY MORNING: Opening General Assembly. Presentation of NAB Distinguished Service Award to Judge Justin Miller, former president of the National Association of Broadcasters.

12:30 P.M. LUNCHEON: Address: LeRoy Collins, President of NAB.

AFTERNOON: General Assembly.

TUESDAY MORNING: Radio Assembly, Television Assembly.

12:30 P.M. LUNCHEON

TUESDAY AFTERNOON: Open — This period not programmed to permit delegates to visit exhibits, hospitality suites, etc.

EVENING: Reception for government officials.

WEDNESDAY MORNING: Labor Clinic, General Assembly.

12:45 P.M. LUNCHEON

AFTERNOON: Radio Assembly, Television Assembly.

EVENING: Annual Convention Banquet.

The Sheraton Hall Ballroom, the largest in Washington, seats 2,000 for dinners and 3,000 for meetings. It is the center of all of Washington's prominent affairs. The convention-goer will remember the annual banquet to be held in this spacious hall on Wednesday evening, May 10th.

NAB SUBCOMMITTEE IS NAMED TO SPARK CONVENTION'S FM DAY

The FM Radio Committee of the National Association of Broadcasters announced the naming of a special subcommittee to carry forward program plans for FM Day which will be observed at the NAB annual.

Members of the subcommittee are Everett L. Dillard, WASH, Washington, D. C., and Fred Rabell, KITT, San Diego, Calif. Mr. Dillard is chairman of the NAB FM Radio Committee and Mr. Rabell is a member of the committee and also president of the National Association of FM Broadcasters, the sales promotion arm of the FM broadcasting industry.

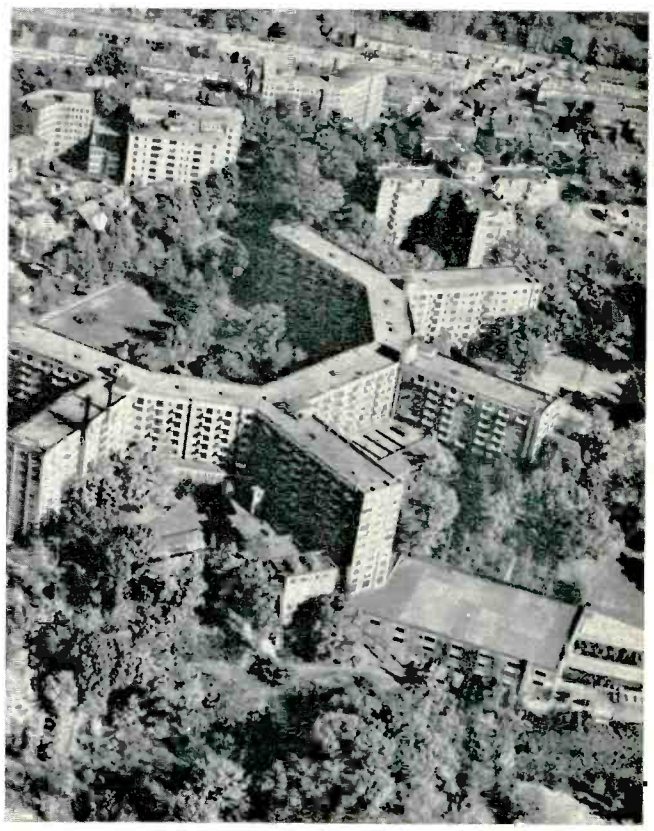
Mr. Dillard said FM Day, which was successfully launched at the NAB Convention last year, is expected to reach a new height in importance and meaning to the industry at the Washington meeting.

"We plan to have an outstanding program all day Sunday, May 7. NAB will be responsible for the afternoon session and NAFMB will present the morning session. The two associations will honor each other's credentials in admitting registrants to the sessions.

"FM radio is on the threshold of a new era of solidity and stature. We hope FM Day this year will provide the impetus to FM broadcasters to cross that threshold," Mr. Dillard added.

Other members of the FM Radio Committee, in addition to Mr. Dillard and Mr. Rabell, are: N. L. Bentson, WLOL-FM, Minneapolis, Minn.; Raymond S. Green, WFLN-FM, Philadelphia, Pa.; Michael R. Hanna, WHCU-FM, Ithaca, N. Y.; Merrill Lindsay, WSOY-FM, Decatur, Ill.; Richard H. Mason, WPTF-FM, Raleigh, N. C., and Harold Tanner, WLDM-FM, Detroit, Mich.

The Shoreham Hotel, in the nation's capital. NAB convention headquarters and equipment exhibitors will be located here.



Aerial view of the Sheraton-Park Hotel, also convention headquarters, located one block from the Shoreham Hotel. The Mutual Broadcasting System is housed in this building.

LOOKING AT THE EQUIPMENT AND SERVICES

Part 3—A listing of this year's exhibits.

Everett E. Revercomb, secretary-treasurer of the National Association of Broadcasters, said the broadcast equipment exhibit at NAB's 39th Annual Convention in Washington May 7-10 will be the largest in history.

Mr. Revercomb said 50 manufacturers and suppliers, all associate members of NAB, have contracted for exhibit space in the Exhibit Hall and Main Ballroom of the Shoreham Hotel.

The firms listed by Mr. Revercomb follow:

Adler Electronics, Inc., New Rochelle, N. Y.; Alford Manufacturing Co., Boston, Mass.; Alto Fonic Tape Service, Inc., Palo Alto, Calif.; Ampex Professional Products Co., Redwood City, Calif.; Bauer Electronics Corp., San Carlos, Calif.

Capitol Records, Inc., Hollywood, Calif.; Cellomatic Equipment Corp., New York, N. Y.; Collins Radio Co., Cedar Rapids, Ia.; Conrac, Inc., Glendora, Calif.; Continental Electronics Manufacturing Co., Dallas, Tex.; Continental Manufacturing, Inc., Omaha, Neb.

Ecco-Fonic, Inc., Hollywood, Calif.; Electronic Applications, Inc., Stanford, Conn.; Fairchild Camera & Instrument Corp.; Yonkers, N. Y.; Fisher Radio Corp., Long Island City, N. Y.; Foto-Video Electronics, Inc., Cedar Grove, N. J.;

Gates Radio Co., Quincy, Ill.; General Electric Co., Syracuse, N. Y.; General Electronics Laboratories, Inc., Cambridge, Mass.; Gotham Audio Corp., New York, N. Y.; GPL Division, General Precision, Inc., Pleasantville, N. Y.; Graham Sales Co., North Hollywood, Calif.

Hughey & Phillips, Inc., Burbank, Calif.; Industrial Transmitters and Antennas, Inc., Lansdowne, Pa.; Kahn Research Laboratories, Inc., Freeport, Long Island, N. Y.; Kliegl Bros., Universal Electric Stage Lighting Co., Inc., New York, N. Y.

MacKenzie Electronics, Inc., Hollywood, Calif.; Metropolitan Electric Manufacturing Co., Long Island City, N. Y.; Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.; Minnesota Mining & Manufacturing Co., St. Paul, Minn.; Miratel, Inc., New Brighton, Minn.; Mosely Associates, Santa Barbara, Calif.

Profit Programming, Inc., Bellingham, Wash.; Programatic Broadcasting Service, New York, N. Y.; Radio Corporation of America, Camden, N. J.; Raytheon Co., Waltham, Mass.; Schafer Custom Engineering, Burbank, Calif., Sony Corporation of America, New York, N. Y.; Standard Electronics Division, Farmingdale, N. J.; Sarkes Tarzian, Inc., Bloomington, Ind.

Tektronix Inc., Beaverton, Ore.; Telechrome Manufacturing Corp., Amityville, N. Y.; Telecontrol Corp., Gardena, Calif.; TelePrompTer Corp., New York, N. Y.; Telescript-CSP, Inc., New York, N. Y.; Television Specialty Co., Garden City, Long Island, N. Y.; Tower Construction Co., Sioux City, Iowa.

Utility Tower Co., Oklahoma City, Okla.; Visual Electronics Corp., New York, N. Y.; and Vitro Electronics, Silver Spring, Md.

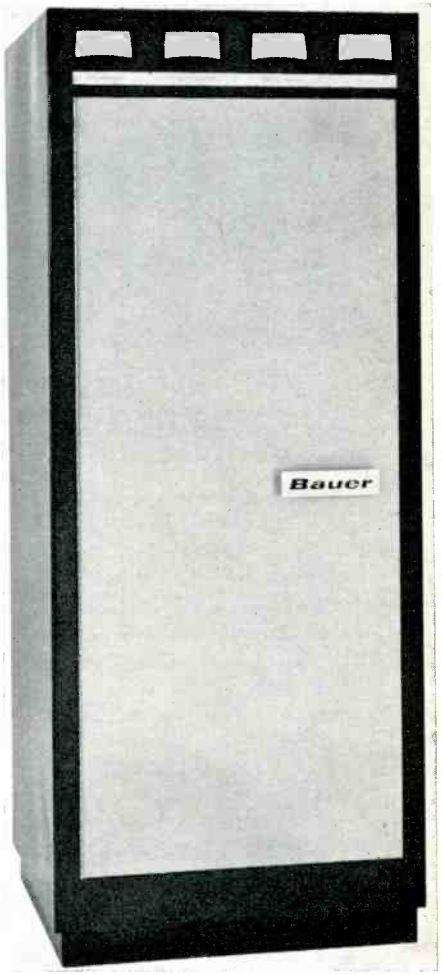
HERE ARE A FEW OF THE PRODUCTS THAT WILL BE ON DISPLAY AT THE 1961 NAB CONVENTION

CONTINENTAL MANUFACTURING INC., 1612 California Street, Omaha, Nebraska

New McMartin "C" series, manufactured on a smaller chassis, 5⅞" high, 14" wide, 9½" deep with cover.

Continental Manufacturing Inc. will have on display the McMartin FM Multiplex Receivers and the FM Main Carrier, Subcarrier Monitor and Relay Receivers. The McMartin Multiplex Receiver, utilizing the heterodyning principle, features adjustable frequency subcarrier selection and also selective muting. The receivers are supplied on a tuner, 5-watt amplifier, or 15-watt amplifier basis.

BAUER ELECTRONICS CORP. 1663 Industrial Road, San Carlos, California

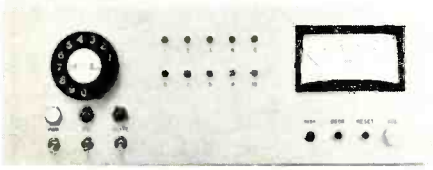


The BAUER 1kw AM Transmitter, available in kit form or factory wired.

The Bauer Model 707 1000/250 watt AM transmitter will be shown in the Bauer booth. It is offered in either kit form, or factory assembled. A completed transmitter will be shown as well as the step by step kit assembly process.

The SEL Model TC-22 remote control system will be exhibited in the Bauer Electronics booth as exclusive distributors. New, the Model TC-22 remote control system incorporates 22 functions designed for remote control of any AM,

FM or TV transmitter and associated directional arrays. This model incorporates circuitry enabling the use of up to 50 per cent fewer components. The TC-22 offers broadcasters a simple, reliable and economically priced remote control system.



NEW STROM ELECTRONIC LABORATORIES REMOTE CONTROL UNIT, model TC-22, to be seen in the BAUER Booth.

Dimensions: Studio Unit—19″ x 7″ x 8½″. Transmitter Unit—19″x7″x11½″.

Phone Line Requirements—2 pairs dc control lines with 5000 ohms per line maximum resistance.

The Sierra Electronic Enterprises production of the SPOT-O-MATIC Cartridge Tape unit as seen in BAUER Booth.

A new cartridge tape record and playback unit will be shown in the Bauer booth at the 1961 NAB convention. Developed under actual broadcast conditions, the "Spot-O-Matic" offers a reliable and economical approach to the handling of the increasing number of production aids. Tape speed: 7.5 ips. Frequency response—30 to 12,000 cps ±2 db. Height and width: 7″ high on standard 19″ rack. Output: 600 ohms at —10 dbm.

GATES RADIO COMPANY
Quincy, Illinois

A complete cartridge tape production center in one compact, portable unit will be introduced at the NAB convention by the Gates Radio Company, a subsidiary of Harris-Intertype Corporation.

Called the M-6086 Cartritape Make-Up Console, the complete unit includes a Cartritape cartridge tape system and recording amplifier, a CB-77 12-inch turntable with equalized preamplifier, a microphone preamplifier, and a UniQue cueing amplifier. By plugging in the console you have available for cartridge tape production a turntable, microphone (or combination of both), a telephone line input for recording net, and an input for external tape recorder or turntable.

The Gates Cartritape Make-Up Console can also be used in control rooms as direct programming equipment, providing an extra turntable or Cartritape System. The UniQue cueing amplifier with self-contained loud speaker and silicon rectifier power supply provides three extra cueing channels for external use.

Gates will also display new transistorized plug-in system components. This special display will include new preamplifiers, program amplifiers, monitor amplifiers and power supply—all transistorized. Compact size, low noise, reliability and heat reduction are the primary features of the new Gates transistorized line.

Other equipment to be exhibited by Gates includes 1 kw and 5 kw AM transmitters, FM transmitters, 5 kw television transmitter for both color and black and white, and special directional phasing equipment.

The complete Gates line of speech input systems will also be on display, along with 12 and 16-inch turntables, remote amplifiers, remote control systems, SA-39B Limiting Amplifier, Level Devil program gated amplifier, M-4990 Frequency Monitor, and the new M-5693 Modulation Monitor.

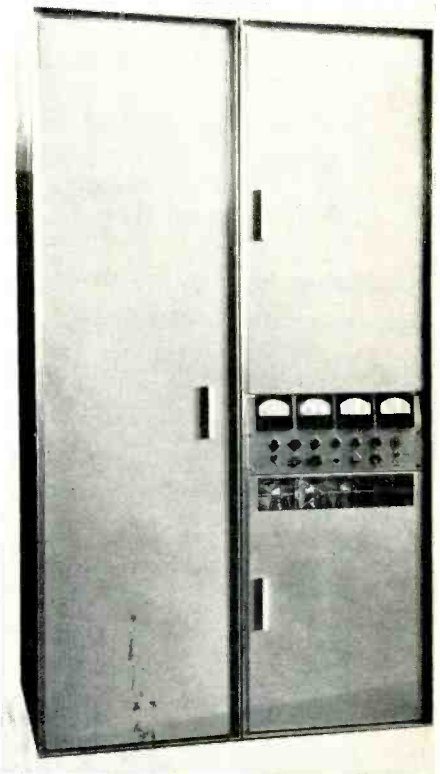
Special displays will be built around the Gates ST-101 Spot Tape Recorder and the Gates Cartritape cartridge tape system. The Spot Tape Recorder uses an indexing system on its control panel for proper selection of announcements. The tape itself is a vertical-playing belt 13″ wide. The recordings can be either musical or voice—each up to a minute and a half in length. Photoelectric cells automatically control rewinding the tape after each playback, and cue it to the proper position to start the next announcement.

