TM 11-2526

WAR DEPARTMENT TECHNICAL MANUAL

OSCILLOSCOPE BC-1060-A

WAR DEPARTMENT 11 NOVEMBER 1944

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 11 NOVEMBER 1944.

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11-587, Sig Base Maint Co
11-597, Sig Base Dep Co
11-617, Sig Radar Maint All Units
11-400, Sig AW Orgn (B) Co Hq Team
11-400, Sig AW Orgn (C) Radar Rep Plat
11-237, Sig Co Dep Avn
11-500, Sig Svc Orgn (EC) Radar Maint Team
IC 44: T/O-E 44-16, Hq and Hq Btry AAA Gun Bn (Mob)
44-17, AAA Btry Mob
44-116, Hq and Hq Btry AAA Gun Bn (Sem Mom)
44-117, AAA Btry (Sem Mob)
44-138, AAA SL Btry

(For explanation of symbols see FM 21-6.)

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LIST OF ILLUSTRATIONS

DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW —1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut —Use axes, handaxes, machetes.

3. Burn —Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. Smash—Panels, switches, tubes, case. Be extremely careful when destroying the cathode-ray tube; use small arms fire from a shielded position.

2. Cut—Wiring, cords, cables.

3. Burn —Manuals, charts, schematic diagrams.

4. Bend —Framework, chassis panels.

5. Bury or scatter—All of the above materials after destroying their usefulness.

DESTROY EVERYTHING

WARNING

HIGH VOLTAGE

is used in the operation

of this equipment.

DEATH ON CONTACT

may result if personnel fail

to observe safety precautions.

Operation of this equipment involves the use of high voltages which are dangerous to life. Any maintenance test requiring operation of the oscilloscope with either of its covers removed should be undertaken only by experienced repair personnel under conditions of adequate precaution against electric shock. Adjustment, replacement, or repair of parts inside the case should be done only with the power cord disconnected from the source of supply.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

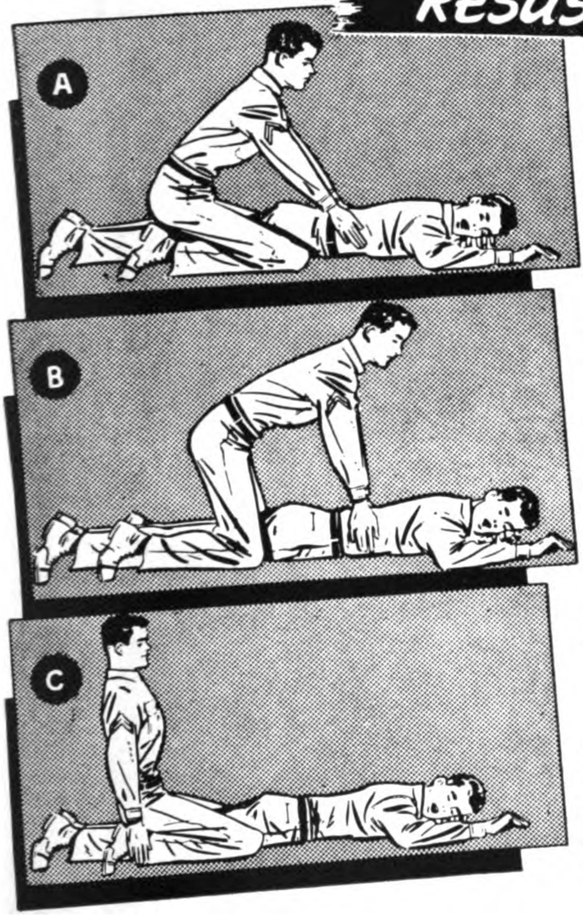
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not immediately possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm. Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up for hours.

8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY

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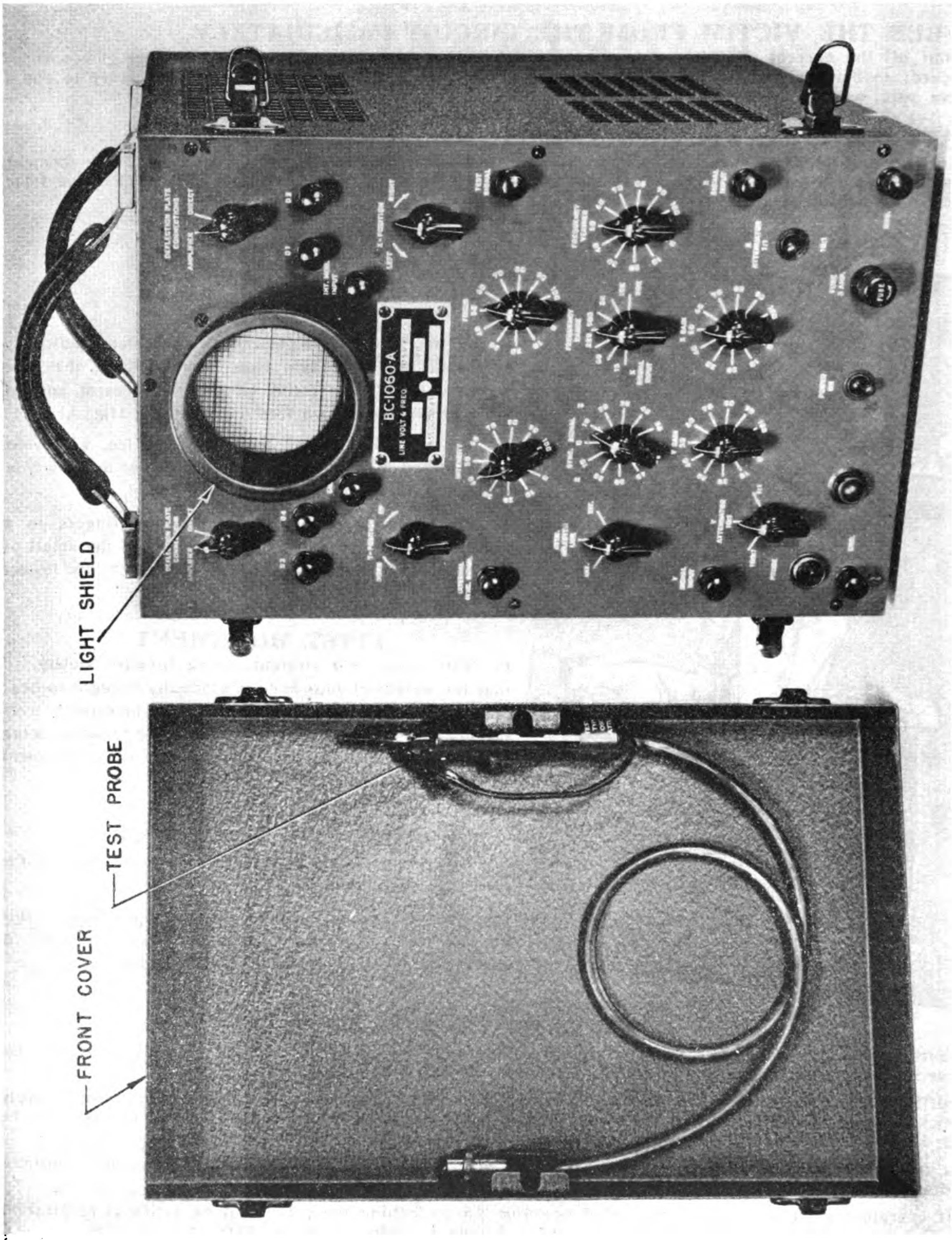


TL 47441

Figure 1. Oscilloscope BC-1060-A.

SECTION I
DESCRIPTION

1. ELECTRICAL CHARACTERISTICS.

a. Cathode-ray Tube.

Type 3GP1
Accelerating potential .... 1,000 volts

b. Input Impedance.

	Terminals		Probe		Direct (Balanced)		Direct (Unbalanced)	
(1) Y-axis	2 meg	30 mmf	1 meg	20 mmf	9.4 meg	20 mmf	4.7 meg	25 mmf
(2) X-axis	2 meg	30 mmf			9.4 meg	20 mmf	4.7 meg	25 mmf
(3) Z-axis	(Int. Mod.)		0.47 meg	30 mmf	(a-c impedance—0.28 meg		30 mmf)	

c. Maximum Input Potential.

(1) Y-axis through amplifier .... 400 volts maximum dc or peak signal.
(2) Y-axis direct to plates .... 400 volts maximum signal dc will position beam.
(3) X-axis through amplifier .... 400 volts maximum dc 50 volts peak signal.
(4) X-axis direct to plates .... 400 volts maximum signal dc will position beam.
(5) Z-axis (Int. Mod.) .... 400 volts dc, signal must never drive grid of cathode-ray tube positive.

d. Amplifier Frequency Response.

(1) Y-axis .... Sine wave response uniform within 3db from 20 cycles to 2mc at any attenuator setting. Square wave response at 50 cycles, 500 cycles, 25kc, 100kc to be equal to that shown in figure 2.
(2) X-axis .... Uniform within 3db from 10 cycles to 100kc at any attenuator setting.
(3) Z-axis .... Uniform within 3db from 30 cycles to 3mc.

e. Deflection Factor.

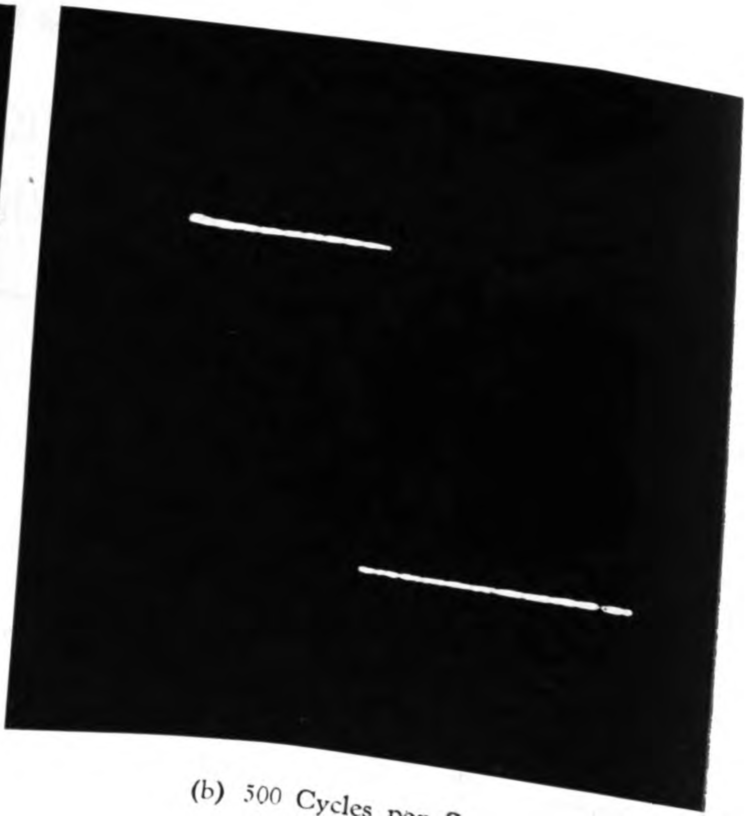
(1) WITH AMPLIFIER (MAXIMUM VALUES).
Y-axis terminals .... 0.1 volt rms/inch deflection.
Y-axis with probe .... 0.4 volt rms/inch deflection.
X-axis terminals .... 0.9 volt rms/inch deflection.
Z-axis .... 15 volts peak signal is sufficient to bring beam from just extinguished to normal brilliance.

(2) TO DEFLECTION PLATES.
Y-axis .... 75 volts rms/inch deflection ±20%.
X-axis .... 78 volts rms/inch deflection ±20%.

f. Sweep Generator.

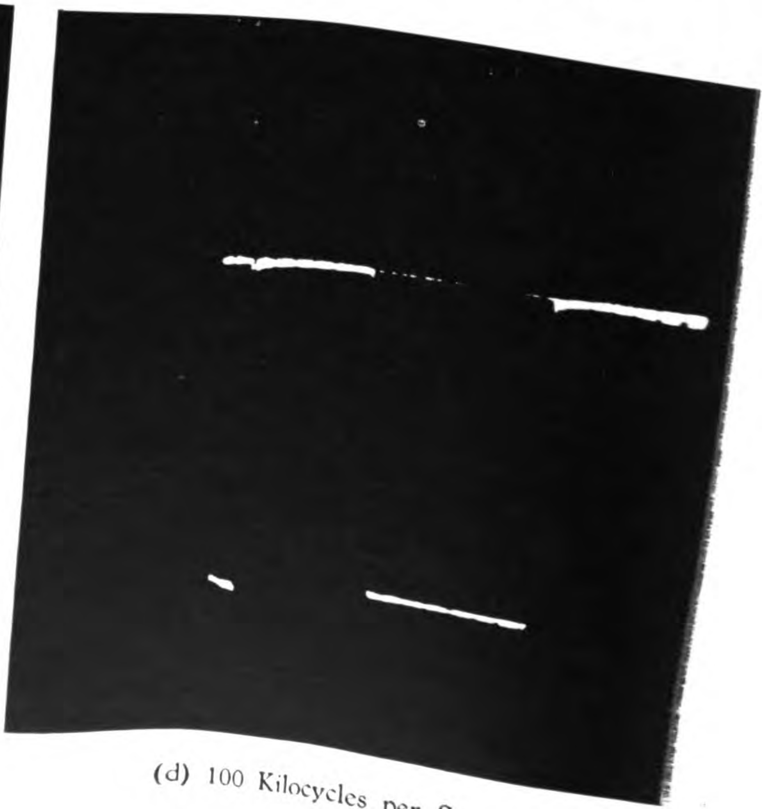
(1) Frequency range .... 15 to 30,000 cps
(2) Direction of sweep .... left to right

(a) 50 Cycles per Second



(b) 500 Cycles per Second

(c) 25 Kilocycles per Second



(d) 100 Kilocycles per Second

Figure 2. Typical square-wave response.

TL 4744

(3) Synchronizing signal sources .... INTernal (Y signal)
LINE
EXTernal

(4) Synchronizing polarity .... either polarity of synchronizing voltage will synchronize sweep.

g. Power Supply Source.

(1) Potential .... 105-125 volts

(2) Frequency .... 50-60 cycles

(3) Power consumption .... 150 watts

(4) Fuse protection .... 3 amperes

2. PHYSICAL CHARACTERISTICS.

a. Height .... 15½ inches over-all

b. Depth .... 17 inches over-all

c. Width .... 10⅜ inches over-all

d. Weight .... 60 lb

e. Finish .... olive drab with black hardware

3. GENERAL DESCRIPTION.

a. This oscilloscope is an instrument for plotting a visual curve of one electrical quantity as a function of another on the screen of a cathode-ray tube. It consists of a cathode-ray tube, amplifiers for producing the deflection voltages, a linear time-base or sweep generator, and associated power supplies. Figure 3 gives a block diagram of the oscilloscope showing the functional relationship of the different sections. Signals may be directly connected to the deflection plates when frequencies to be observed are above the useful limits of the amplifiers.

b. The Y-axis or vertical deflection amplifier has uniform frequency response from 20 cps to 2 megacycles. The X-axis or horizontal deflection amplifier has uniform response from 10 cps to 100 kilocycles. Both amplifiers have input attenuators and distortionless gain controls. The Y-amplifier has an input connection for a test probe which reduces the input capacitance, with a loss of sensitivity, but which provides freedom from stray pick-up. The X-amplifier can be used to amplify the linear time-base or an external signal. Provision is made for modulating the electron beam of the cathode-ray tube by external signals at the INT. MOD. INPUT post.

c. A light shield is provided which may be slid forward from the panel a distance of 4 inches when the pattern on the screen must be viewed under adverse lighting conditions. When not in use, it may be slid along its own axis into the body of the instrument.

d. The unit is housed in a case with a removable front cover which serves to protect the front panel and cathode-ray tube when the unit is not in use. The test probe and operating instructions are held inside the front cover by clips.

4. CONTROLS.

All controls and terminals of the oscilloscope are located on the front panel. Related controls are grouped together where possible. In general, the X-axis controls occupy the right side of the panel and the Y-axis the left side. Each group of controls will be considered separately.

5. BEAM CONTROLS.

The beam controls comprise those which adjust the intensity, focus, and position of the fluorescent spot on the screen of the cathode-ray tube.

a. Power Switch. The power switch is located on the front panel to control the power supply to the instrument. When this switch is thrown to the POWER ON position, the pilot light should come on. This switch should always be thrown to the OFF position before the instrument is removed from the cabinet.