New complete cartridge tape production center manufactured by the Gates Radio Company, Quincy, Ill.

New all transistorized plug-in audio system components manufactured by the Gates Radio Company, Quincy, Ill.

The Cartritape cartridge tape system accommodates tape cartridges from 40 seconds to 45 minutes. Several Cartritape units may be cross-connected to give completely automatic programming segments, to accommodate broadcasters who wish interspersed automatic and live or manual programming from the same equipment.

GENERAL ELECTRONIC LABORATORIES, INC.
18 Ames Street, Cambridge 42, Mass.



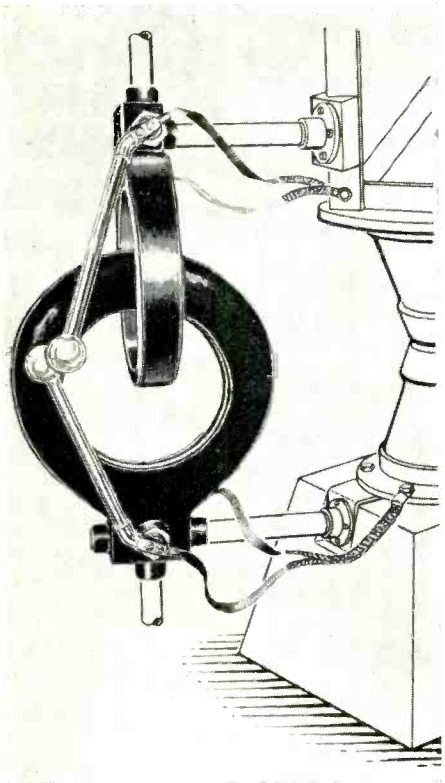
One KW FM Transmitter to be exhibited by General Electronic Laboratories, Inc.

This year will be the first public exhibit of the Model FMT-1B, one KW FM transmitter, manufactured by General Electronic Laboratories, Inc. GEL makes available a complete FM line of 15KW and 1KW transmitters, and exciters for converting conventional FM transmitters for multiplex use.

HUGHEY & PHILLIPS, INC.
3200 N. San Fernando Blvd. Burbank, California

Tower Obstruction Lighting Equipment display of Hughey & Phillips, Inc., will feature the new Lighting Isolation Transformer. Available in three load capacities, 750, 1750, 3500 watts, these

transformers provide advantages over similar types heretofore available. It features higher efficiency, improved regulation, additional taps, and epoxy encasement.



New Hughey & Phillips Tower Isolation Transformer designed for higher efficiency, improved regulation, additional taps, and epoxy encasement.

The exhibit will include the demonstration of the Remote Lamp Failure Indicator System providing a continuous and positive means of monitoring tower lamp conditions. Also on demonstration will be Tower Light Control and Alarm Units for unattended microwave relay stations. Other items on exhibit will include the firm's combination Photoelectric Control and Beacon Flasher, Beacons, obstruction lights, and various control units.

INDUSTRIAL TRANSMITTERS & ANTENNAS, INC., 130 East Baltimore Ave. Lansdowne, Pa.

ITA will exhibit a complete line of broadcast equipment including 1KW and 5KW AM transmitters; two channel, three channel, and stereo consoles; 1KW, 5KW, 10KW and 35KW FM transmitters; the instant locating, instant cueing, maximum capacity, Simplexer for station automation; and a host of associated audio and studio equipment.

The AM transmitters feature compactness with accessibility, conventional modern high efficiency circuitry, silicon rectifiers, built-in dummy loads, automatic recycling, and front panel power cutback switching.

The consoles feature a new concept in broadcasting. Electronic gain controls and crystal diodes are used that guarantee infinite life, distortion free operation and automatic gain control.

The new line of FM transmitters reflects the years of ITA's FM experience and utilizes the most conservative tubes and circuitry for rated power output. No stage in ITA FM equipment requires neutralization controls, and special emphasis is made this year on the 35KW FM transmitter which can be delivered from stock.

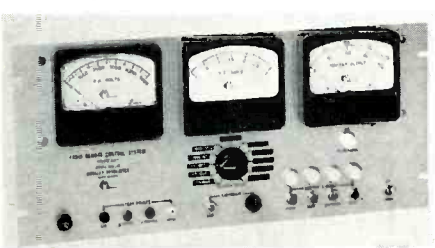
The heart of ITA's automation system, the Simplexer, is on display. It permits instantaneous locating and instantaneous cueing of any one of 450 prerecorded spots.

JAMPRO ANTENNA COMPANY 7500 14th Avenue Sacramento 20, Calif.

Jampro FM antennas will be displayed in the ITA booth. Jampro's FM line includes omni-directional antennas with gains up to 15. A new line of directional FM antennas is being introduced with power gains up to 25. The JAR line of directional FM antennas consist of the regular Jampro 6 and 8 bay omnidirectional antennas with the addition of reflectors. The side and back patterns may be controlled to suit individual coverage requirements. The use of directional FM antennas may permit additional FM stations for crowded areas such as Zone 1, the company believes.

MOSELEY ASSOCIATES P. O. Box 3192 Santa Barbara, Calif.

A complete radio remote control system for FM broadcast transmitters will be on display at Booth 35B. Manufactured by Moseley Associates and designated the Model RRC-10, the system provides the complete remote control and telemetering requirements for an FM transmitter located on a mountain top. While designed principally for FM use, the equipment is adaptable to AM transmitters. Main channel audio, multiplex program, and control signals are relayed to the remote site over a 5-watt STL, Model PCL-2A. Metering is returned to the studio as a multiplex subcarrier on the main FM transmitter. Completely independent of wire circuits, the Model RRC-10 Radio Remote Control System provides for 10 circuits of on-off control plus one independent switching channel.



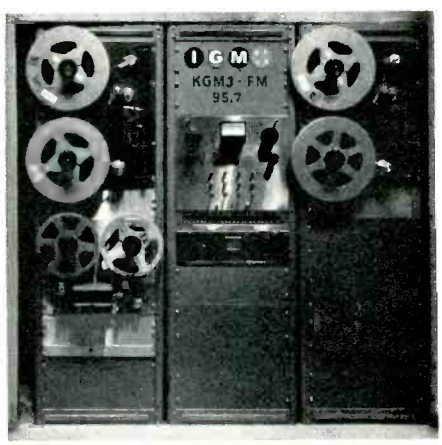
The Moseley Associates Radio Remote Control System, Model RRC-10, Studio Unit.

Also on display will be the Model SCG-2 Subcarrier Generator for FM multiplexing incorporating automatic muting, deviation meter, and regulated power supply.

PROFIT PROGRAMMING INC., Div. International Good Music, Inc., Bellingham, Washington

International Good Music, Inc., and their associated division, Profit Programming, Inc., will exhibit for the first time this year a comprehensive automation program package. IGM plans to show two separate "auto" systems, one for FM, one for AM radio stations.

The FM system, called "Iggum," is an improved model of the original equipment placed on the market by the company last year. The system plays prerecorded music on full-track tape at 7½ ips and commercials at a speed of 7½ or 3¾ ips.



An "Iggum" automation unit, produced by International Good Music, Inc. This unit uses Ampex tape decks for music tapes. Ampex is optional, but production units ordinarily will come with Bogen-Presto model 625 decks.

The 1961 "Iggum" package is controlled by a newly designed four-channel switcher. Three Bogen-Presto type magnetic tape decks are employed. The package includes sensing equipment and a "make-up" oscillator unit. This new unit features an "ID" inserter, keyed to a timer and capable of identifying the station in any pre-recorded variety of pre-set times or to the nearest recorded selection. This system is housed in three standard racks. The pre-recorded program tapes are supplied complete with tones and announcements.

The AM automation system to be exhibited features a new eight-channel

switcher to serve the increased number of input channels required for AM program operation. This unit incorporates a "commercial gate," allowing a pre-set maximum number of spots to be aired in quarter, half or hour segments. The "ID" inserter is also employed in the AM system.

RADIO CORPORATION OF AMERICA
Camden, N. J.

The Grand Ballroom of the Shoreham Hotel will be the R.C.A. exhibit location of a complete line of broadcast equipment, including AM, TV, FM, Studio, and Automation.

SARKES TARZIAN, INC.
East Hillside Drive
Bloomington, Indiana

The Broadcast Equipment Division of Sarkes Tarzian, Inc., will display new television studio equipment at the convention. A new 4½-inch Image Orthicon Camera will be displayed. This camera contains solid state sweep circuits, power supply, viewfinder amplifier, and is particularly simple to service and operate. It employs an integrated eight inch (8") viewfinder.

A new completely solid state Vertical Interval Switching system will be displayed. The switching system is all new modular construction, allowing custom system design to meet any broadcast or network requirement without a surcharge for customizing each system. The solid state switcher has excellent color response and several of the modules can be used in other applications within the station.

Pertinent partial specifications are:

Switching time during vertical interval —Less than 1 microsecond.

Frequency response—To 15 mc.

Differential phase error—Less than 1 degree.

Differential gain error—Less than 1 per cent.

Isolation—60 db minimum.

A new solid state Distribution Amplifier of modular construction will be displayed. The total rack space required is 1¾ inches. The distribution amplifier frame will house any of the following components: distribution amplifier, clamping amplifier, synchronizing adder, or any combination of these units. Each Distribution Amplifier provides 1 input and 3 outputs at 75 ohms ± 1% sending and termination. Input is either high impedance or 75 ohms ± 1%.

A new Four-Mirror Multiplexer design incorporating an indexing feature will be displayed. The 4-Mirror Multiplexer (MP-15) will mount two vidicon film cameras and the control arrangement allows either camera to be classified as prime at any time. The Multiplexer is of unitized construction, with self-contained switching control which can be switched to remote operation, if desired.

A new broadcasting Studio Vidicon Camera with integrated 8-inch viewfinder will be displayed. The 880 Vidicon Camera will reproduce 700 lines resolution and is particularly sensitive, giving excellent results for certain broadcast studio applications.

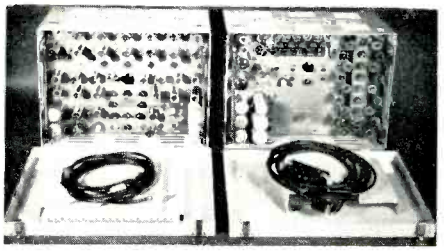
The RMW-1A Heterodyne Microwave Relay is an improved version over previous models. The Heterodyne Relay is particularly applicable to multi-hop microwave systems. The relay is completely transparent to the repeated signal.

Other items which will be displayed include a new Master Monitor, a new Prism Multiplexer, and a new Transistorized Audio Console.

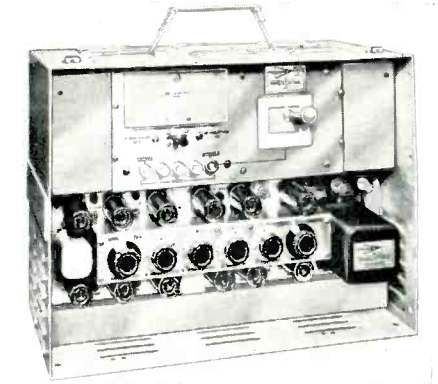
TELECHROME MFG. CORP.
Amityville, Long Island, N. Y.

The showing of video transmission test set, model 1005-A, manufactured by Telechrome Mfg. Corp., will be one of many units displayed at the convention. Other specialized video products to be seen are the 1004-B transmission test receiver and signal generator, and the EIA sync generator with vertical interval keyer, model 1007-A.

An additional attraction will be the demonstration of their model 491-A special effects positioner. This unit provides an infinite number of geometric wipes by manual shifting of the phase of the horizontal and/or vertical components of wipes as produced by the special effects generator.



Video transmission test signal generator, Model 1005-A.

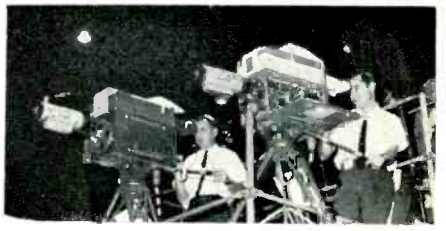


Special Effects Positioner, Model 491A1, by Telechrome Manufacturing Corporation.

All units presented by Telechrome Mfg. Corp. are supplied in metal carrying cases or may be rack mounted in standard 19" housings.

TELEVISION ZOOMAR CO.
500 Fifth Avenue
New York 36, New York

Television Zoomar Company this year will show the Zoomar Lenses to have improved optics and new coatings with increased blue transmission. These have special significance for color telecasting. The Super Universal has an overall zoom range of 2½ to 72 inches.



Super Universal Zoomar Lenses in use at Democratic National Convention in Chicago, 1960.

The new Super Studio and Super Universal Zoomar Lenses have been designed for interchangeable use between the present 3-inch and the new 4½-inch Image Orthicon Camera. These interchangeable Zoomars are already in use at television stations in this country and stations in Australia, Canada, England, Brazil, Argentina and Sweden.

VISUAL ELECTRONICS CORP.
356 West 40th Street
New York 18, New York

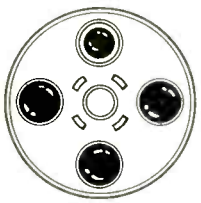
Visual Electronics Corporation will exhibit many items of equipment in three basic groups.

TV Equipment: Visual automation systems, GPL high resolution vidicon film system, TARC switchers, English Electric Valve 3" and 4½" Image Orthicon tubes, MacKenzie program repeater unit, Favag master studio clock system, Conrac picture monitor line, Eastman 16mm TV projectors, Smith-Florence faultfinder, Prodelin transmission line, Decca weather radar, Superior self normalling video jack, Dynair video and R.F. distribution equipment, Power Sources all transistorized supply systems.

AM Equipment: Continental transmitters and remote control systems, Broadcast Electronics Spotmaster, Altec audio console, microphones, Nems Clark monitors, field strength meter.

FM Equipment: Gel transmitters and multiplex exciters. Audiomation tape players for background music, Perfectone tape reproducers.

LOOKING AT THE ENGINEERING CONFERENCE



Part 4—A listing of technical papers to be presented on engineering.