b. Intensity Control. The INTENSITY control

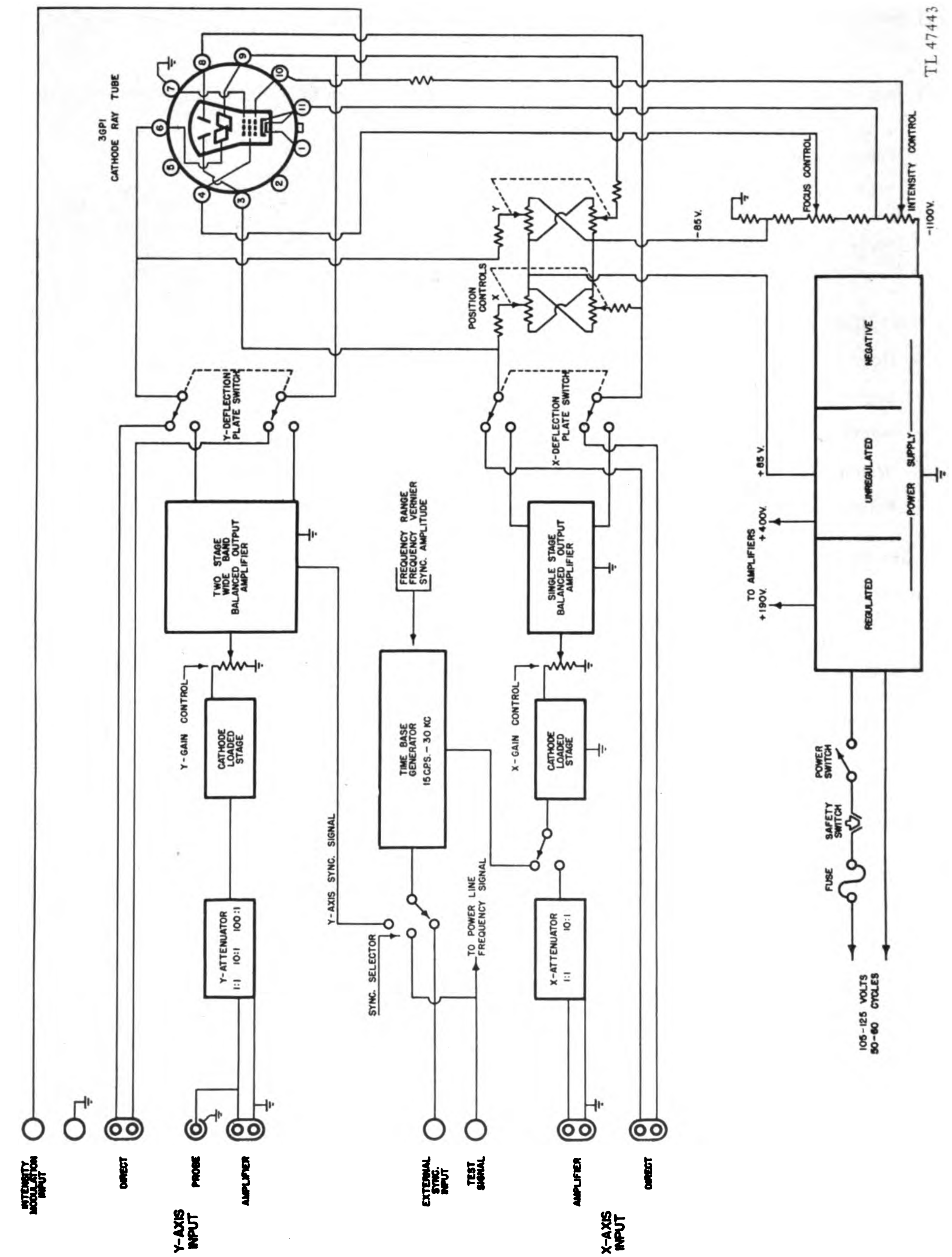


Figure 3. Block diagram.

sets the bias between control electrode, or grid, and cathode of the cathode-ray tube and thus determines the beam current. It is desirable to keep the intensity of the trace as low as is consistent with convenience in use in order to conserve tube life. A sharply focused line or spot of high intensity should never be permitted to remain stationary on the screen for any considerable period.

c. Focus Control. The FOCUS control serves to set the potential of the focusing electrode of the cathode-ray tube. There will be a setting for optimum focus at each intensity level.

d. X- and Y-position Controls. The X- and Y-POSITION controls adjust the location of the spot or trace on the screen in the horizontal and vertical directions respectively. Each control is marked with the direction of motion of the spot it produces.

6. LINEAR TIME-BASE CONTROLS.

The linear time-base or sweep oscillator controls include the FREQUENCY RANGE and FREQUENCY VERNIER controls, SYNC. SELECTOR switch, SYNC. SIGNAL amplitude control, and the EXTERNAL SYNC. SIGNAL terminal.

a. Frequency Range Control. (1) The setting of the FREQUENCY RANGE selector determines the range of sweep frequencies which operation of the FREQUENCY VERNIER control will produce. The approximate limits of each of the six ranges are given by the numbers to either side of the dial pointer and are as follows: 15, 60, 220, 900, 3K, 10K, 30K. The letter "K" represents kilo or 1,000; thus 30K represents 30,000 cycles per second.

(2) When the control is in the extreme counterclockwise position marked X SIGNAL INPUT, the sweep circuit is prevented from oscillating, and the input of the X-amplifier is connected to the X SIGNAL INPUT terminals.

b. Frequency Vernier Control. When the proper frequency range has been selected with the FREQUENCY RANGE control (subpar. **a** above), the exact frequency necessary to stabilize the pattern on the screen can be obtained by means of the FREQUENCY VERNIER control.

c. Sync. Selector Switch. The source of signal to which the sweep is synchronized is determined by the setting of the SYNC. SELECTOR. The following sources of synchronization are available: EXTernal SIGNAL, power LINE frequency, and INTernal or Y-signal.

d. Sync. Signal Control. This control permits the adjustment of the synchronizing signal to the optimum value.

e. External Sync Signal Terminal. This terminal provides for the connection of an external source of synchronizing voltage. It is used in conjunction with the EXTernal position of the SYNC. SELECTOR switch.

7. Y-AMPLIFIER.

The Y-amplifier consists of an input attenuator, a cathode-loaded input stage, a stage of amplification, and a balanced phase-inverter deflection amplifier. The amplifier has uniform frequency response from 20 cps to 2mc. This frequency response is maintained for any setting of the gain control or input attenuator. The over-all gain of the amplifier is about 300 times. A typical response curve is shown in figure 4. Figure 2 shows typical square-wave response at 5 cycles, 500 cycles, 25 kilocycles, 100 kilocycles. The Y-amplifier controls consist of the Y SIGNAL INPUT terminal post, the test PROBE terminal, the Y ATTENUATOR control, and the Y GAIN control.

a. Y-signal Input Terminals. The signal used to provide Y-axis or vertical deflection will be connected to either the Y SIGNAL INPUT terminals or the test probe. When the test probe is not in use, it should be removed from its terminal, since it will add input capacity to the Y SIGNAL INPUT terminals. Conversely, when the probe is used, nothing should be connected to the Y SIGNAL INPUT terminal.

b. Y-attenuator Control. A high-impedance attenuator of the compensated resistance-capacitance type is provided at the input of the Y-amplifier to reduce the input signal voltage, if necessary, to a value that will not overload the amplifier. The attenuation ratios provided are approximately 100:1, 10:1, and 1:1.

c. Y-gain Control. A low-impedance, continuously variable attenuator supplies a continuous adjustment of the amplitude of deflection. The operator will notice that the signal amplitude can never be reduced to zero with this control, but that the amplitude in the extreme counterclockwise position is about 10 percent of that for the full gain position.

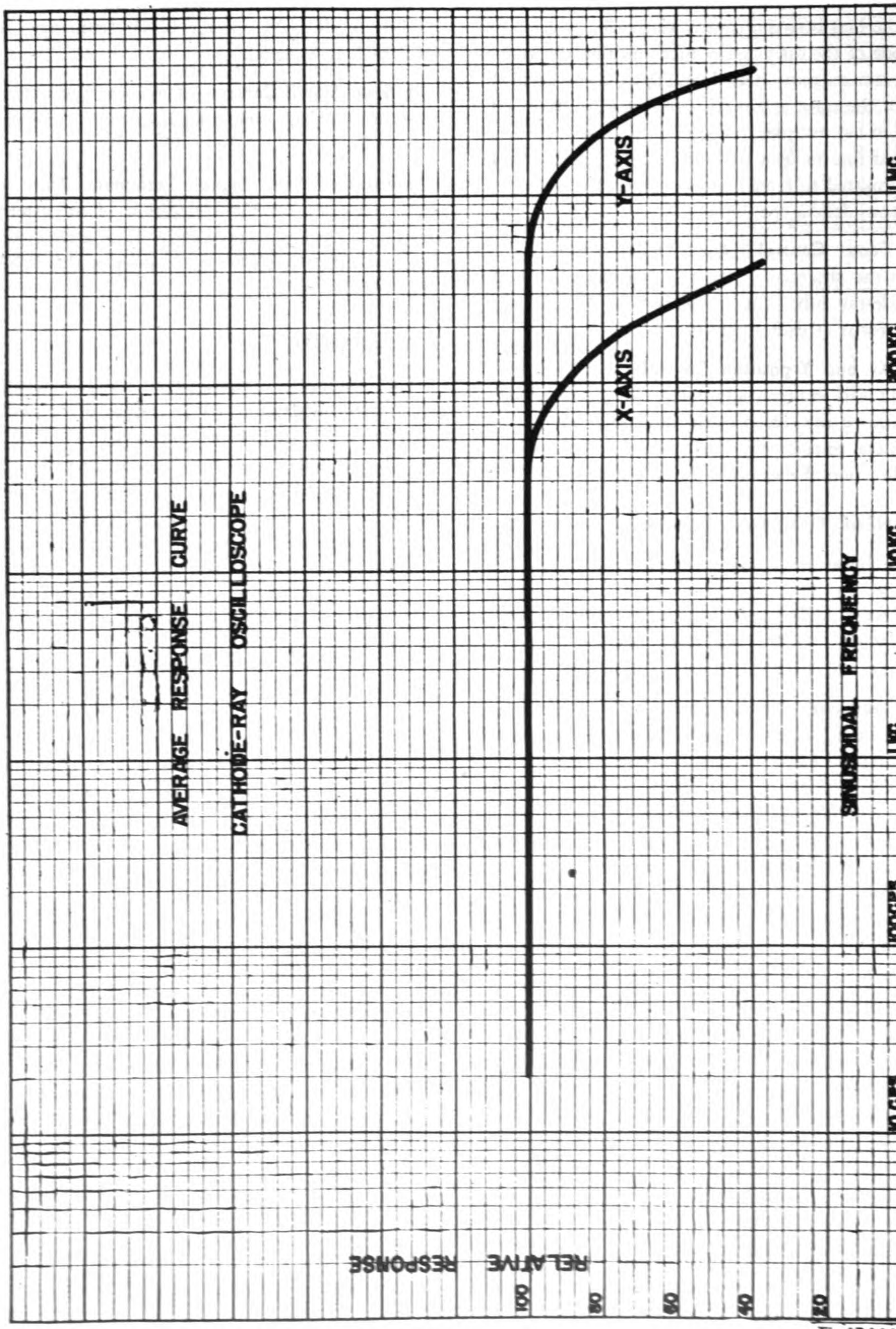


Figure 4. Response curve.