The 15th Annual NAB Broadcast Engineering Conference will be held this year in the West Ballroom of the Shoreham Hotel, Washington.

LIST AND SUBJECTS OF TECHNICAL SESSIONS:

Monday Morning—May 8

Presiding: A. Prose Walker, Manager of Engineering, NAB.

Session Coordinator: Warren L. Braun, Assistant General Manager & Director of Engineering, WSVA AM/FM/TV, Harrisonburg, Virginia.

9:00-9:15 A.M. Opening of Engineering Conference—Gov. LeRoy Collins, President, N.A.B.

9:15-10:00 A.M. Review of Equipment Exhibits — Virgil Duncan, Chief Engineer, WRAL-TV, Raleigh, N. C.

10:00 A.M. Adjournment.

Monday Afternoon—May 8

Presiding: George W. Bartlett, Assistant Manager of Engineering, NAB.

Session Coordinator: Benjamin E. Windle, Chief Engineer, WCLT AM/FM, Newark, Ohio.

2:30-2:55 P.M. Interesting Aspects of Acoustical Design and Practical Improvements in Studio Characteristics—Warren Braun.

3:00-3:25 P.M. Semi-Conductor High Voltage Power Supplies for Transmitters — Robert Morris, ABC.

3:30-3:55 P.M. Communication of Engineering Information Between Operating Technicians, Maintenance Technicians and Supervisors—George Hixenbaugh, Chief Engineer, WMT-TV, Cedar Rapids, Iowa.

4:00-4:25 P.M. FCC Broadcast Station Renewal Inspections—George S. Turner, Chief, Field Engineering & Monitoring Bureau, FCC.

4:30-5:00 P.M. The Effect of Transistorization on Broadcast Studio Equipment Design — John Wentworth, RCA.

5:00 P.M. Adjournment.

Tuesday Morning—May 9
RADIO TECHNICAL SESSION

Presiding: Leslie S. Learned, Director of Engineering, Mutual Broadcasting System.

Session Coordinator: Clure Owen, Administrative Assistant to Vice-President for Engineering, ABC.

9:30-9:55 A.M. The Effect of SWR on Cross Modulation of FM Multiplexed Signals — A. H. Bott, RCA.

10:00-10:25 A.M. Power Dividers for Directional Antenna Systems —R. S. Bush, Gates.

10:35-10:55 A.M. Problems Encountered in Mounting FM Antennas on Various Types of Supporting Structures — John Caraway, Collins Radio.

11:00-11:25 A.M. Contributing Factors in the Establishment of the New FM Stereo National Standard — Harold L. Kassens, FCC.

11:30-12:00 N. Practical FM Broadcast Engineering — Bernard Wise, President, Industrial Transmitters & Antennas, Inc.

12:00 N. Adjournment.

Tuesday Morning—May 9
TELEVISION TECHNICAL SESSION

Presiding: J. D. Bloom, Chief Engineer, WWL, New Orleans, La.

Session Coordinator: Jack Petrik,

Chief Engineer, KETV, Omaha, Neb.

9:00-9:25 A.M. The Use of Color Field Redundancy for the Simplification of Color Television Transmission Systems—Prof. William L. Hughes, Iowa State University.

9:30-9:55 A.M. Progress Report on Automation at NBC—Richard H. Edmondson, RCA.

10:00-10:25 A.M. An Economical 20 Milli-Microsecond Pulser; A Transistorized Distribution Amplified (2 short papers)—Ben Wolfe, Chief Engineer, WJZ-TV, Baltimore, Md.

10:30-10:55 A.M. Design and Installation of a Large Station Audio System—A. C. Angus, General Electric Co., and D. E. Easterwood, WFAA (paper to be delivered by Mr. Angus)

11:00-11:25 A.M. The Applications of 8 MM. Magnetic Sound Equipment in Television — Mr. Kenneth LiDonnici, Engineering Mgr. Industrial Products Division, Fairchild.

11:30-12:00 N. Time Base Stability in Video Tape Recorders—L. W. Weiland, Ampex Corporation.

12:00 N. Adjournment.

Tuesday Afternoon—May 9

No Engineering Conference Sessions scheduled to enable engineers to inspect the equipment exhibits.

Wednesday Afternoon—May 10

Presiding: William S. Dutters, Manager, Allocations Engineering, NBC.

Session Coordinator: George W. Bartlett, Asst. Manager of Engineering, NAB.

2:30-2:55 P.M. A Computer Control System for Program Switching—Adrian B. Ettlinger, CBS.

3:00-3:25 P.M. How to Burn a Fireproof TV Station Building—Gene Ellerman, Manager, WWTV, Cadillac, Michigan.

3:30-3:55 P.M. VHF Translators—A New Coverage Tool for TV Broadcasters — Bernard Nadler, Project Engineer, Adler Electronics, Inc.

4:00-4:25 P.M. Global Satellite Communications — Jean Felker, Asst. Chief Engineer, American Telephone & Telegraph Co.

4:30-5:00 P.M. Experience in Remote Control Operation of AM Plants — Ogden L. Prestholdt, CBS Television Network.

5:00 P.M. Adjournment of 15th Annual Broadcast Engineering Conference.

ADDITIONAL EVENTS CONCERNING ENGINEERS

Saturday—May 6

Registration and non-agenda events.

Sunday—May 7

Registration, exhibits open, FM day and non-agenda events.

Monday—May 8

10:30 A.M. Joint Management-Engineering Session, Opening of Convention, Sheraton Park Hotel.

12:30 P.M. Engineering Conference Luncheon, Palladian Room, Shoreham Hotel.

Presiding: Frank Marx, Vice-President for Engineering, ABC, New York.

Tuesday—May 9

12:30 P.M. Engineering Conference Luncheon, Palladian Room, Shoreham Hotel.

Presiding: James D. Parker, Director, Radio Frequency Engineering, CBS Television Network.

Wednesday Morning—May 10

Joint Engineering-Management Session, Sheraton-Park Hotel.

12:30 P.M. Engineering Conference Luncheon, Palladian Room, Shoreham Hotel.

Presiding: Virgil Duncan, Chairman, NAB Engineering Conference Committee (WRAL-TV)

Speaker: Dr. Edward Teller, Lawrence Radiation Lab., University of California.

Presentation of NAB Engineering Award to Raymond F. Guy—A. Prose Walker.

Wednesday Evening—May 10

Annual Convention Banquet, Sheraton Hall Ballroom, Sheraton-Park Hotel.

DR. EDWARD TELLER, ATOMIC SCIENTIST, TO ADDRESS NAB ENGINEERING CONFERENCE

Dr. Edward Teller of the University of California, atomic scientist and "father" of the hydrogen bomb, will be a guest speaker during the Annual Convention.

The 53-year-old Hungarian-born scientist who was naturalized as a U. S. citizen 20 years ago will speak at a May 10 luncheon of the Broadcast Engineering Conference being held as part of the NAB Convention.

His selection was announced by Virgil Duncan, WRAL-TV, Raleigh, N. C., chairman of NAB's Engineering Conference Committee, and by A. Prose Walker, NAB manager of engineering.

Dr. Teller, a professor of physics-at-large at the University of California, is also associate director of its Lawrence Radiation Laboratory. He previously was with the Manhattan (atomic bomb) project and the Los Alamos Scientific laboratory.

His research interests are broad, encompassing chemical and molecular physics as well as the nuclear and thermonuclear fields. He was an early researcher in the processes by which stars generate energy and has maintained an active interest in two current developments—project Sherwood, a controlled thermonuclear program, and project Plowshare for peaceful uses of nuclear explosives.

A member of the National Academy of Sciences and a fellow of the American Nuclear Society, Dr. Teller was awarded the 1960 "Living History" award of the Research Institute of America. He also holds the Albert Einstein Award of 1959, the 1957 Joseph Priestly Memorial Award, and the 1960 Midwest Research Institute Award.

Editor's Note:

Part II of "FOCUS, THE NAB CONVENTION" will be carried in the May issue of Broadcast Engineering.

A. Prose Walker, NAB Manager of Engineering, will open the 15th Annual Broadcast Engineering Conference, May 8th.

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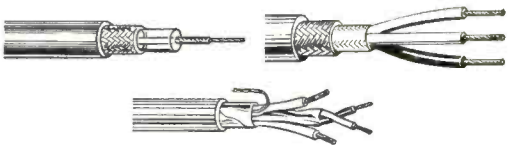
Offer low capacitance, lighter weight, smaller diameters, long flex-life and high tensile strength. Resistant to oil and ozone.



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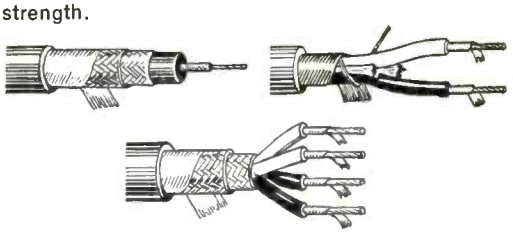

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75-Ohm Video Cable

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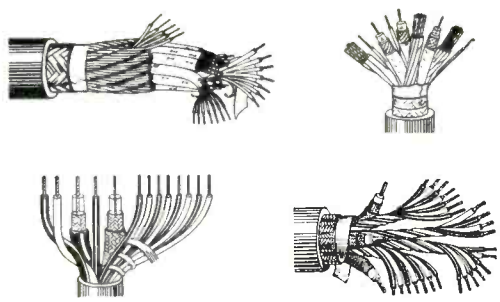
TV Camera Cables

For color and black and white TV transmission. Lightweight, small diameters, low friction coefficient, maximum flexibility.

82 CONDUCTOR COLOR CAMERA CABLE
28 CONDUCTOR CAMERA CABLE
24 CONDUCTOR CAMERA CABLE
13 CONDUCTOR TV EYE CABLE



Picture Signal Analysis

Starts on page 6

The most convenient standard from an operational point of view (and for scopes with sweep calibrated in time rather than frequency) is the Tektronix 180A Marker Generator. When this unit is available, or can be rented or borrowed, the sweep can be calibrated in a minimum of time and with maximum accuracy by following the instructions. Otherwise an oscillator of known accuracy such as the Hewlitt-Packard, the Signal Corps BC-221, or any good crystal standard may be used. Obviously the secondary standard itself should be checked occasionally and for this purpose a WWV receiver will be found invaluable.

The scope time base normally employs a low frequency adjustment and several adjustments affecting the faster sweeps. A sine-wave from the oscillator may be fed to the scope vertical amplifier and the sweep time per cm will be:

$$\text{Sweep time/cm} = \frac{\text{Cycles/cm}}{\text{ocs freq}}$$

For example, on the Tektronix 524AD scope, a 1 mc signal should show one cycle/cm when the sweep time switch is set on 1 u/s and the multipliers set to 1.0. The accuracy of the marker generators should then be checked (and adjusted if necessary) against the properly calibrated time base.

It is also pertinent to become completely familiar with the sweep linearity of the scope. Usually some slight amount of non-linearity will be indicated. Fig. 9 illustrates 1 u/s markers and it can be observed that the linearity is reasonable to about 4 cm each side of center, allowing for a slight amount of parallax. Note, however, that in this case ten micro-seconds is not indicated by exactly ten cm of deflection. Non-linearity is of no importance when markers are present, but instances occur (as for example in setting vertical sync serration width relative to leading edge of horizontal sync) when it is cumbersome to attempt use of markers. Sweep linearity can usually be improved in case of an exhorbitant amount of non-linearity by selecting horizontal amplifier tubes for balance while observing markers on the trace as in Fig. 9. It is most important, however, to determine over what portion of the sweep is the linear region.

Amplitude Calibration

The absolute accuracy of the signal amplitude is not quite as important as time base accuracy provided the same scope is used in setting levels throughout the system. This is true since slight differences in levels are arbitrarily adjusted to give proper modulation of the transmitter or are adjusted for a given level in terminal equipment of the AT&T. However, a reasonable accuracy is desirable. EIA standards call for a picture line amplifier standard output (black negative polarity) of 1 volt peak-to-peak within 0.05 volts.

Mercury cells are available with a rather precise voltage of 1.35 volts over periods of 30 months and more when used as secondary voltage standards, unloaded. Eight of these cells in series will provide a standard of 10.8 volts within 1 per cent, which can be used to calibrate dc meters. The pulse calibration circuit of most scopes employs a dc check point for proper adjustment which requires a

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Raytheon KTR — for Intercity Relay network pick-up — is available in both 1/10-Watt and 1-Watt systems to meet individual needs. These systems have proven their reliability, operating unattended over extended periods. Initial cost is low, and long-term financing is provided.

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voltage scale which normally can be calibrated by the 10.8 reference. Or the dc reference can be used to check the scope calibration directly if a chopper is available.

The properly calibrated scope can then be used to check the ac meter scales. The peak-to-peak value displayed multiplied by 0.3535 gives the RMS meter value.

Test Accessories

It is often desirable to employ "keyed" test signals phased by the station sync generator to eliminate the test amplitude during horizontal and vertical blanking intervals. This enables checking the many types of amplifiers incorporating line-to-line clamps which otherwise need to be modified if straight test signals are used. Although commercial equipment is available for "keyed" sine waves, video sweep, stairstep signals, etc., there is an apparent scarcity of available units which will properly process a square wave signal.

For this reason the writer devised the simple transistor inhibition gate of Fig. 10. Q1 acts as an open circuit in the interval between blanking pulses by means of the reverse battery bias to the base, thus allowing the test signal to pass. The negative blanking pulses quickly saturate Q1 which switches the test signal to ground potential, while the blanking amplitude across R2 is used to establish the setup level (pedestal) with an amplitude determined by the control setting of R4. Care should be taken that a dc potential of positive polarity does not exist at the test signal generator output when using the PNP type transistor. If this does exist, an NPN transistor should be used with reverse battery potential to that shown by Fig. 10. A small negative dc is acceptable.

Fig. 11(a) illustrates the keyed output when the test signal is a 60-cycle square wave. The setup level is adjustable by R4 (Fig. 10) and the signal may then be fed to a sync-mixing unit such as the switcher, stabilizing amplifier, sync-mixing distribution amplifier, etc. This type of test signal is particularly useful for overall checks since a clean blanking interval (both horizontal and vertical) is required for the "back porch" clamping circuit of the transmitter.

The keyer may also be used for sine waves, as shown by Figs. 11(b) and 11(c), as well as video sweep, stairsteps, etc. Due to the extreme simplicity, no isolation for the blanking signal is provided, and therefore is useful only if a pulse distribution system prevails at the installation providing an isolated source for blanking. Additional circuitry can of course be used to provide blanking pulse isolation. The unit shown by Fig. 10 can be built for less than ten dollars at current prices. Although diodes only can be used for this purpose, the transistor gate provides a cleaner blanking interval with fewer transients.

Another useful accessory is the simple differentiating network of Fig. 12. The switch selects the proper time-constant for horizontal or vertical drive, and delivers a positive trigger from the trailing edge of the input pulse. Certain devices such as the Tektronix 105 Square Wave Generator which accept external sync inputs are more stable with a positive trigger of short duration.

(This has been the first in a series of general and specific considerations in telecast system maintenance.—Editor)

When time

5CPB FIVE-CHANNEL SELECTIVE PROGRAM REPEATER

is money . . .

and quality counts

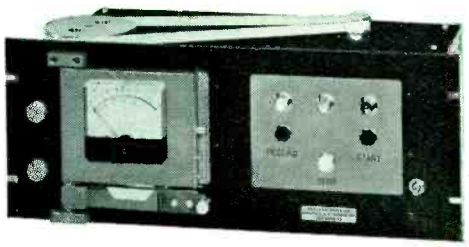
USE MACKENZIE "INSTANT" AUDIO

Proven by millions of hours of continuous service

NOTHING FASTER... NO HIGHER QUALITY!

The completely transistorized 5CPB features perfect quality and greatest reliability. It is the fastest automated audio unit you can get... carefully designed and built to give you the continuous, dependable service you need.

A PERFECT COMPANION! MacKenzie 1CPR Instant Recorder—and single-channel playback repeater—assures perfect pre-recorded announcements...made in leisure time. Provides natural live quality reproduction...instant playback...instant automatic erasure, interlocked against accidental operation. Saves waste motion, lost time... makes every precious second count...for you!



Check how MACKENZIE "Instant" Audio can save you at least four minutes of saleable time each day . . . or at least 120 minutes of saleable time per month! Send coupon TODAY!

MACKENZIE 5CPB Five-Channel Selective Program Repeater gives you quick returns on your investment

TIME IS MONEY! And every second saved...every miscue or fluff that you eliminate means more time to be sold... fewer penalties...and all of these mean greater return on your investment.

The ruggedly built, completely dependable MACKENZIE 5CPB contains five continuous loop tapes that may be used simultaneously or individually...plays pre-recorded spots, announcements, commercials, station breaks, jingles, music bridges, sound effects...any material requiring precision cueing and instantaneous stop-start operation. Saves seconds-minutes-hours...puts money in **your** pocket!

Gentlemen,

☐ Please contact us immediately.

☐ Please mail me the complete story on MACKENZIE money-making equipment.

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What Happened to Tape After a

Inspection of unused
magnetic recordings ten years of age
reveals deterioration

By JOHN P. JARVIS
Research & Development Group
Muzak Corporation, New York

Foot by foot visual and aural examination of ten year old cellulose acetate base tape has pointed several requirements for adequate storage:

1. Use today's Mylar base tape.

2. Storage in air tight containers. This will help prevent brittleness, especially if the containers are not subjected to temperature and humidity extremes. The containers could be metal cans sealed at the edge with pressure sensitive tape.

3. Keep temperature and humidity of storage area under constant rate of control.

4. Spool finished tape on N.A.B. hub reels, "tail-out," at low tension (R.M.A. tension).

5. Run stored tapes at normal speed at least once a year. This may result in some tapes being "tail-out" and some "head-out," mark the reels.

6. Use of leader tape (especially within a reel) that is similar to base material of the magnetic tape.

7. Store a good dub of the original tape. It is unlikely storage defects would occur in identical portions of both.

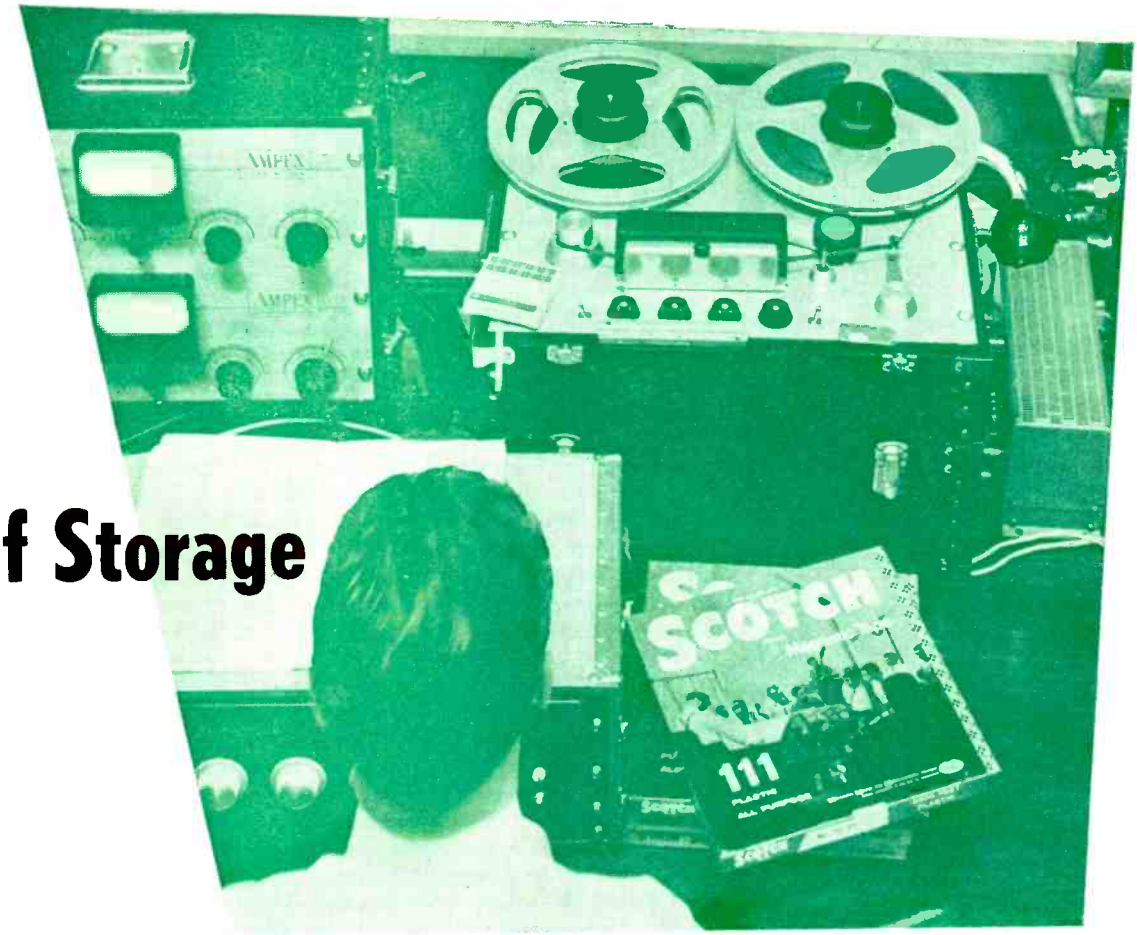
RECENTLY, I had occasion to play back well over 100,000 feet of ¼-inch magnetic tape that had remained spooled for almost ten years. In all this time, not a reel of it had ever been run, even once! It seemed feasible to glean some information about tape storage, so the tape was visually inspected as it ran through the playback machine and the audio program was continuously monitored.

The following is a short report of what had happened to the tape during its ten years of storage. First, a listing of some conditions:

Type of Magnetic Tape: M.M.M. 111, ¼-inch acetate.
Type of Recording Machines That Originally Recorded the Tapes: Ampex Models 200 and 300.
Type of Recording: 15 ips full width single track monaural.
Reels: 10½ inches dia. N.A.B., metal.
Leaders (where used): Plastic and paper.
Conditions of Storage of Tapes: In air-conditioned environment. (Air-conditioning of type provided for human comfort.) No control of humidity. No strong magnetic fields. Tapes were in individual boxes.

Had the tapes deteriorated? . . . yes, but the decay was much more physical than magnetic!

Decade of Storage



Changed Electrical Properties

Dynamic range apparently did not change. Many of the programs on the tapes were preceded by short 1,000 cycle signals at standard recording levels. These still played back at correct level.

Frequency response had not changed. The old Ampex 200 had a habit of leaving some of its 60 KC bias signal on the tape along with the audio. This 60 KC was still present and had suffered no apparent degree of attenuation.

"Printing" from layer to layer in the reels was quite noticeable on some recordings. M.M.M. obviously made some change of formulation of their 111 tape about 1950, as some was of slightly different color than the rest. The tapes that *looked* like our 1960 M.M.M. 111 did *not* have any really serious degree of printing.

Changed Physical Properties

So much for magnetic properties . . . now to the more serious aspect of physical deterioration. This, at times, made satisfactory program recovery almost impossible. Bear in mind, all of the tape used was cellulose acetate, and not Mylar base tape!

The tape had become rather brittle over the decade and had none of the "springy" feel of new tape. When making a small loop for the loading slots of the N.A.B. hubs, it folded like paper. From this it might be expected that it would have taken a permanent "set" conforming to any winding irregularity. Such was found to be the case. There were corrugations caused by the hub notches on tape near the ends of reels. These, of course, persisted for only a few feet of tape.

Much more damaging to reproduction were the sections of tape "frilled" by weaving during rewind ten years ago. Playback of such was marred by fast fluctation, especially at higher audio frequencies. However, moderate frills were tolerable. This was attributed to the fact that, if part of the width of a tape does not make contact with the head, the remainder presses just that much harder. To check this, tape was played with a two-track stacked head feeding two separate amplifier and speaker systems. The violent fluctation then rendered all badly frilled tape absolutely useless. Such would certainly be the case for stereophonic or other multi-track recordings.

The reproducing machine was immediately equipped with felt head pads. A great percentage of the frilled tape then played back satisfactorily although at times very heavy pressure was required. A few short lengths of tape that seemed beyond all hope were restored by actually ironing them out with a steam iron. The tape was placed on smooth Bristol board and covered with thin cotton cloth and steam pressed back into normal shape and acceptable for replay.

Most of the tapes that showed this type of frilled damage were aged "head-out," that is, stored after fast rewind. This produced a softer wind resulting from trapped air between layers of tape during the rewind process ten years ago.

A small percentage of tape had

(Continued on page 48)

AMENDMENTS AND PROPOSED CHANGES OF F.C.C. REGULATIONS

Notice of Proposed Rule Making in the Matter of Amendment of Section IV (Statement of Program Service) of Broadcast Application Forms 301, 303, 314 and 315, Docket No. 13961.

1. Notice is hereby given of proposed rule making in the above-entitled matter.

2. As a result of information submitted to the Commission by its Network Study staff in a report dated Oct. 3, 1957, the Commission instituted an "Investigatory Proceeding" (Docket No. 12782) which envisioned, *inter alia*, an over-all inquiry with respect to the television network program selection process. This proceeding was amended and enlarged by Commission Order of Nov. 9, 1959 to include a general inquiry with respect to programming to determine, among other things, whether the general standards heretofore laid down by the Commission for the guidance of broadcast licensees in the selection of programs and other material intended for broadcast are adequate; whether the Commission should, by the exercise of its rule making power, set out more detailed and precise standards for such broadcasters; and whether the Commission's present review and consideration in the field of programming and advertising are adequate under present conditions in the broadcast industry. This part of the inquiry was conducted by the Commission *en banc* between Dec. 7, 1959 and Feb. 1, 1960, and consumed nineteen days in actual hearings.

3. The information and views which the Commission obtained in connection with the above-mentioned programming inquiry led to the Commission's "Report and Statement of Policy Re: Commission *En Banc* Programming Inquiry" (FCC 60-970, 25 F.R. 7291, 20 R.R. 1902) released on July 29, 1960. The Commission set forth therein certain guidelines to assist broadcast applicants and licensees in fulfilling their statutory obligation to program their stations in the public interest. It also stated that it intended to revise Section IV of the broadcast application forms to require a statement by the applicant as to the measures he has taken and the effort he has made to determine the tastes, needs and desires of his community or service area, and the manner in which he proposes to meet those needs and desires.

4. There is presently pending a proceeding (Docket 12673) involving a revision of Section IV. Notice of Proposed Rule Making in said matter was issued Nov. 24, 1958 (FCC 58-1098). However, as noted above, the Commission's programming hearings have been held and its programming policy statement has been issued since the institution of the proceedings in Docket 12673, and accordingly said proceedings are no longer considered appropriate in light of the form proposed in Nov., 1958 and its variance with the Commission policy announced on July 29, 1960. We have, therefore, devised the attached form consonant with the Commission's recent policy statement.

5. In light of the above, it appears that the proceedings in Docket 12673 should be terminated. Accordingly, contemporaneously with the issuance of the instant Notice, the Commission is issuing an Order terminating the collateral proceedings in Docket 12673. Additionally, the Commission requests that comments in the instant proceedings be submitted *de novo* by interested parties and without incorporation by reference of any comments which may have been filed in the earlier proceeding. We believe this procedure to be desirable because it will encourage comments on individual sections of the proposed application as they are related to the new form as a whole; and that it will expedite and facilitate the adoption of a final report in the instant proceedings.

6. Pursuant to applicable procedures set out in Section 1.213 of the Commission's Rules, interested parties may file comments on or before April 3, 1961* and reply comments on or before April 17, 1961. In reaching its decision in this

Broadcasters Propose Time Extension

***The National Association of Broadcasters asked the Federal Communications Commission to grant broadcasters more time in which to file comment on the FCC's proposed revision of its broadcast application forms.**

NAB suggested that the April 3 deadline for filing comments be deferred to May 1.

In its formal request, the NAB advised the commission that it considered the proposed application revision of such "extreme importance" to the industry that it has had them reprinted and distributed to NAB members.

"Our preliminary information," it said, "is to the effect that many broadcasters will wish to make their views known. This should be of considerable assistance to the Commission in its consideration of the important questions involved. It is believed however, that a much more informative result may be achieved if additional time is granted."

The request was filed on NAB's behalf by Douglas A. Anello, the association's chief counsel.

NEUMANN WILL CREATE ONLY 400 NEW U-67 MICROPHONES IN 1961!

THE LATEST FROM NEUMANN! The unhurried hands that assembled the famous U-47, exploit that incomparable experience in creating the new multi-purpose U-67 condenser microphone.