This feature in conjunction with the use of the Y ATTENUATOR prevents overloading of the input stage of the amplifier as long as the pattern is no larger than full screen. Thus, the operator will not be deceived by distortion caused by overload in the amplifier so long as the pattern is kept entirely on the screen.

d. Test Probe Terminal. The test PROBE terminal provides a means for connecting the test probe which is provided to the input circuit of the Y-amplifier. When connected, the probe is in parallel with the Y SIGNAL INPUT terminals (subpar. **a** above).

e. Test Probe. The test probe consists of a compensated 4:1 attenuator in an insulated probe supplied with a length of coaxial cable and a connector. The input capacitance of the test probe is 20 mmf, and the input resistance is 1 megohm. This makes it possible to connect it to relatively high-impedance points without serious loading effects.

8. X-AMPLIFIER.

The X-amplifier consists of an input attenuator, a cathode-loaded input stage, and a phase-inverter deflection amplifier. The X-amplifier controls consist of the X SIGNAL INPUT terminal, the X GAIN control, and the X ATTENUATOR.

a. X-signal Input Terminal. An external signal to be applied along the X- or horizontal axis should be connected between the X SIGNAL INPUT terminal and ground. This terminal is connected to the input of the amplifier only when the FREQUENCY RANGE switch is in the X SIGNAL INPUT position (par **6a**).

b. X-attenuator. The input circuit of the X-amplifier incorporates a two-position high-impedance attenuator with attenuation ratios of 10:1 and 1:1. If the input voltage is over 7 volts peak, the attenuator should be set in the 10:1 position. *For input voltages over 70 peak, an external attenuator should be used, since voltages in excess of this value will overload the input stage.*

c. X-gain Control. The X GAIN control is a continuously variable low-impedance attenuator which operates in conjunction with the X ATTENUATOR to determine the amount of deflection along the X-axis.

9. DIRECT DEFLECTION CONTROLS.

a. When frequencies above the useful limits of the amplifiers are to be observed (about 5 megacycles and 500 kilocycles for the Y- and X- amplifiers respectively), direct connections to the deflection plates are available to extend this range.

b. The direct deflection controls consist of the X and Y DEFLECTION PLATE CONNECTION switches and the X and Y DEFLECTION PLATE CONNECTION terminals. Since the action of these controls is the same for either the X- or Y-axis, they will be considered together.

c. The X- and Y-deflection plate switches allow the selection of deflection plates either directly, with a deflection factor of approximately 75 dc volts/inch, or through the amplifiers. The deflection plates can be directly connected to the front panel terminal posts, but position voltages are always applied through 4.7-megohm resistors. It is therefore possible to examine still larger signals by a-c coupling and positioning either up or down. When an unbalanced signal source is used, the deflection-plate terminal to which signal voltage is not applied should be connected to ground by means of a separate lead wire.

10. TEST SIGNAL TERMINAL POST.

A sinusoidal signal of power line frequency having an amplitude of approximately 2.2 volts peak to peak is provided at the front panel as a source of test signal.

11. Z-AXIS (INTENSITY MODULATION).

a. Provision is made for coupling a signal to the control electrode or grid of the cathode-ray tube for the purpose of controlling the beam current and thus the intensity of the pattern on the screen. This provides a method of introducing timing or blanking signals to blank or intensify sections of the trace.

b. Signals for intensity modulation are connected between the input post marked INT. MOD. INPUT and ground. The input impedance of the INT. MOD. INPUT terminal is 20 mmf and 470,000 ohms. The response of the beam to modulation is uniform within 3 db from 30 cycles to 3 megacycles. A signal within this frequency range having a peak value of 15 volts will bring the beam from a just extinguished condition to normal brilliance on its positive phase.

SECTION II
INSTALLATION AND OPERATION

12. INSTALLATION.

a. General. The oscilloscope is shipped with all tubes clamped in place. It is made ready for use by unpacking, removing the front cover, and connecting the power cord to a 105-125-volt, 50-60-cycle power source. It is desirable to connect one of the GND. terminals of the instrument to the ground system of the equipment with which the oscilloscope is to be used. A heavy conductor should be used for this connection, and it should be kept as short as conveniently possible.

b. Power Source Precautions. When external voltage or frequency-changing or regulating devices are used in connection with the oscilloscope, such devices should be located at least 6 feet from the oscilloscope to avoid magnetic deflection distortion.

13. BEAM CONTROLS.

When the oscilloscope has been installed as in paragraph **12** above, it may be put into operation by the following procedure:

a. Turn power switch to the POWER ON position. Pilot light should come on.

b. After a 30-second warm-up period, advance the INTENSITY control until a spot or line appears on the screen.

c. Adjust the FOCUS and INTENSITY controls until the pattern is in focus and of moderate intensity. If necessary, slide the light shield forward to screen objectionable light from the face of the tube. The oscilloscope is now ready for use.

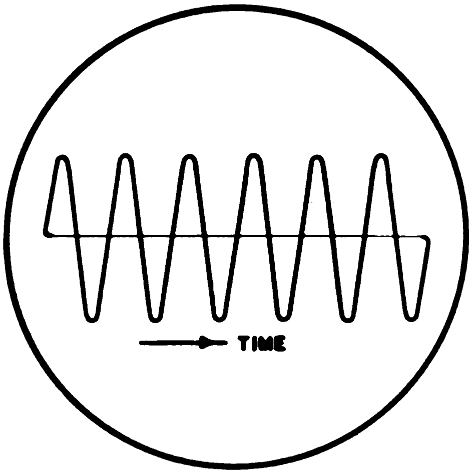
14. Y-AXIS.

Y-axis deflection may be accomplished by applying the signal to be observed to one of the following: Y SIGNAL INPUT terminal, test probe, or direct deflection (D_3, D_4) terminals. The choice of the point to which the signal is applied is covered by the following sections.

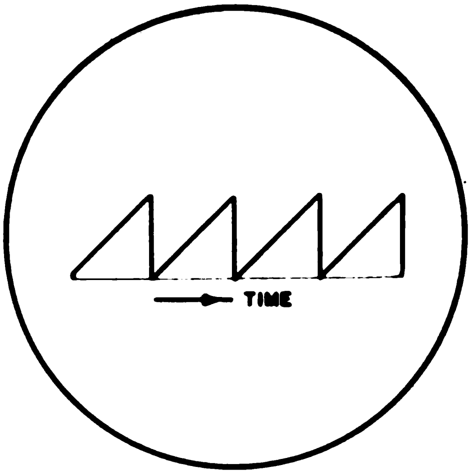
a. Y-signal Input. Signals for Y-deflection within the frequency and voltage range of the Y-amplifier (sec. I, pars. **1c** and **d**) are normally connected between the Y SIGNAL INPUT terminal and the GND. terminal. The amplitude of deflection produced then depends upon the Y ATTENUATOR and Y GAIN controls, and these are adjusted until the desired deflection is produced. The DEFLECTION PLATE CONNECTIONS switch must be set on AMPLIFIER during the use of the Y SIGNAL INPUT terminal.

b. Test Probe. When the signal for Y-axis deflection is such that a minimum of capacitive loading by the oscilloscope is desirable, the test probe may be used. The test probe is held in the front cover by clips and may be removed and attached to the PROBE terminal on the front panel. The use of the test probe is then identical with that of the Y SIGNAL INPUT terminal. *The Y SIGNAL INPUT terminal and the PROBE terminal are in parallel.* When either is used as a signal input point, the other should be disconnected. When not in use, the test probe should be removed and placed in the front cover clips provided.