When you've checked these outstanding features...*you'll want to be in on this year's U.S. quota:*

1. Electronically switched directional characteristics: Cardioid, Omni-directional, Figure-8.
2. Frequency response with virtually no peak at the high end.
3. A newly developed input circuit permits flat response to 40 cps with sharp roll-off below, making the U-67 virtually "pop"-proof. (This circuit readily disabled for flat low-end response to below 10 cps.)
4. Separate "Voice-Music" switch raises the roll-off starting point from 40 cps to 100 cps.
5. A third switch on the microphone itself permits reduction of the capsule's sensitivity by approximately 14 dB BEFORE the amplifier section. Prevents overload of amplifier from extremely close placement of the microphone. This is the first time that such overload protection is available in a studio microphone, at the INPUT to the amplifier.
6. "Calibrating input" connection on power supply permits direct testing of microphone preamplifier with oscillator.
7. Regular EF-86 tube readily replaceable.
8. Complete protection against radio frequency interference.
9. Built-in pad for U.S. nominal input impedances and levels; fully compatible with all domestic microphones.

Complete system includes: U-67 Microphone, NU-67 Power supply, UC-6 Interconnect cable and stand mount. U.S. std. fuse, pilot light, AC cord etc.
Write for full specifications and possible U-47 trade-in allowance.

GOTHAM AUDIO CORPORATION

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IN CANADA: Audio Sonic Products Ltd., 1434 St. Catherine St. W., Montreal 25, Quebec

proceeding, the Commission will not be limited to comments of record but will take into account any relevant information obtained in any manner from informed sources.

7. In accordance with the provisions of Section 1.54 of the Rules, the Commission shall be furnished with an original and 14 copies of all written comments filed herein.

8. Authority for adopting the amendments proposed herein is contained in Sections 4(i), 303(j), 307(d), 308(a) and 308(b) of the Communications Act of 1934, as amended.

FEDERAL COMMUNICATIONS COMMISSION
Ben F. Waple
Acting Secretary

Adopted: Feb. 17, 1961
Released: Feb. 21, 1961

(See accompanying Concurring Statements of Commissioners Ford, Chairman; and Hyde. Commissioner King abstained from voting.)

BROADCAST APPLICATION, FEDERAL COMMUNICATIONS COMMISSION, SECTION IV, PAGE 1

Statement of Program Service of Broadcast Applicant

Name of Applicant

Notice to all Applicants

The replies to the questions herein which relate to future operation constitute a representation of programming policy upon which the Commission relies in considering the application, and against which the Commission will measure the subsequent operation of the station. Applicant may, during the ensuing license term, supplement this information with respect to significant changes which may occur in his over-all programming.

Instructions

1. Questions herein pertain to past and proposed operation. Applicants for new stations or assignees or transferees of existing stations are to answer only questions relating to proposed operation. Applicants for renewal of existing station licenses are to answer questions as to both past and proposed operation; in areas where no substantial change from past operation is proposed, applicant may so state.

2. Applicants for renewal of license must attach the original or one exact copy of program logs for the seven days currently designated by the Commission as the "composite week."

3. Program types and classifications incident to the replies to Paragraphs 7 and 8 below, are to be in accordance with the definitions on Pages 5, 8 and 9 of this Section.

4. Applicants for renewal filing FCC Form 303 need not complete Paragraph 8(d), except to indicate the names, ad-

dresses, and positions of employees who are not United States citizens.

1. *Service Area Description*

With reference to the primary service area (daytime pattern) of a standard broadcast station, the 1 mv/m contour of an FM broadcast station or the area within the Grade A and B contours in the case of a television station (excluding translator stations), attach as Exhibit a description of said area, including but not limited to such factors as over-all population; foreign language and minority groups; agricultural population; religious institutions and educational facilities; recreational, sports and cultural facilities; broadcast services; newspapers; and the nature of the principal businesses, trades or industries in the area. If the applicant has previously submitted such a statement to the Commission, it will be sufficient to identify the prior application, and to indicate the changes in such information since the date of filing.

2. *Area Needs and Interests*

(a) Attach a brief statement as to the continuing efforts made during the past license period by or on behalf of the applicant to ascertain the needs and interests of the listening and viewing audience to be served. If this is an application for new facilities, attach a brief statement as to the scope and results of the applicant's efforts to ascertain the foregoing information. Evidence in support of the above statement should be retained in the station's files for a period of three years.

(b) State the scope and results of consultations with civic leaders, including but not limited to public officials, educators, religious leaders, and representatives of agriculture, business, labor, non-profit organizations and the professions with respect to the needs of their groups.

(c) How does the applicant propose to translate into its schedule programs designed to fulfill the needs found through the consultations and efforts described above?

(d) State the extent to which, and the procedure by which, complaints and suggestions from listeners have been and will be considered by the applicant and acted upon if appropriate. For past operation, give specific examples.

3. *Controversial Issues of Public Importance*

State the past and proposed practice of the applicant with respect to the fair presentation of controversial issues of public importance, including the frequency of the editorials (if broadcast) or other types of programs, and the procedure followed or to be followed with respect to the presentation of opposing views of view. If this is an application for renewal of license, describe at least

two leading community issues (i.e., *local* in nature) in each of the last three years and state whether specific programs and/or announcements have been broadcast in connection therewith, the number and length thereof, and the times at which broadcast.

4. *Community Expression*

(a) Describe the steps, if any, taken or proposed to encourage the development of local talent for use in connection with the applicant's program service.

(b) Attach a statement indicating whether the applicant has carried and proposes to carry programs devoted to any of the following, including the frequency and length of such programs (N.B., only programs of at least 4½ minutes duration which do not contain in excess of one minute of commercial continuity, spot announcements or non-commercial spot announcements are to be counted): 1. Area News (i.e., dealing with *area events*); 2. Area political candidates; 3. Area governmental affairs (viz. activities of local councils, officials, legislatures, boards, etc.); 4. Area business, labor, fraternal, cultural or civic organizations.

5 *Specialized Programming Service*

State whether the applicant's past and/or proposed programming falls substantially into a specialized category, such as: popular music and news, classical music, foreign language, religious, agricultural, educational or instructive, etc. If answered in the affirmative, state the manner in which the applicant has determined that the public interest is being served by such "specialization," with appropriate attention being given to the public interest served by the applicant if the programming of one or more other stations in the community is devoted primarily to the same "speciality."

6 *Program Review Prior to Broadcast*

State your policy and practice and describe regular procedures within your organization for review of programs and advertising prior to transmission or exhibition through your station:

(a) as to programs produced or originated by your station;

(b) as to non-network programs produced by others (syndicated programs, etc.) and originated by your station;

(c) as to network programs.

7. *Program Types*

(a) Indicate whether the applicant has broadcast or proposes to broadcast any of the following types of programs on a daily or weekly basis. (N.B. Only programs of at least 4½ minutes duration which do not contain in excess of one minute of commercial continuity, spot announcements, or non-commercial spot announcements are to be counted.) Check under appropriate heading. Also state the total amount of time devoted and to be devoted to each program type in the average week during the past license period.

PAST (Check) Daily	PAST (Check) Weekly	PAST Amt. of Time During the Average Week		PROPOSED (Check) Daily	PROPOSED (Check) Weekly	PROPOSED Amt. of Time During the Average Week
.....	.....	.....	Religious	.....	.....	.....
.....	.....	.....	Instructive	.....	.....	.....
.....	.....	.....	Public Affairs	.....	.....	.....
.....	.....	.....	Agricultural	.....	.....	.....
.....	.....	.....	News	.....	.....	.....
.....	.....	.....	Sports	.....	.....	.....
.....	.....	.....	Entertainment	.....	.....	.....
.....	.....	.....	Other (Specify)	.....	.....	.....

(b) Of the average weekly time set forth above, state the time (hours and minutes) devoted and to be devoted to programs prepared by, or in behalf of, or in cooperation with educational organizations, exclusive of sporting events.

PAST..... PROPOSED.....

(c) Does the information above adequately describe past or proposed programming?

Yes ☐ No ☐

If "no" attach any additional information which the applicant wishes to bring to the Commission's attention.

(d) Indicate the applicant's maximum and maximum daily operating hours.

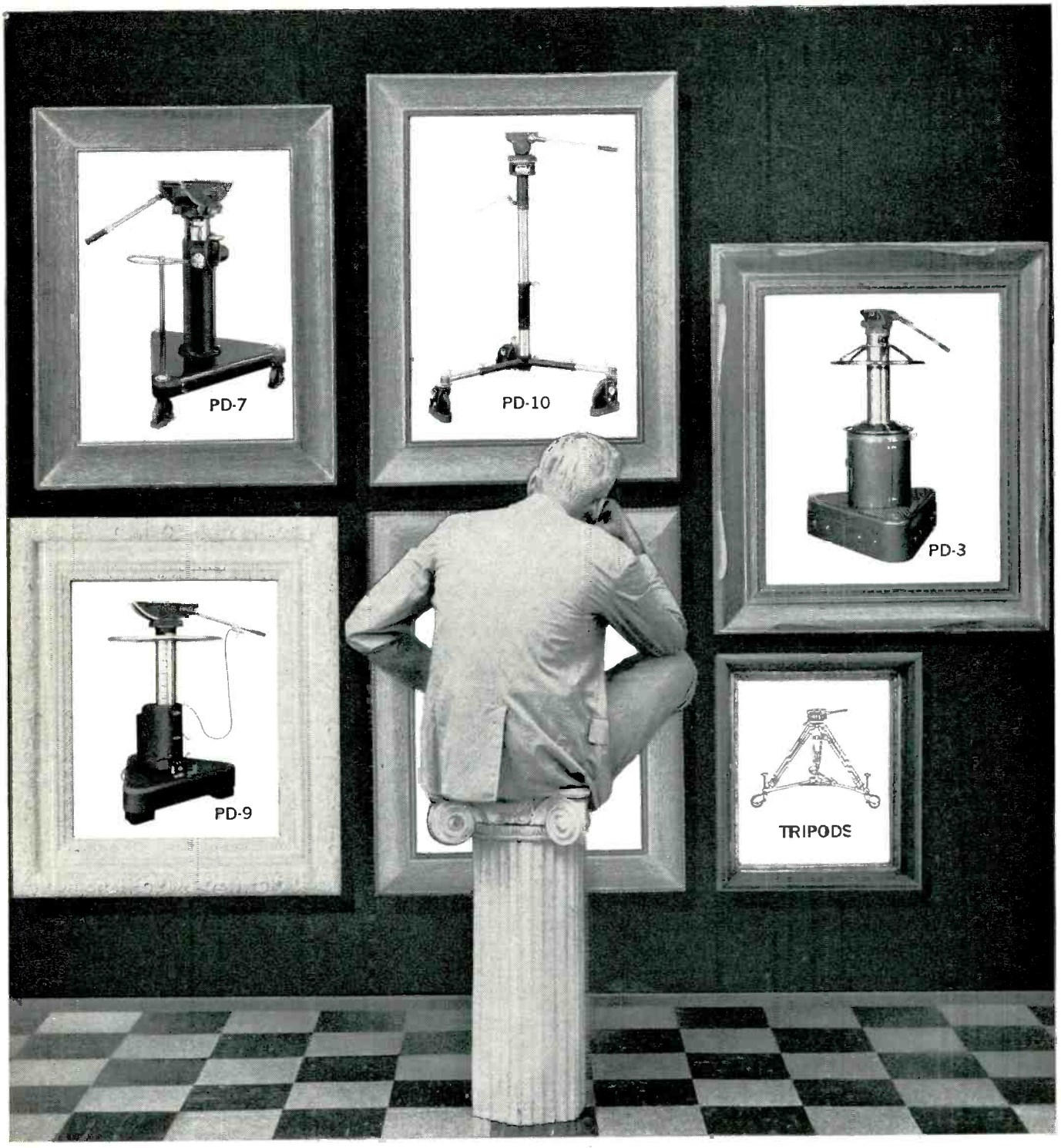
PAST Max.	PAST Min.		PROPOSED Max.	PROPOSED Min.
.....	.....	Recorded Time	.....	.....
.....	.....	Live Time	.....	.....
.....	.....	Network Time	.....	.....
.....	.....	Total Operating Hours	.....	.....

(e) State whether this applicant adheres to the principles of any code of broadcasting ethics and what measures the applicant has taken or proposes to take to insure the maintenance of programming and advertising standards.

Program Types

Religious (include here all sermons, devotionals, religious news and drama, etc.)

Instructive (include here programs



WHICH PEDESTAL IS BEST FOR YOU? You're on top with any camera pedestal from Houston Fearless. The smallest TV stations and the biggest networks have known this for years. In fact, most TV pedestals in use today were designed and built by HF. Small wonder. Houston Fearless grew up with the television industry, shared its problems, helped solve a few . . . and is still doing so. ■ What kind of camera mount does your station need? A rugged power-driven model that gives a feather touch to a big color camera? A tripod you can pick up with one hand? Houston Fearless has variations of both — and several in between. There's a size for every requirement, a model for every budget. ■ The light, maneuverable PD-7 has a hand wheel that raises or lowers the camera while dollying. Parallel or tricycle steering. The lightweight PD-10 rolls smoothly on 8" wheels. A hydraulic jack raises and lowers the column. Portable. Easily disassembled. The PD-3 gives a firm, steady mount and smooth dollying. The camera, counterbalanced, is easily raised by lifting on wheel. The rugged PD-9 has a motor-driven height adjustment. It gives smooth, steady mobility to biggest color or monochrome cameras. The versatile HF all-metal tripod and dolly offer maximum portability. Write for brochures on full HF pedestal line. Westwood Division HF Houston Fearless Corporation, 11851 Olympic Boulevard, Los Angeles 64, California

other than those classified under religious, agricultural, news or public affairs, involving primarily the discussion of, or primarily designed to further an appreciation of or understanding of, literature, music, fine arts, history, geography, and the natural and social sciences, and similar programs intended principally to instruct.)

Public Affairs (include here talks, discussions, speeches, editorials, forums, panel, round table and other programs primarily concerning local, national and international affairs or problems.)

Agricultural (include here all programs of farm or market reports or other information specifically addressed to the agricultural population.)

News (include here news reports and commentaries; news programs devoted primarily to wire news copy are "recorded" news programs.)

Sports (include here play-by-play and all pre- and post-game related activities, and all programs devoted exclusively to sports news and reports.)

Entertainment (include here all programs which are intended primarily as entertainment, such as music, drama, variety, comedy, quiz, etc.)

NOTE: The type of the program is determined by the character of the program material, and not the nature of whatever commercial material or NCSAs may be included. Thus, a 5-minute program of recorded music containing an NCSA on behalf of a civic organization is "entertainment."