c. Direct Deflection. (1) Signals may be connected directly to the Y-deflection plates of the cathode-ray tube by using the deflection plate terminals near the top left of the panel as the signal input point. The DEFLECTION PLATE CONNECTIONS switch must be set in the DIRECT position to connect the Y-deflection plates to these terminals. If the signal voltage is unbalanced (that is, if it is a voltage with respect to ground), one of the DEFLECTION PLATE CONNECTIONS must be grounded and the signal connected to the other one. If the signal is balanced to ground, each signal lead is connected to a deflection plate terminal. If the signal is directly coupled to the deflection plate terminals, direct-current voltages from

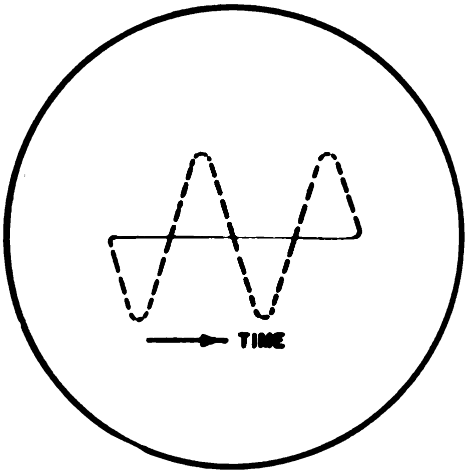


Y-SIGNAL: 60 cps SINEWAVE
X-SIGNAL: 10 cps LINEAR SWEEP



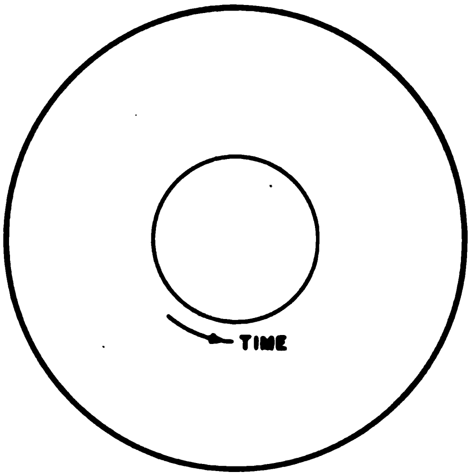
X-SIGNAL: LINEAR SWEEP
Y-SIGNAL: SAWTOOTH WAVE FOUR TIMES SWEEP FREQUENCY

C



X-SIGNAL: LINEAR SWEEP
Y-SIGNAL: SINE WAVE, TWICE SWEEP FREQUENCY
Z-SIGNAL: (INT. MOD.): SQUARE WAVE ABOUT 20 TIMES SWEEP FREQUENCY

D



X-SIGNAL: SINE WAVE
Y-SIGNAL: SINE WAVE SAME FREQUENCY AND AMPLITUDE BUT 90° OUT OF PHASE

TL 47445

Figure 5. Typical cathode-ray oscilloscope patterns.

the signal source will deflect the beam from its normal centered position. If this is undesirable, the signal may be capacitively coupled to the DEFLECTION PLATE CONNECTIONS by inserting a capacitor between the signal voltage and the terminal.

(2) The Y-POSITION control will then control the position of the pattern in a vertical direction. If capacitive coupling of the signal is not used, the Y-POSITION control will not function, and the direct-current voltage of the signal will determine the location of the pattern.

15. X-AXIS.

X-axis deflection may be accomplished by the following: the sweep generator or linear time-base; an external signal at the X SIGNAL INPUT post; or an external signal at the direct deflection terminals. The operation of the sweep generator is covered in paragraph **16**.

a. X-signal Input. (1) When the FREQUENCY RANGE control is set to its extreme counterclockwise position marked X SIGNAL INPUT, the X-amplifier is connected between the X SIGNAL INPUT terminal and the GND. terminal.
(2) The amplitude of deflection produced then depends upon the X ATTENUATOR and the X GAIN controls. These controls are adjusted until the desired deflection is produced. The range of signal voltage and frequency which may be used to give X-axis deflection is covered in section I, paragraph **1**. *If these values are exceeded, the X-amplifier may be overloaded and the pattern distorted.* The DEFLECTION PLATE CONNECTIONS switch must be set on AMPLIFIER during the use of the Y SIGNAL INPUT terminal.

b. Direct Deflection. Deflection by connection directly to the X-deflection plates may be accomplished by connecting the input signal to the deflection plate terminals near the top right of the panel. The DEFLECTION PLATE CONNECTIONS switch must be set to the DIRECT position. The information on signal connections in section II, paragraph **14c**, applies to the X-deflection plates also.

16. SWEEP GENERATOR.

The sweep generator is connected to the X-amplifier when the FREQUENCY RANGE control is set in any position other than that marked X SIGNAL INPUT. It produces a horizontal deflection of the beam by applying a sawtooth voltage to the X-deflection plates through tht X-amplifier. The appearance of this sawtooth wave is shown in figure 5. The resulting horizontal deflection consists of a uniform motion of the beam from left to right on the face of the tube, followed by a rapid return of the beam to its starting point. This is repeated at a rate depending upon the setting of the FREQUENCY RANGE and the FREQUENCY VERNIER controls. When the sweep is used to provide a time-base for some Y-axis deflection, is is ordinarily adjusted by means of the FREQUENCY RANGE and FREQUENCY VERNIER controls to have the same frequency as the Y-axis deflection frequency, or some *integral fraction* of that frequency, such as one-half, or one-third. When both frequencies are the same or, as noted above, the sweep is some *integral fraction* of the Y-axis deflection, then a stationary pattern will be observed on the screen. Examples of this condition are figures 5 and 6.

a. Synchronizing. To hold the pattern stationary on the screen, it is necessary to apply a signal to the sweep generator of the same frequency as that of the pattern it is desired to hold. This is accomplished by means of the SYNC. SIGNAL control, the SYNC. SELECTOR, and the EXTERNAL SYNC. INPUT terminal.

b. Sync. Selector. (1) The SYNC. SELECTOR switch determines the source of the signal used for synchronizing. In the EXTernal position, the switch permits synchronizing the time-base oscillations with a signal connected between ground and the EXTERNAL SYNC. SIGNAL input post. The amount of signal necessary is discussed in section II, paragraph **16d**.

(2) When the switch is thrown to the LINE position, the sweep may be synchronized to the frequency of the power line supplying the instrument.

(3) When the selector is in the INT. position, a signal is picked off from a suitable point in the Y-amplifier and used to synchronize the sweep.

c. Sync. Signal Control. This control allows the amount of synchronizing voltage applied to the grid of the gas triode to be adjusted to the optimum value to insure good synchronization. In addition, the polarity of the synchronizing signal upon which the synchronization occurs may be selected. In the sector of the control marked ±, the sweep synchronizes on the negative half-cycle of an external syn-

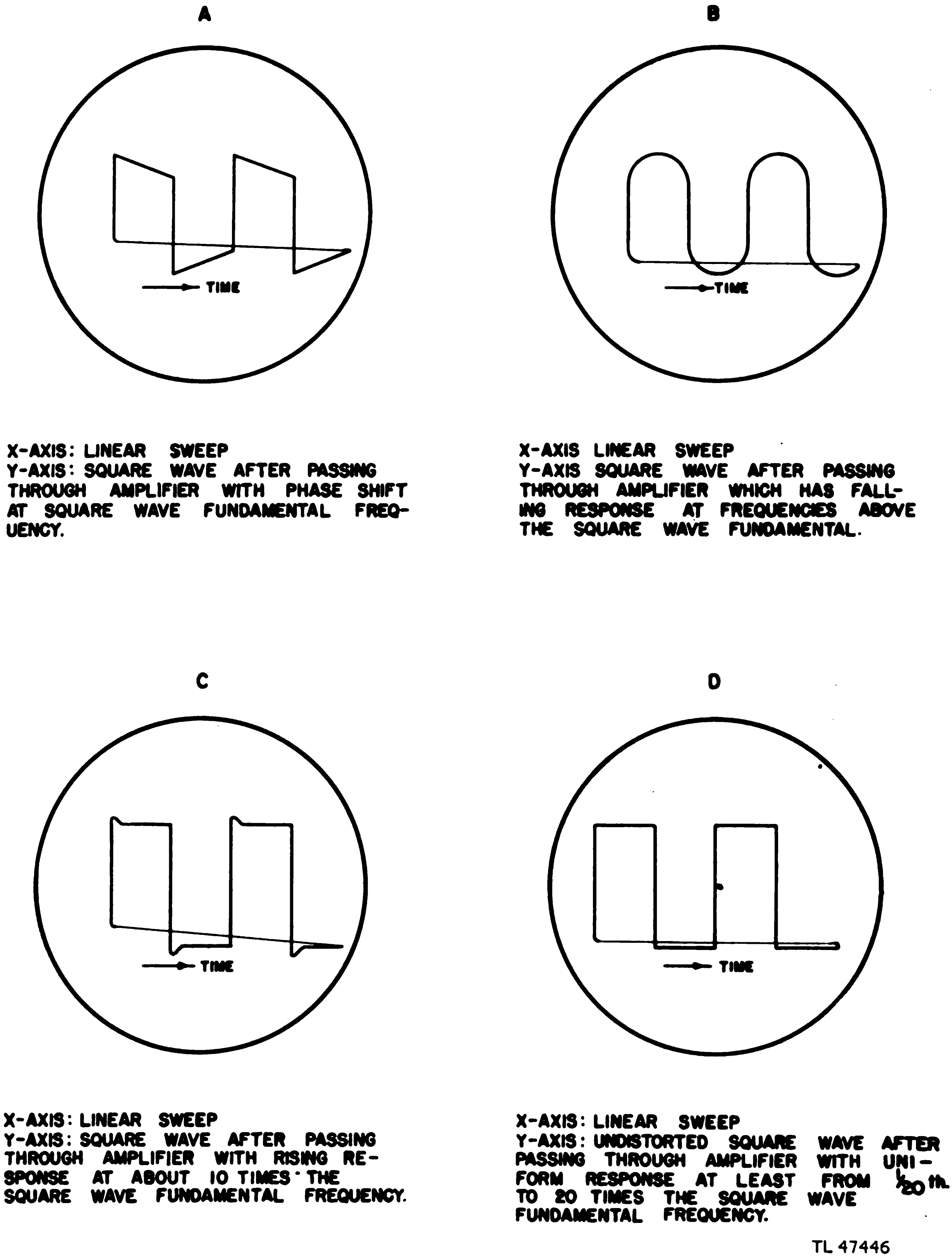


Figure 6. Typical cathode-ray oscilloscope patterns.

chronizing signal or the positive half-cycle of an internal synchronizing signal. In the sector of the control marked $\mp$, the reverse is true. Thus, synchronization from nonsymmetrical waveforms such as short pulses, etc., is assured.

CAUTION: The minimum amount of synchronizing voltage which gives good synchronization should always be used. Excess synchronizing voltage at the grid of the gas triode may introduce nonlinearity in the sweep.

d. External Sync. Signal Input. When synchronization is desired from a signal other than the power line or that amplified by the Y-amplifier, that signal voltage should be connected to the EXT. INPUT terminal. Under such conditions, the SYNC. SELECTOR (sec. II, par. **16b**) should be thrown to the EXTernal position.

CAUTION: Excessive synchronizing voltage fed to this terminal may be coupled into the X- or Y-amplifiers and cause distortion. The volts (peak to peak) should be the maximum external synchronizing signal ever used. The impedance of the external synchronizing signal circuit is 1.5 megohms. If large values of external synchronizing voltages are available, a suitable series resistor should be connected to the external synchronizing signal input terminal to reduce this to the maximum value given above.

17. INTENSITY MODULATION.

a. Intensity Modulation Input Terminal. The electron beam may be modulated in intensity by a signal applied to the INT. MOD. INPUT terminal and a GND. terminal. For adequate modulation, a signal of about 15 volts peak is necessary. The positive polarity of the applied signal will increase the intensity of the pattern, and the negative polarity will decrease it.

b. Intensity Modulation Precautions. Care should be taken never to apply a modulating signal which swings the grid positive with respect to the cathode. This condition is indicated on the cathode-ray tube screen by marked defocusing during the positive phase of the modulating signal, and it may cause a serious reduction in life of the cathode-ray tube. No more than 600 volts direct current should ever be applied to the INT. MOD. INPUT post.

18. CHECKING RADIO TRANSMITTERS.

a. Neutralization of Radio Transmitters. Neutralization of the radio-frequency amplifier stages of a transmitter can be accomplished with the cathode-ray oscilloscope. The procedure for neutralization is essentially the same as any other method with the exception that the oscilloscope is used as the indicating instrument.

(1) With circuits utilizing link coupling between successive amplifier stages, the link winding coupled to the plate circuit of the amplifier to be neutralized can be connected directly to the terminals of the oscilloscope through a twisted pair of wires. If the frequency of operation of the r-f amplifier is below 3 megacycles, connect the link to the Y-axis amplifier terminals. If the frequency of operation is above 3 megacycles, connect the link coupling to the Y-axis direct deflection terminals D_3 and D_4. Turn deflection plate connection switch to the appropriate position. Set the frequency range control at any position except the X-signal input position. This is done to prevent a stationary spot from appearing on the screen of the cathode-ray tube and thus shortening its life. In general it will be impossible to synchronize the trace, and in this operation synchronization is not necessary. The amount of Y-axis deflection is the only criterion of whether or not the r-f amplifier is neutralized.

(2) Apply filament power, grid bias, and grid excitation to the stage to be neutralized, but *apply no plate voltage*. Connect the oscilloscope according to previous instructions. Assuming that the r-f amplifier is not neutralized, tune in the plate tank tuning capacitor for maximum Y-axis deflection on the oscilloscope. When this point is reached, tune the neutralizing capacitor for minimum Y-axis deflection. In using the Y-axis amplifier, adjust the attenuator and Y-gain controls for maximum necessary sensitivity. Varying the plate tank tuning capacitor over its range now should produce no change in the Y-axis deflection if the r-f amplifier is properly neutralized.

(3) With amplifiers which do not have link couplings, it will be necessary to use an auxiliary link coil made of a few turns of wire and coupled to the tank coil of the r-f amplifier. Care must be taken when using an auxiliary link coil that it does not alter the circuit conditions. Figures 7 and 8 show the connection for neutralization.

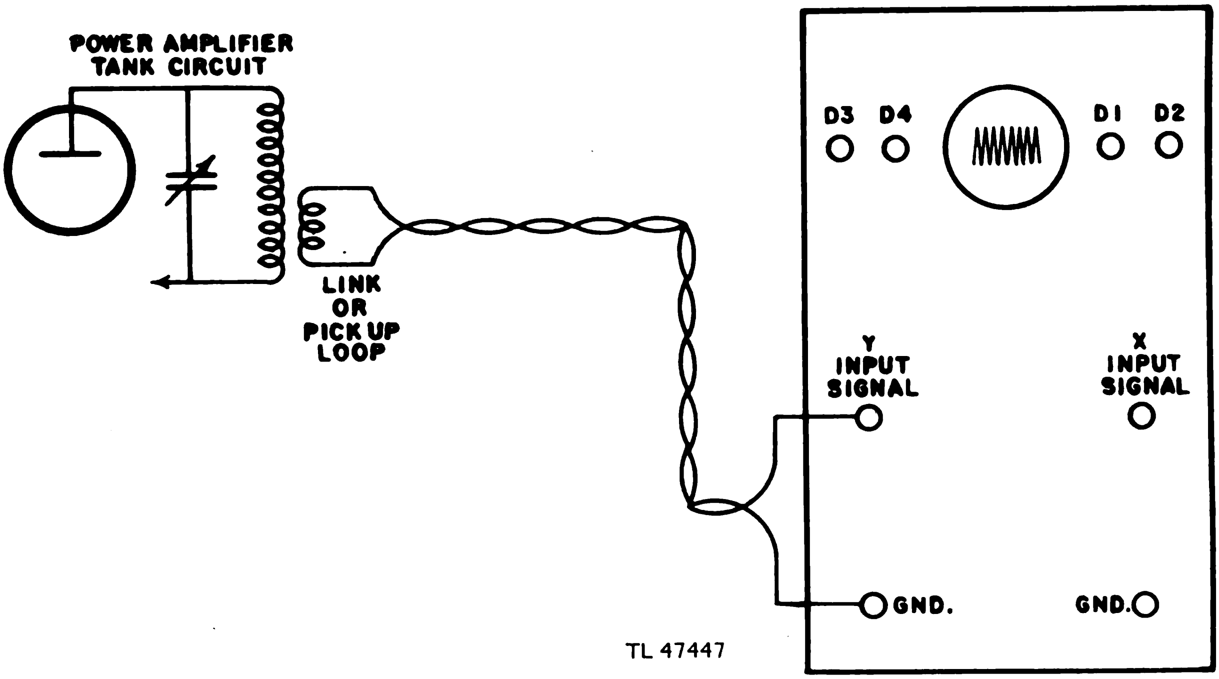


Figure 7. Neutralization of amplifiers which operate at a frequency below 3 megacycles.