8. *Commercial Operation*

(a) State the maximum amount of commercial time (i.e., time devoted to spot announcements plus time devoted to commercial continuity) which the applicant has broadcast or proposes to broadcast during any one hour.

PAST		PROPOSED
.....minutes	Commercial Time	.....minutes
.....minutes	Other program matter	.....minutes
.....60.....minutes	Total	.....60.....minutes

(b) State the maximum number of spot announcements which the licensee has broadcast and proposes to broadcast in any one hour.

PAST..... PROPOSED.....

9. *Operating Policies*

(a) State the name of the network, if any, with which the station will be affiliated.

(b) (1) State the average number of announcements and hours of programming per week which will be used in advertising or promoting any business, profession or activity other than broadcasting in which the applicant or any party to the application is engaged or financially interested either directly or indirectly. (This includes affiliated companies, subsidiaries and parent companies.) If this is an application for renewal of license, also show this information for the past license period.

(2) Does the applicant, any party to the application, or employee or independent contractor of the applicant have a financial interest, either direct or indirect, in any product or service which is advertised, promoted, or exposed on the air without payment of standard commercial rates? (E.g. the applicant is affiliated with or connected with a manufacturer and announcements or programs are broadcast on behalf of said manufacturer without charge.)

☐ Yes ☐ No

(Check)

If the answer is yes, give name and description of the products and the programs on which they have been and will be mentioned or exposed. Indicate the extent and frequency of such exposure, and the nature of such financial interest.

(c) If this is an application for an FM authorization, state whether the programs of any AM station serving the same area will be duplicated, and if so, the number of hours per day to be devoted to duplicated programs and the basis for applicant's belief that such duplication serves the public interest of the area served.

(d) State applicant's general plans for staffing the station, including the number of employees in each department (i.e., program, commercial, technical, etc.), and the names, residence and citizenship of the general manager, station manager, program director and other department heads who have been employed or whom the applicant expects to employ.

Program Classification

A *network program* (N) is any program whether of live or recorded character furnished to the station by a network or another station (except in the case of combined AM-FM operations in the same area). Delayed broadcasts of transcribed programs or films, originated by networks, are classified as "network" not "recorded." Programs are classified as network whether furnished by a nationwide, regional, or special network or by another station.

A *recorded program* (R) is any program consisting primarily of phonograph records, electrical transcriptions, films or other means of mechanical reproduction. A program utilizing mechanical reproductions half the time or longer is classified as "recorded"; otherwise it is classified as "live." Programs in which the live talent employed is incidental to the presentation of mechanical reproductions, as in so-called "disc jockey" shows, shall be classified as "recorded." A transcribed delayed broadcast of a network program, however, is not classified as "recorded" but as "network." A live program produced by the station and recorded or filmed for later broadcasting by the station shall be considered a live program.

A *live program* (L) is any local program which uses live talent primarily, whether originating in the station's studios or elsewhere. Programs furnished to a station by a network or another station, however, are classified as "network." A program utilizing mechanical reproductions less than half the time is classified as "live"; otherwise it is classified as "recorded." Programs in which the live talent employed is incidental to the presentation of mechanical reproductions, as in so-called "disc jockey" shows, shall be classified as "recorded" and not "live." A live program produced by the station and recorded or filmed for later broadcasting by the station shall be classified as "live."

A *commercial program* (C) is any program all of the time for which is purchased by a single sponsor, or by two or more sponsors each of whom pays for a portion of the total program time rather than for announcements within the program. A *participating program* (P) is any program, not classified as commercial under the foregoing definition, which is interrupted by one or more spot announcements (as defined below). A network program shall be classified as "commercial" if it is commercially sponsored on the network or contains announcements originated by the network on behalf of participating sponsors, even though the particular station is not paid for carrying it—unless all commercial announcements have been deleted from the program by the station. Cooperative programs furnished to its affiliates by a network which are available for local sponsorship are sustaining programs if no local sponsorship is involved, but are either commercial or participating commercial programs, as defined above, where there is local sponsorship.

A local alternately-sponsored program retains the classification *commercial* if the time is sold to a single sponsor and the program contains no more than one "cross-plug" for the alternate sponsor.

A *sustaining program* (S) is any program which is not interrupted by a spot announcement (as defined below) or the time for which is not paid for by one or more sponsors.

A *spot announcement* (SA) is any

announcement, including a promotional announcement, for which a charge is made and which is not part of the continuity of a commercial program, as defined above; or any announcement which, by express or implied agreement between the applicant and a sponsor assumes in fact the character of a paid commercial announcement (such as "bonus" spots, "per inquiry" spots, promotional announcements containing sponsor indentification, or "trade out" spots involving a barter arrangement). Time signals, weather announcements, and station identification announcements are classified as "spot announcements" if they come within either of the two foregoing categories; otherwise, they are not classified as announcements except for station identification announcements which refer to or mention the name of any business concern beyond the mere name of the station licensee (i.e., the exact name of the applicant herein), in which case they are classified as "spot announcements."

A *non-commercial spot announcement* (NCSA) is an announcement which is not paid for by a sponsor and which is devoted to a non-profit cause—e.g., Government Bonds, Red Cross, Public Health, civic announcements, etc. Government Bond, Red Cross, civic and similar announcements for which the station receives renumeration should not be classified as "non-commercial spot announcements" but as "spot announcements." Promotional announcements which are not "spot announcements" within the above definition should not be classified. Participating announcements should be classified as "spot announcements."

Concurring Statement of Chairman Frederick W. Ford

I concur in the above proposed form, however, I would prefer that the provision made for a composite week be eliminated and that item 7 be further broken down better to reflect the actual programs proposed and broadcast as well as the number of weeks involved. Specifically, column 3 should be divided to show the number of weeks the program category was broadcast and the time per week it was broadcast.

Concurring Statement of Commissioner Rosel H. Hyde

I concur in the issuance of the Notice of Proposed Rule Making, Docket No. 13961, for the purpose of obtaining comment. However, I have misgivings concerning certain phases of the procedures proposed and the possible overall implications of the same which it seems appropriate to state in conjunction with the issuance of the invitation for comment.

The approach, however well intended, in which the licensing authority endeavors to prescribe certain guidelines for the programming of stations would seem to assume responsibilities which should remain as the clear responsibility of licensees. The more the agency gets into this business, the more impossible its position is likely to become. It could find itself being held responsible by the public in matters involving creative effort, taste and opinion, which it would be hopeless to deal with aside from the traditional objections against government intervention in such matters and the specific prohibition of Section 326.

I am also concerned that this attempt to give direction may tend to limit rather than expand the potential of broadcast services. The concept which requires a determination of the tastes, needs and desires of the community or service area and the reduction of the same into a written formula for submission to the Commission seems most difficult of application. Does it assume that a definitive statement of actual needs can be posted for each community to be used as some kind of a standard for the weighing of the service of all broadcasters serving the community? If, on the other hand, it means submission of an applicant's opinion or judgment as to a community's needs, how can the agency undertake to approve or disapprove?

My suggestion is that it would be more appropriate to recognize that there is always a general need in every community for information, public understanding of local and national issues, for entertainment as such, the enhancement of cultural interests and, of course, the serving of economic interests. The possibilities and opportunities for service would seem to be as great as the imagination, creative ability, dedication and resources of the applicant would permit. It would be agreed, I am sure, that there is always a need for better understanding of the values on which society has been established; always the need for making the educational message more interesting, and always a need for making informative presentations more effective. There is, it seems to me, a need for diversity and competition as opposed to conformity and sameness which, I fear, would be the product of prescribing guidelines and formulae.

My suggestion in respect to the application form would be that the Commission should put more emphasis on the showing it requires of the applicant as to the effort it makes to provide a successful and useful service. It seems to me that information as to an applicant's methods and means of obtaining and developing program material, evidence as to the provision made for continuing study, research, experimentation and consultation in search of good programming would be relevant and more significant than statistical analyses of past and proposed programs. I would further suggest that more emphasis should be placed upon the provision made by the applicant to insure the integrity of its service. It seems to me the Commission might require specific information as to how an applicant insures that it is fully informed and that necessary safeguards are maintained regarding all matters accepted for broadcasting.

Recorded Tape

Starts on page 38

the layers so firmly stuck together the the only obvious way to get it off the hub was with a hacksaw.

A large percentage of tape cohered to a lesser degree. When played back at 15 ips, the layers separated with a "tearing" noise audible several feet from the machine. This irregularity caused very high flutter in the reproduced program. Oxide and binder debris of a dustlike nature accumulated near guides and heads. A re-play of the same tape showed no flutter, since the layers no longer cohered.

Rapid rewind of this stuck-together tape prior to actual playback proved to be a bad idea. Physical damage to the tape was often severe. As a result of this observation, tapes were always run through at 15 ips prior to use. The tape more nearly matching the color of our 1960 tape did *not* exhibit as much sticking of layers.

There did not seem to be any observed difference between tapes whose ends had been secured and those whose ends had been allowed to be free. Quite possibly this would have been different had the tape boxes been handled physically during storage instead of remaining in a fixed position.

Some of the tapes had paper or plastic leaders affixed to the ends. These made no difference in the condition of the tapes if the leaders were toward the periphery of the reel. Leaders at the hub end protected against the loading-slot corrugations, but a few turns of magnetic tape would have served just as well.

The story is different for the case of leader tape spliced within the body of a recording for the purpose of separating or identifying parts of it. In all cases, plastic leader tape caused no trouble. But paper tape had sometimes "crinkled" and the layers of magnetic tape adjacent had "set" in complementary corrugations. This was mainly noticeable in the tightly-wound "tail-out" reels.

No real trouble due to splices was observed. Occasionally one would cause a momentary disturbance as it wound away from an adjacent layer on the supply reel, but in each case re-play was satisfactory. Bear in mind that all splices were made by professionals with proper tools and material.

The tapes were stored in steel cabinets in normal air conditioned area. Temperature was held fairly constant but no real degree of humidity control was kept. There seems to be a damaging effect when humidity shock occurs. Again, today's newer, harder binding design and Mylar base tapes will survive these detrimental effects.

Conclusion

The deterioration of the ten-year-old cellulose acetate tape that was examined seems to be typical. Other sources of information report the same general data. The conclusion must be that this type of magnetic tape should not be considered where permanence or program is a prime requirement. Undoubtedly recordings would be irretrievable in the same manner that we have lost much of the footage of early motion picture films.

NEW TEKTRONIX 5-INCH WAVEFORM MONITOR

for Television Broadcasters

Rack-Mount Model Type RM527 • Portable Model Type 527

8" commercial picture monitor

Type 527

In a rack or console, this new Tektronix Waveform Monitor *adapts* easily to your control applications.

For example, in addition to conventional two LINE and two FIELD displays, you can choose from three calibrated time-base rates—at 0.125 H/CM, at 0.025 H/CM with 5X Magnifier, and at 0.005 H/CM with 25X Magnifier—which eliminates the need for time markers.

You can use the dual inputs differentially.

And you can observe bright displays at 4-kv accelerating potential over a full 7-centimeter by 10-centimeter viewing area.

Adaptable and versatile, this new Waveform Monitor also features:

- backporch dc restoration, with no color-burst distortion,
- sensitivity from 0.25 volt minimum to 1.6 volts maximum for 140 IRE units,
- response flat from zero to 5 megacycles, ±1 db, or new IRE Roll-off,
- amplitude linearity within 1% over full 7-cm of vertical deflection,
- internal voltage calibrator at 0.714 or 1.00 volt, ±1%, with long-term accuracy,
- field-shift pushbutton control,
- electronically-regulated power supplies.

The Rack-Mount Model is 5¼" high, 16¾" wide, 16" deep, weighs 30 pounds.

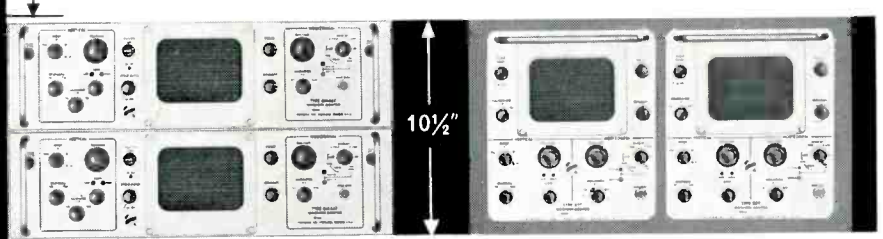
Type RM527 . . . . . **$1075**

The Portable Model is 9¾" high, 8½" wide, 16¾" deep, weighs 27 pounds.

Type 527 . . . . . **$1000 ***

(prices f.o.b. factory)

*Field case pictured is available at additional cost.



2-RM527's slide mounted

2-527's cradle mounted

For a demonstration of the all-around adaptability, operating convenience and dependability of either model of this new video waveform monitor, call your Tektronix Field Engineer.

Tektronix, Inc.

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TEKTRONIX ENGINEERING REPRESENTATIVES: Hawthorne Electronics, Portland, Oregon • Seattle, Washington. Tektronix is represented in twenty overseas countries by qualified engineering organizations. In Europe please write Tektronix Inc., Victoria Ave., St. Sampsons, Guernsey C.I., for the address of the Tektronix Representative in your country.

SEE THE TYPE 527 AT BOOTH 28B, N.A.B. SHOW

Cues and Kinks

A new name for an old column, formerly "Technical Hints," "Cues and Kinks" will be 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.

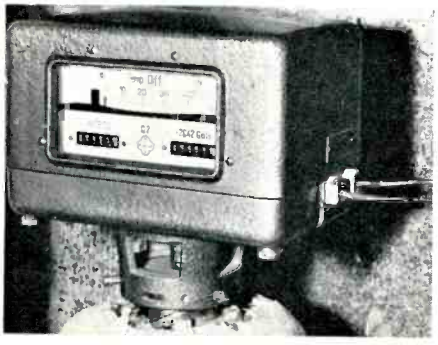
Cue and Kink No. 1: Broadcast Tube Identification.

I'm sure if you were to ask any visiting consulting engineer who is performing a proof of performance on the station, his favorite gripe is the lack of proper identification and records of replacement tubes, new or old. Check your area where the vacuum tubes are stored. Throw away the small tubes that you cannot depend on. Separate a special marked closed area for new tubes *only*. Create a card file or record book on power tubes and rectifiers. Detail hours of service, date of service, date out of service. Accurate marking of tube code numbers and dates on tubes help identification. Eliminate guess work, time and expense by proper preparation, stocking, inventory and complete records of broadcast service tubes.