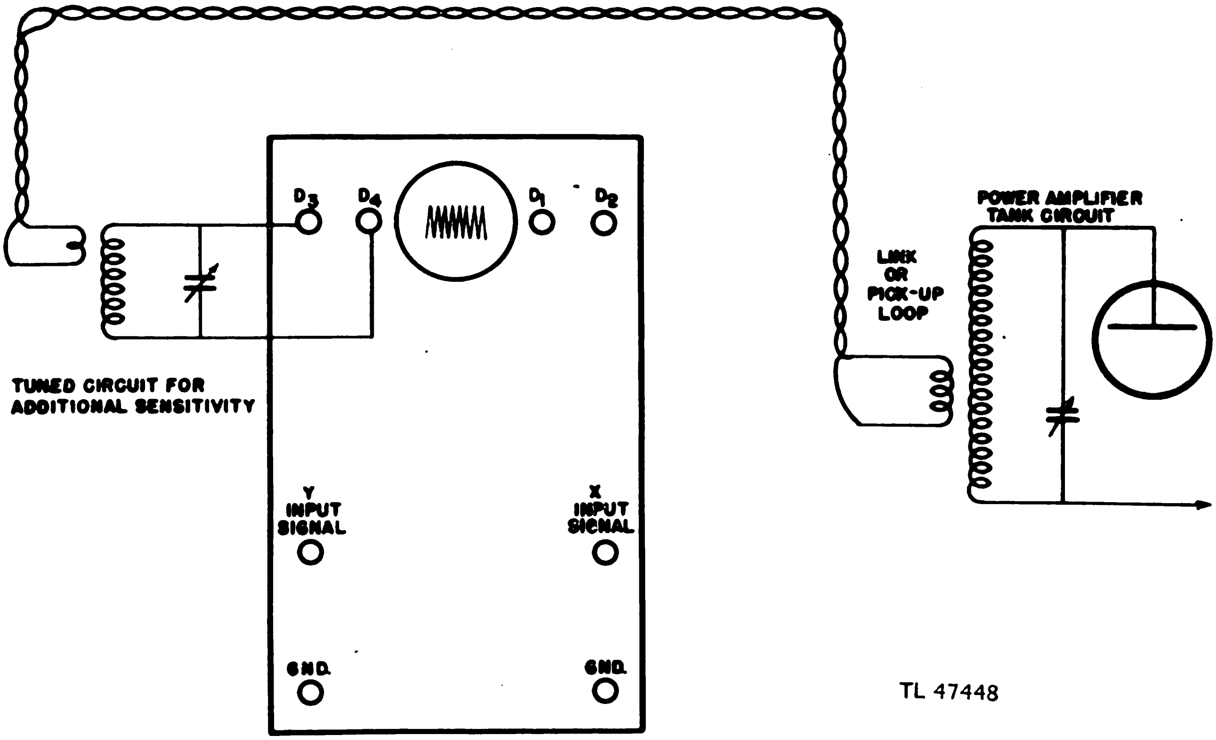


Figure 8. Neutralization of amplifiers which operate at a frequency above 3 megacycles.

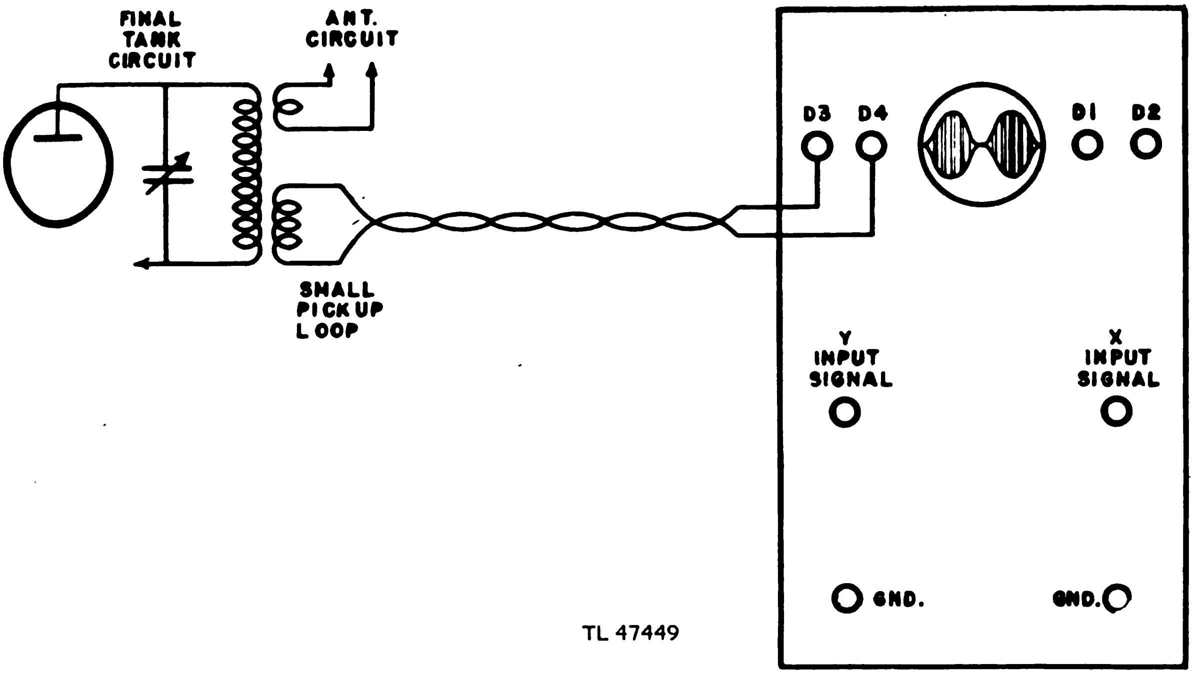


Figure 9. Method for obtaining wave envelope modulation pattern.

b. Checking Phone Transmitter Operation. The most reliable method of determining percentage of modulation is by means of the cathode-ray oscilloscope. The oscilloscope gives a direct picture of the modulated output of the transmitter at all times. Two types of oscilloscope patterns may be obtained, known as the *wave envelope* and the *trapezoid.* The former shows the shape of the modulation envelope directly, while the latter in effect plots the modulation characteristic of the modulated stage on the cathode-ray screen.

(1) The connections for the wave envelope pattern are the simplest. On a transmitter it will usually be found that sufficient voltage will be picked up by a few turns of wire connected to the Y-axis direct deflection terminals D_3 and D_4 through a twisted pair line and placed near the final tank circuit. The oscilloscope is synchronized to the audio component of the r-f modulated wave by adjustment of the FREQUENCY RANGE control and the SYNC. SIGNAL control. Figure 9 shows the connections used to obtain the wave envelope pattern.

(2) The trapezoidal pattern is more difficult to obtain but gives clearer information than the wave envelope pattern when nonsinusoidal waveforms are encountered. The connections to the Y-axis deflection plates are accomplished with a coil of a few turns of wire in the same manner as outlined for the wave envelope pattern. The sweep generator is not utilized to obtain the trapezoidal pattern. Instead, a voltage divider must be connected across the voltage being used to modulate the final amplifier; that is, between ground and the modulation connection the r-f amplifier. A small fraction of the modulator audio output voltage in the order of a few volts must be obtained from a tap on the divider. The voltage is fed to the X-axis amplifier terminals through a suitable blocking capacitor. The X-axis gain control can be used for adjusting the width of the trapezoidal pattern on the screen. Figure 10 shows the connections used to obtain the trapezoidal pattern.

19. CALIBRATING THE INSTRUMENT FOR READING VOLTAGES.

a. Method of Calibration for D-c Voltages and Large A-c Voltages. (1) For this particular application the direct deflection plate terminals D_3 and D_4 are used. For calibration, a variable source of voltage is needed. An a-c source for a-c calibration, a d-c source for d-c calibration, and corresponding voltmeters are also needed. If the a-c voltmeter reads peak volts the calibration will be in peak volts, or if the a-c voltmeter reads rms volts the calibration will be in rms volts.

(2) The method for calibration is straightforward;

various values of voltage are applied to the deflection plates, one of which is connected to ground, and the corresponding deflection in inches is recorded. A graph is plotted of the deflection in inches as a function of the applied voltage. This graph will be a straight line since the deflection is directly proportional to the applied voltage.

b. Method of Calibration for Small A-c Voltages. (1) The method of calibration for small a-c voltages is essentially the same except that use is made of the oscilloscope. It is important to remember that the calibration using the amplifiers will hold only over the range where the amplifier response characteristic is flat, and a d-c voltage calibration is not possible using the amplifiers. Before starting to calibrate the amplifiers it is well to take note of the setting of the attenuator and gain control since the particular calibration will hold only for that particular setting of the attenuator and gain controls.