A Consulting Engineer

Cue and Kink No. 2: Plant Air Conditioning Records

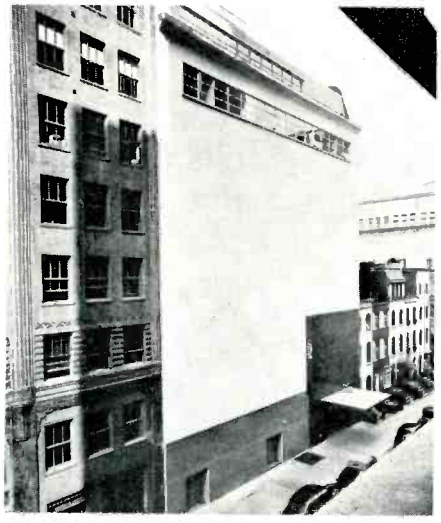
When the 1961 air conditioning season begins, Columbia Broadcasting System, Inc., New York, for the first time will be able to measure exactly how much chilled water for cooling is being consumed by each of two separate CBS divisions.



The Pollux Btu meter.

This information is a prerequisite for determining how much of the cost of this service should be charged to each division and for measuring the overall cost, per Btu ton, of chilled water used in the air conditioning system.

The scope of this building management problem is more clearly understood when it is realized that the two CBS divisions are physically separate from each other. Although consuming chilled water from a common source, they are in different buildings of CBS' multi-building Manhattan headquarters.



The CBS Radio Building in New York City.

The chilled water, in fact, is piped beneath busy 52nd St., from the CBS Radio Building at 49 East 52nd St., which houses the refrigeration plant, over to the main building at 485 Madison Avenue.

The data required to find out who should pay how much in this two-building situation and to determine over-all cost of the air-conditioning service will be obtained from a Pollux Mechanical Btu Meter. Pollux Btu meters are distributed in the United States and Canada by Air Conditioning Equipment Corp., New York City.

Although Pollux Btu meters are designed to measure consumption of either hot water for heating or chilled water for cooling, the meter at CBS has the sole function of measuring chilled water in air conditioning. With this meter, building management at CBS need only read the meter dial at regular intervals to assess proper charges to each division. Present plans anticipate monthly billing for Btu consupmtion based, of course, on monthly meter readings.

Industry News

NAB President Sees Broadcasting as a Profession

President LeRoy Collins of the National Assn. of Broadcasters said recently that the radio-television industry must be developed as a profession to "reach a pinnacle of responsibility we can all be proud of."

Addressing a luncheon at the Sixth Annual Conference of State Broadcasting Assn. Presidents, the former Governor of Florida said:

"Broadcasters, for better or worse, indeed have in their hands the most powerful means for influence ever known to man. How they use it depends upon broadcasters, themselves.

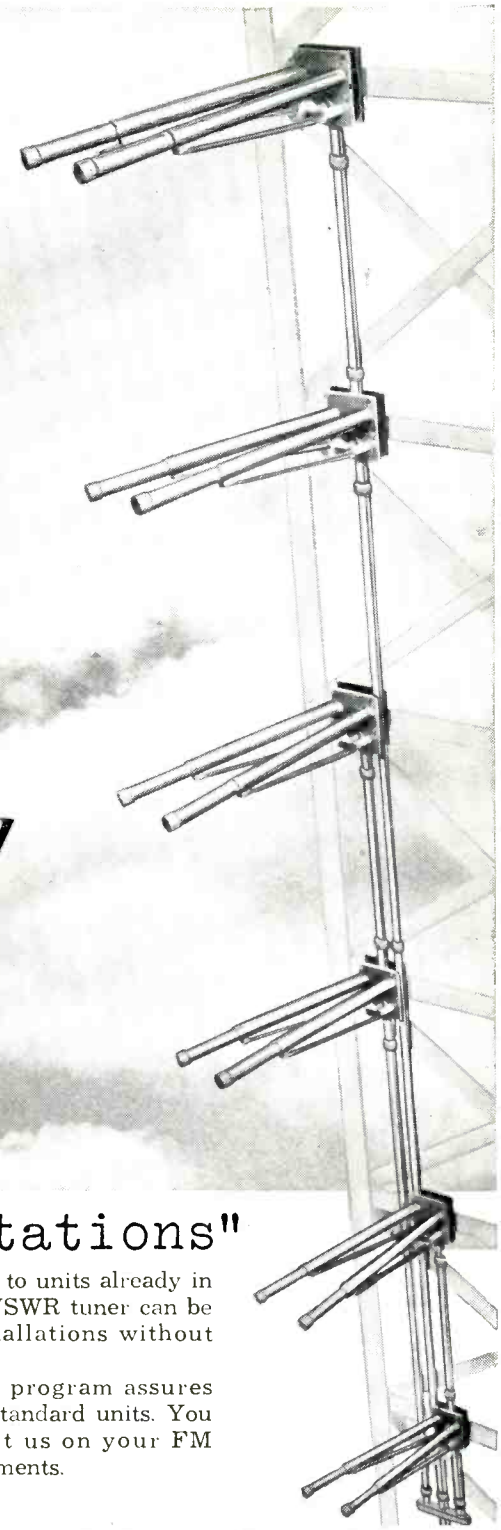
"Broadcasting, as I see it, is an art, not a craft. It must be developed as a profession, not as a trade. The artist—the professional man—has a higher responsibility than being a sharp operator in the market place.

ITA Appoints Marketing VP

Bernard Wise, president of ITA, Inc., has announced the election of R. Paul Comstock, Jr., formerly of Textron electronics, to the newly created position of vice-president, director of marketing. Mr. Comstock's responsibility will be to coordinate the sales and marketing activities of the three divisions of ITA —broadcast, government and industrial, and international.

ANDREW MULTI-V* FM ANTENNA

For Multiplex or Standard Service



Sales Office and Studios: Sheraton Plaza Hotel
Boston 16, Mass. Tel. CO 7-7080

General Offices and Transmitter: 750 South St.
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"Boston's Music Stations"

WCRB

AM 1330 / FM 102.5

January 22, 1960

Andrew Corporation
P.O. Box 296
Westwood, Massachusetts

Attention: Mr. John Wyman

Gentlemen:

As you know we recently purchased one of your six-bay Multi-V FM broadcast antennas, and over 1000 feet of your H-1 Heliax for use on our new FM installation on the WBZ-TV tower.

Our choice of the antenna was based on our previous experience with antennas of this type, which have always performed very well. We are happy to say that our new antenna and co-ax are exceeding our best expectations, and giving excellent coverage for both our main channel and our multiplex transmissions.

We do not hesitate to recommend highly this Multi-V Antenna to any broadcaster proposing new or improved FM facilities.

Yours truly,
Richard L. Kaye
Richard L. Kaye
Station Manager

RLK:chn

Also Special Background Music Via WCRB Music Service Inc.

"exceeding our best expectations"

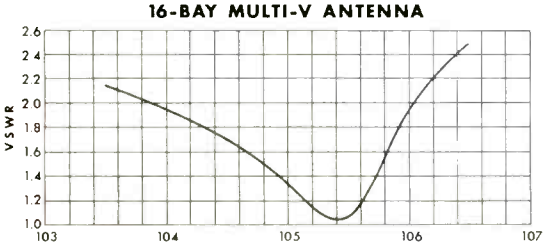
The ANDREW Multi-V is the standard of the industry. Over 353 Multi-V units have been installed to date, accounting for more than 50% of the stations presently licensed. Installations have been made in all climates and service is uniformly acclaimed both for standard and multiplex operation. De-icers are available for use when icing conditions occur and can be added to units already in service. Similarly, the VSWR tuner can be added to existing installations without modifying the antenna.

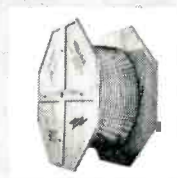
A new warehousing program assures quick deliveries of all standard units. You are invited to consult us on your FM antenna system requirements.

*U.S. PATENT 2,637,533 — Exclusive ANDREW design

Measured VSWR on a 16-bay production unit. Note bandwidth. VSWR tuner, Type 19893, is available for tuning out tower effect, thus, assuring optimum performance and eliminating need for field tuning individual bays.

16-BAY MULTI-V ANTENNA





HELIAX
the flexible air dielectric cable

HELIAX is the preferred cable for FM. Low VSWR, greater mechanical strength and flexibility have made it the favorite of broadcasters. Available in continuous lengths in diameters up to 3⅛ inches.

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P.O. Box 807, Chicago 42, Illinois
Boston • New York • Washington • Los Angeles • Toronto
ANTENNAS • ANTENNA SYSTEMS • TRANSMISSION LINES

Industry News

Bleeksma Named Vice-President at Ampex

Bleeksma

Pieter van den Berg, chairman of the board of the North American Philips Co., Inc., has announced the appointment of Jan Bleeksma as vice-president in charge of manufacturing of Amperex Electronic Corp., Hicksville, L. I., N. Y. Mr. Bleeksma's former position was plant manager.

A wholly owned subsidiary of the North American Philips Co., Amperex is engaged in the research and development, manufacture and sales of electron tubes and semiconductors for defense, communications and broadcast industry.

NAB Opposes UPI Bid For Radio Channel

The National Assn. of Broadcasters has asked the Federal Communications Commission to reject a request by United Press International for exclusive use of a special radio band for covering news events with two-way radio equipment.

The NAB said in comments filed with the FCC that the 25 kilocycles of frequency space (161.625-161.650 Mc) sought by the news service are part of a frequency band the FCC has proposed for exclusive use by broadcasters for remote control pick-ups. It added that the 150 kilocycles (161.625-161.775) the FCC has proposed for such use in itself is inadequate.

"Broadcasters are in need of more, not less, frequencies in this area," the NAB statement said. ". . . Additionally, channels for remote pick-up broadcast service should be on an exclusive basis in order to assure freedom from harmful interference."

"Unlike UPI," it added, "the broadcaster's need for remote pick-up frequencies is a constant one, not isolated to the special events category. Admittedly, the degree of utilization of broadcast remote frequencies will vary. However, in its proposal UPI has failed to take into account that the very occasions which give rise to its need for mobile frequencies are the same occasions that demand maximum mutilization of broadcast remote pickup frequencies.'

The NAB suggested that UPI's needs might be satisfied by development of "offset" frequency operations in the industrial services—use of a frequency at less than full channel separation.

RCA Offers Simplified Tape Recorder for Closed-Circuit TV Systems

A simplified television tape recorder, designed for use in educational, industrial, military and other closed-circuit TV systems, is announced by the Radio Corp. of America.

The new model will sell for roughly half the price of standard television tape recorders used in commercial broadcasting.

The RCA black-and-white television tape recorders now in use are available for $49,500.

This should give added impetus to the growing educational television market where it could be used to record for playback at any future time the lectures and demonstrations of gifted instructors, the company reports.

Papers Requested for AES Fall Convention

The thirteenth annual Fall Convention and Technical Exhibit of the Audio Engineering Society will be held Oct. 10-13 at the Hotel New Yorker in New York City.

New developments in audio presented at AES conventions receive world-wide attention from industry, government and audio engineers. The present-day cultural and technological significance of the field emphasizes the need for a constant up-to-date exchange of information among professional audio engineers. The Fall AES Convention provides this opportunity.

The Committee on Technical Papers is now accepting manuscripts for the four-day convention. Completed papers received by Aug. 15 will be reprinted before the conven-

tion. Manuscripts are also considered for publication in the *Journal of the Audio Engineering Society*. Abstracts of all papers to be included in the program must be sent before Aug. 15 to: Hermon H. Scott, Chairman Convention Committee, AES, 111 Powder Mill Road, Maynard, Mass.

Some topics suggested by the committee are:

Disc Recording and **Reproducing** (pick-ups, recording heads, effect of vertical angles); **Magnetic Tape Recording** (reproducing heads, tapes, decks, electronics, tape cartridges, tape duplication); **Loudspeakers and Systems** (single speakers, multi-unit speakers, best speaker characteristics for stereo, measurement of characteristics); **Artificial Reverberation**; **Stereophony** (discs, magnetic tape, multiplex systems); **Architectural Acoustics** (characteristics for stereo, studio, living rooms, auditoria, reverberation, sound re-enforcing, special requirements for stereo, stereo microphones, microphone placement); **Amplifiers** (tubes, transistors, transformers and other circuit elements); **Standards of Measurement and Performance**.

Also, **Electronic Musical Instruments** (tone generation, synthesis, modification); **Speech Analysis and Synthesis; Compression and Expansion; Bioacoustics; Psychoacoustical Engineering** (subjective aspects of sound reproduction, why audible results do not always agree with measurements); **Other Audio Applications** (sound re-enforcing systems, hearing aids, industrial and school systems, industrial noise); **Tuners** (AM-FM effects of bandwidth on fidelity, effects of time delay in multiplex stereo systems, distortion and crosstalk in multiplex stereo systems.)

Ampex Unveils New Television Tape Recorder

Ampex Corp. announces the introduction of a new television tape recorder specifically designed exclusively for closed circuit, non-broadcast applications in educational, industrial, and governmental fields.

In 1956, Ampex introduced the first commercially acceptable videotape recorder for broadcast use. Ampex will continue development and manufacture of standard broadcast video tape recorders.

NAB Urges Continuance of 50 Per Cent TV Tolerance

The National Assn. of Broadcasters has filed comments with the Federal Communications Commission on the agency's proposal which, in part, would reduce the allowable tolerance of television frequency deviation monitors from 50 to 10 per cent per 30 days operation.

Under this proposed rule making, NAB said, an undue hardship would be placed on television stations having equipment rated at 50 per cent tolerance in type approval accepted by the Commission. The proposed 10 per cent tolerance would require replacement or modification of frequency monitors now in use by television stations.

The Commission plans to incorporate this tolerance change under a proposed modification of Section 3.690 which also would grant television stations permission to use external frequency measuring sources for comparison with actual operating frequencies to insure compliance with FCC prescribed tolerances.

In filing the comments, NAB expressed general agreement with the proposed modification, but recommended that the 50 per cent tolerance factor previously in use be continued, in place of the 10 per cent tolerance in frequency measuring devices.

New Officials Named At Houston Fearless

Houston Fearless Corp. president, B. J. Shillito, has announced the appointment of Frank Nichol, president of the company's Federal Div. in Boston, as executive vice-president of the corporation.

Fred C. Mehner, former vice-president, board member and general manager of Acoustica Associates, has joined the Horkey-Moore Associates division of Houston Fearless Corp., as administrative general manager, according to Edward J. Horkey, HMA president.

Collins Elects Vice-President

Collins Radio Co.'s board of directors has elected Robert P. Dutton as vice-president, government representation, the company president, Arthur A. Collins, has announced.

Dutton, who was formerly manager of Collins' Washington, D. C., office, will continue to serve in that city as Collins' management representative.

Low-Band TV Transmitter To Be Installed in Canada

Arrangements have been completed for the building and installation of the most powerful low-band television transmitter in North America at the Canadian Broadcasting Corp.'s new station CBXT-TV, in Edmonton, it was announced by J. D. Houlding, president, RCA Victor Co., Ltd., Canadian subsidiary of the Radio Corp. of America.

Mr. Houlding said that the new CBC transmitter will be capable of broadcasting with an effective radiated power of 318 kilowatts, which is almost double that of any low-band station (covering Channels 2 to 6) in Canada and three times as powerful as any in the U. S.

"While signal power of low-band transmitters is limited by international agreement to 100 KW within 250 miles of the Canada-United States border," Mr. Houlding pointed out, "Edmonton, by its geographical location, avoids this ruling, and the CBC is using the increased power to give exceptionally wide coverage."

Fairchild Merchandises On Direct Mail Basis

Donald Plunkett, president of Fairchild Recording Equipment Corp., has announced that as part of a program of opening new avenues of distribution for high fidelity components, the Heath Co. of Benton Harbor, Mich., would merchandise on a direct mail basis some of the company's products.

Included in the merchandising plan are the recently introduced Fairchild 440-2K Turntable Kit, the base for this turntable, the 440CBW, and the new 500 anti-skating arm transport and SM-2 cartridge.

Advertisers' Index

Product News

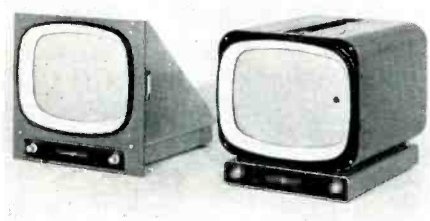
PROGRAM LINE AMPLIFIER

A compact, completely self-contained high quality medium power amplifier for program line feed has been produced by Hughey & Phillips, Inc., and is available through Graybar Electric Co. Employing only two vacuum tubes, the model LA-429A amplifier provides a power output of ten watts and requires only 3½ inches of rack space.

The performance of the LA-429A is said to exceed the requirements for feeding wired music circuits, and the modest cost and space requirements make it ideal for voice intercept networks, or time and weather service.

The chassis contains mounting arrangements for a cable equalizor and an output distribution network for feeding 20 lines. A total of 100 lines may be fed by a single amplifier.

For complete information request bulletin HPS-158 from the Graybar Electric Co., or the manufacturer, Hughey & Phillips, Inc., 3200 N. San Fernando Blvd., Burbank, Calif.

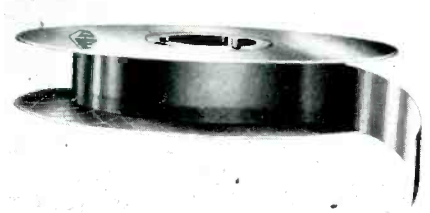


G-E DEVELOPS NEW MONITORS FOR BROADCAST STATION USE

A new series of quality television monitors has been developed by General Electric Co., Syracuse, N. Y., to fill the varied needs of TV broadcast stations.

The versatile models have been functionally designed to combine attractive styling and easy accessibility to all parts, and they operate with any standard monochrome camera.

For maximum flexibility in filling broadcast industry needs, the monitors are provided in cabinets or rack mounting, and in three screen sizes, 14, 17 and 21-inch.



FRICTION FREE TAPE REEL

A new friction free tape reel, designed to achieve the smooth and tight winding of tape that has long been desired by the recording industry, is being offered by Pro-Tex Reel Band Co., 200 Film Bldg., Cleveland 14, Ohio. A finely embossed design on the inner surface of both reel flanges is said to reduce reel-to-tape friction by 98 per cent on a solid flange reel, and additional reduction is attained on reels with flange ports.

The especially designed embossing eliminates flat spots and portions of loose winding that cause an extended tape lash to the recording and reproducing heads, which results in distortion.

NEW 35-KW TELEVISION TRANSMITTER

A new high band VHF 35-kw television transmitter, designed to enable broadcasters to achieve maximum effective radiated power with low-cost tube economy, has been introduced by Radio Corp. of America, 30 Rockefeller Plaza, New York 20, N. Y.

Since the new equipment retains the basic design of RCA's 25-kw transmitters, it is said that stations using such transmitters may convert to the higher power at relatively low cost. The transmitter, designated RCA TT-35, uses air-cooled triodes similar to the type 5762 tubes. Air-cooled linear broad-band amplifiers are used for the visual carrier, and air-cooled class C amplifiers for the aural carrier. Each amplifier consists of a single power stage using a cluster of triode tubes in grounded-grid circuit.

Sounding Board

Starts on page 4

clock so that there was no question as to the location of the minute hand. In the other plans the clock is more accurately located.

BETTY SHIMER,
Head of Radio/TV Dept.
Station WNTI-FM
Centenary College for Women,
Hackettstown, N. J.

Good point, and thank you.—Ed.

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.

EQUIPMENT FOR SALE

Commercial Crystals and new or replacement crystals for RCA, Gates, W. E. Bliley and J-K holders; regrinding, repair, etc. BC-604 crystals. Also A.M. monitor service. Nation-wide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 31, Temple, Texas. 12-60 tf

FOR SALE—EQUIPMENT Harkins Multiplex Equipment: FME-50 exciter with full frequency output. SCT-2 dual-subchannel generator for 49 kc and 67 kc. In good operating condition. Sub-channel generators have modulation and frequency monitors with each. $1500 FOB. Charles Balthrope, KEEZ, Tower Life Building, San Antonio, Texas. 3-61 2t

New TV camera tubes—6198 or 5527—$50.00. Alfred C. Denson WIBYX, P. O. Box No. 122, Rockville, Conn. 3-61 3t

See our new line at N.A.B. May 7th, Washington, D. C.—Large screen waveform oscilloscope. High resolution viewfinder, 70 models video monitors. Miratel Electronics, Inc., 1st St. S.E. & Richardson, New Brighton, St. Paul 12, Minnesota. 4-61 1t

50 KW Transmitter RCA 50D formerly used by KNX. Complete with spares and emergency generator at attractive price. Contact Ted Denton, KNX, 6121 Sunset Blvd., Hollywood 28, California. 4-61 1t

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Looking for cartridge tape equipment? Keep looking but don't buy until you investigate the new SPOT-O-MATIC. The first quality cartridge system at a realistic price is now in production. For advance information write, Sierra Electronic Enterprises, 6430 Freeport Blvd. Sacramento 22, California. 4-61 1t

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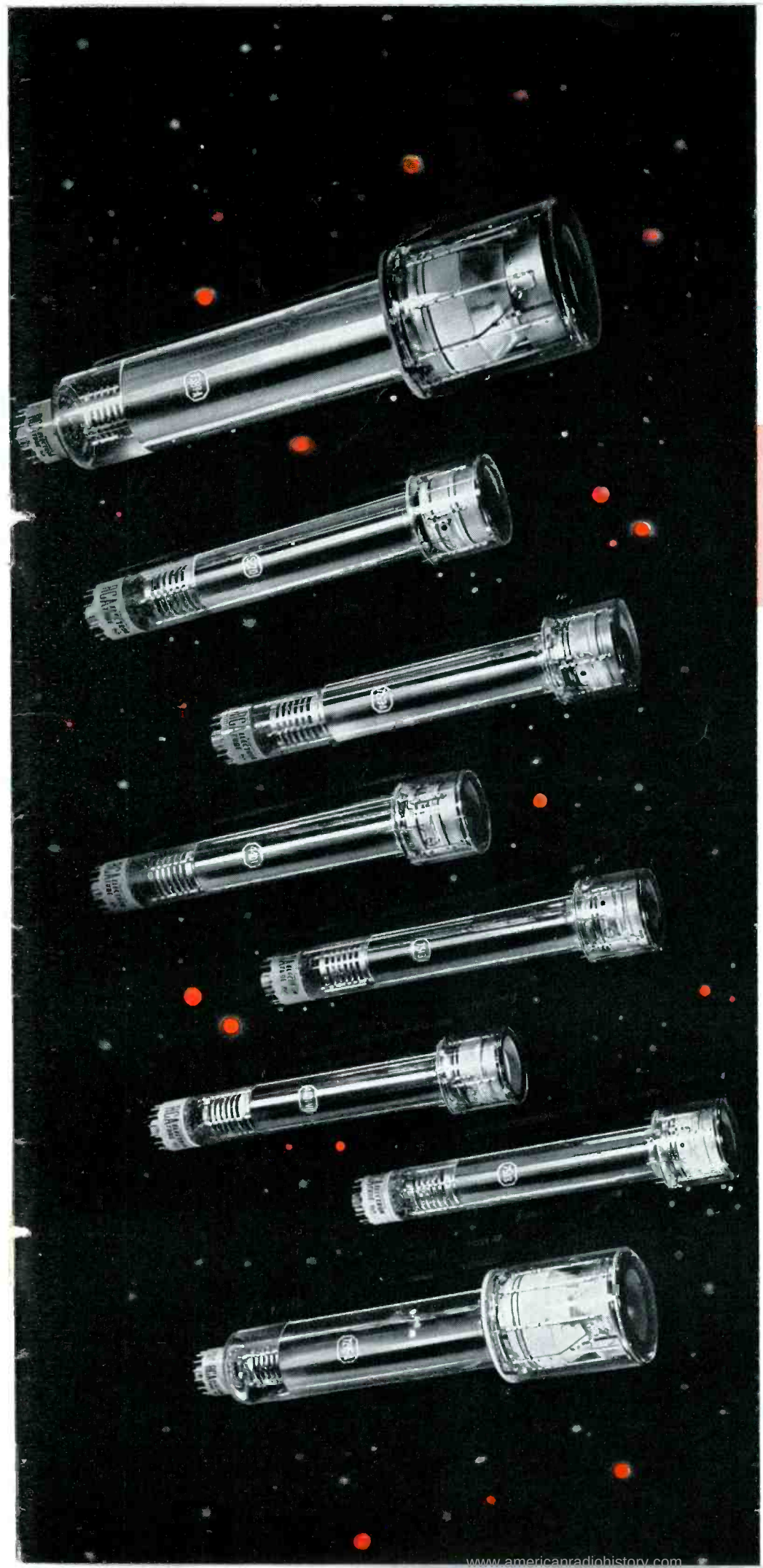

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Facts About RCA Image Orthicons

Type	Description
RCA-7295-A	Designed for tape and B&W studio broadcast use. High resolution capability and very high signal-to-noise ratio. Features new Field Mesh.
RCA-7389-A	Superior quality, extremely high signal-to-noise ratio. For tape recordings and exceptionally high-quality B&W pickup. Features new Field Mesh.
RCA-5820	Studio and outdoor pickup in B&W. The "standard" of broadcasting.
RCA-7293-A	Fine performance in B&W studio cameras. Features Field Mesh and anti-ghost, image-section design.
RCA-7513	Precision construction for color and high-quality B&W TV. Features Field Mesh.
RCA-4401	High signal output—for studio or outdoor color or B&W light level situations. Matched sets for max. performance in color cameras.
RCA-4401-V1	High sensitivity and high signal output. For B&W remote pickup at very low light levels.

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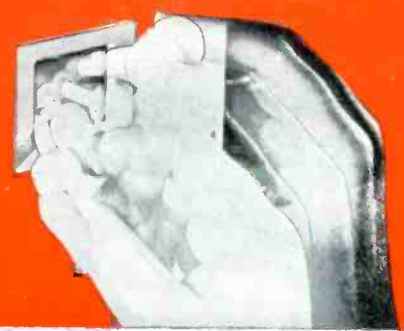
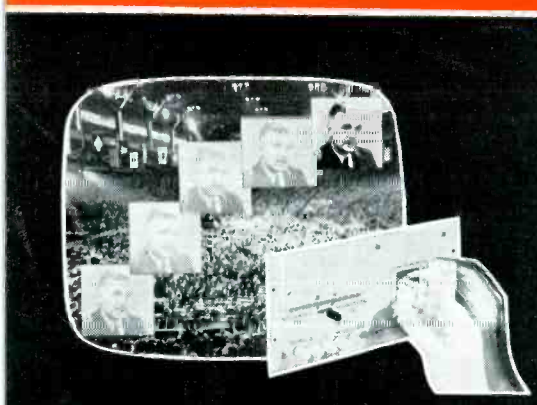
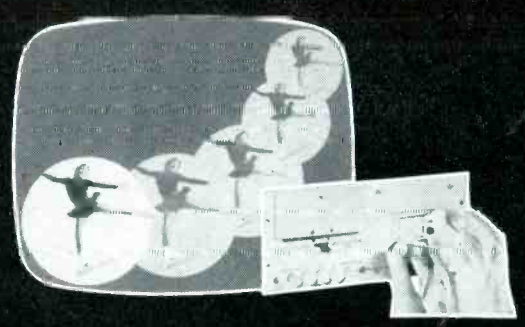


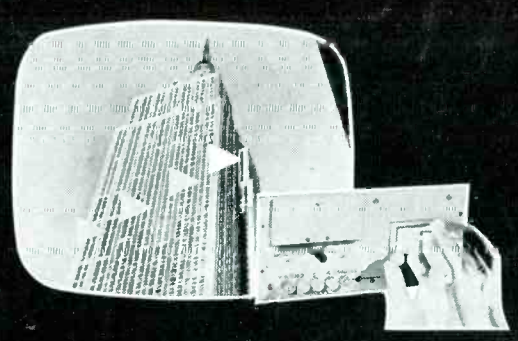
...with "Joy-Stick" Positioner and Built-In Fader



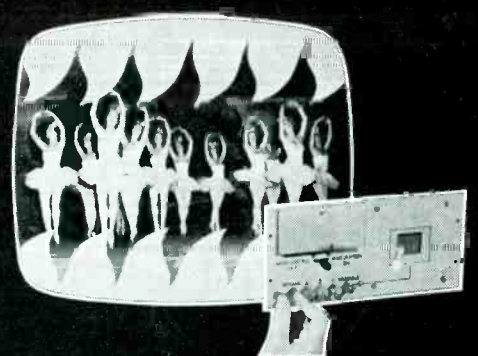
Insert May be Placed at Any Position on Raster



Electronic Spotlight



Electronic Pointer



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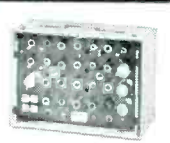
490WA1 Waveform generator. Generates keying signals for the 72 different wipes.



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