(2) As in the preceding section, various a-c voltages are applied to the amplifier terminals and a graph plotted of the deflection in inches as a func-

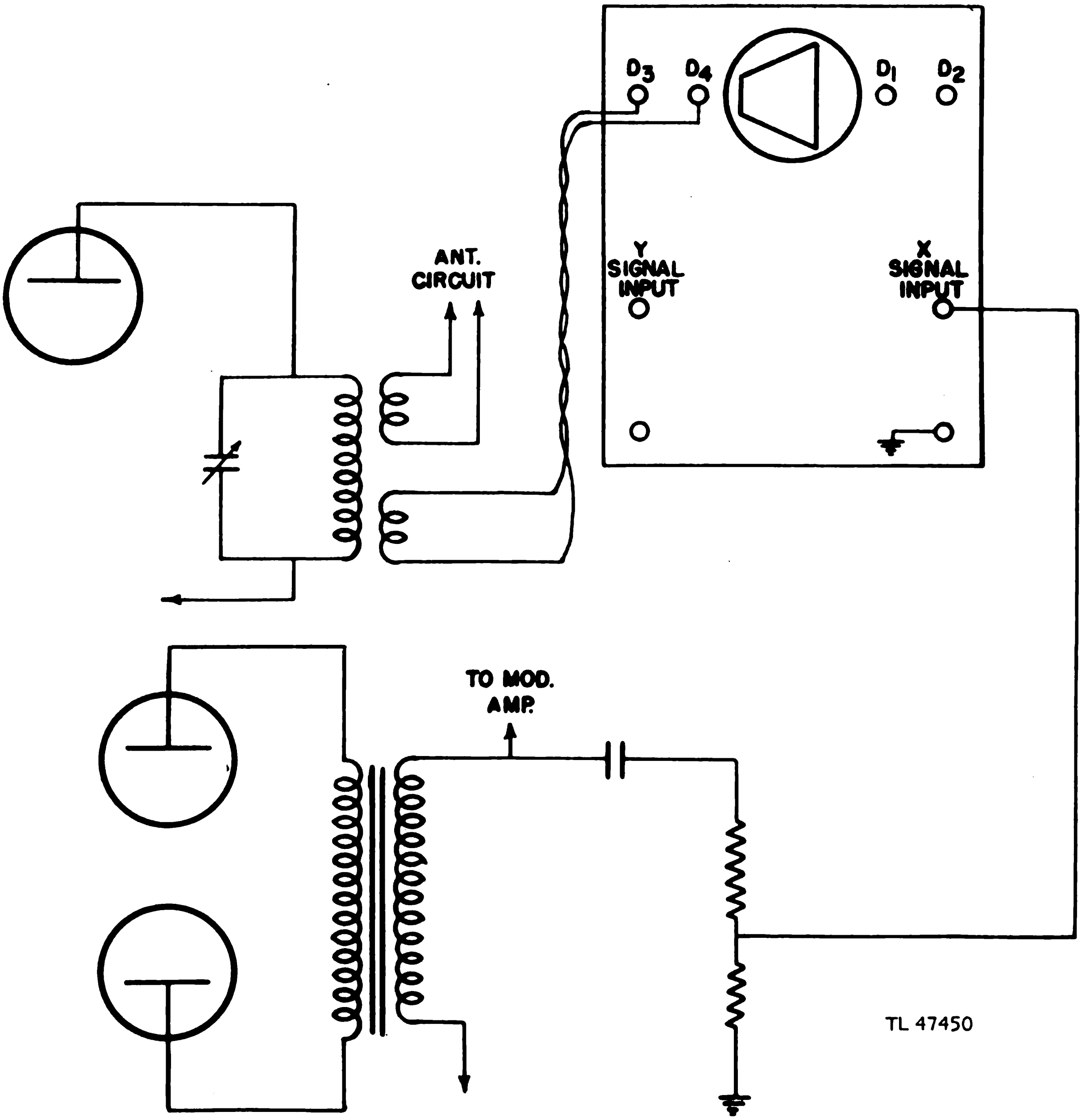
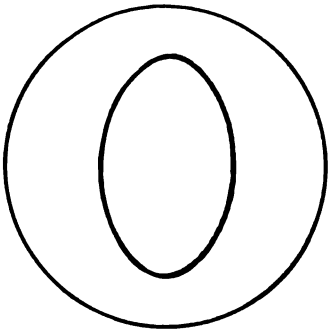


Figure 10. Method for obtaining trapezoidal modulation pattern.

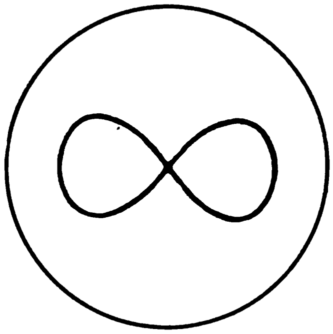
tion of the applied voltage, specifying whether the value of voltage is peak or rms.

20. LISSAJOUS FIGURES.

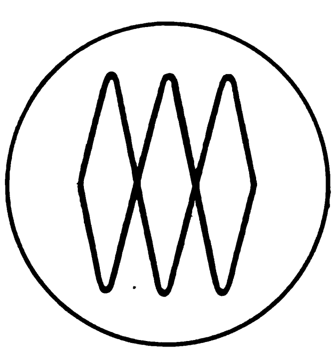
When voltages are applied simultaneously to the two pairs of deflecting plates, the deflection is the sum of those produced when the two voltages are applied individually. The application of alternating voltages to one set of plates causes the spot to trace a straight line on the screen. When alternating voltages are applied to both sets of plates, the spot traces a complicated path that does not in general form a completed loop if the frequencies of the two voltages are not the same, and this is therefore seen as a moving pattern commonly called a *Lissajous figure*. If the ratio of the two frequencies is a rational number, the path forms a closed loop and the pattern is stationary. In the simplest case, in which the two frequencies are the same and the voltages pure sinusoids, the pattern may be a circle, an ellipse, or a straight line, depending upon the relative magnitude and the phase difference between the two voltages. In general, a rational frequency ratio can be determined by enclosing the pattern with a rectangle the sides of which are parallel to the X and Y axes and tangent to the pattern. The ratio of the X to the Y frequency is equal to the number of points of tangency of the pattern to a vertical side divided by the number of points of tangency to a horizontal side. Figure 11 shows Lissajous figures for various frequency ratios.



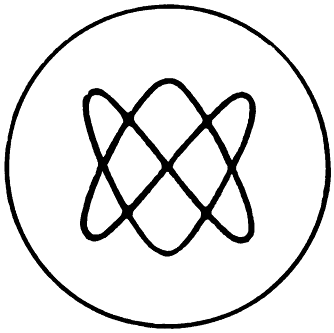
Ratio 1:1



Ratio 2:1



Ratio 3:1



Ratio 3:2

TL 47451

Figure 11. Lissajous figures.

SECTION III
FUNCTIONING OF PARTS

21. GENERAL.

The main divisions of Oscilloscope BC-1060-A are as follows and will be taken up in the same order.

a. Cathode-ray tube circuits.

b. Power Supply.

c. Time-base generator.

d. Y-axis amplifier.

e. X-axis amplifier.

22. CATHODE-RAY TUBE CIRCUITS (fig. 22).

a. The cathode-ray tube circuits include the focus control (R74) and the intensity control (R76). These controls along with R71, R72, and R75 form a voltage divider and bleeder network across the negative high-voltage supply. The intensity control (R76) sets the bias between the grid and the cathode of the cathode-ray tube, thus controlling the number of electrons that pass the grid and eventually strike the fluorescent screen of the tube. The greater the number of electrons being permitted to pass the grid, the greater the intensity. The focus control (R74) sets the potential of the focusing electrode of the cathode-ray tube. This will determine the spot size of the beam on the cathode-ray tube screen.

b. The X-POSITION control (R58) and the Y-POSITION control (R59) determine the position of the spot on the screen. Each of the positioning controls is a dual potentiometer; these are connected in such a manner that a change in potential on one deflection plate of a given pair will be accompanied by an identical change on the other plate of opposite polarity. Balanced voltages (that is, equal positive and negative voltages) minimize defocusing of the spot. R56 and R60 serve as the X-positioning decoupling resistors, while R57 and R61 perform the same function for the Y-positioning circuit. R62 and R63 form a bleeder network for obtaining a positive voltage for the positioning circuit. Negative voltage for positioning circuit is obtained from the negative bleeder between R71 and R72.

23. POWER SUPPLY (fig. 22).

The power supply may be divided into two divisions, the positive supply and the negative supply.

a. The positive supply consists of a conventional full-wave rectifier (V10) connected to the 400-volt terminals of T1. The output of the rectifier is then filtered by C40, C41, C42, and L6. This filtered voltage is used to supply power to the amplifiers. For the more critical circuits, voltage is obtained from the regulated portion of the supply.

b. The regulator is of the degenerative type which makes use of a high-vacuum tube (V12) connected between the power supply and load, and is operated as a variable resistance. Increase of the output voltage (+190) decreases the value of the negative grid voltage of V13 and thus increases the voltage across R67. The resulting increase of voltage across R67 makes the grid more negative, thus reducing the plate current of V12 and hence tending to reduce the output voltage. R69 and R70 serve as a voltage divider, and the output voltage may be varied by means of R70. Capacitor C44 increases the fraction of the voltage change impressed upon the grid (V13) when the change occurs rapidly. The current through the regulator tube V14 is limited by R68. The regulator tube serves as a source of constant reference voltage, since the voltage across the glow tube is unvarying.

c. The negative high-voltage supply is obtained by an extension of the 400-volt winding to 875 volts. This voltage is then rectified by a half-wave rectifier V11 and filtered by a resistance-capacitance filter consisting of R65, R66, and C43. This voltage, which is in the order of 1,100 volts, is then applied to a voltage divider previously described in the description of the cathode-ray tube circuits.

24. TIME-BASE GENERATOR.

The time-base generator or sweep circuit used in the BC-1060-A is used to generate a linear sweep. This unit generates a voltage which is sawtooth in form.

a. A gas discharge triode (V7) is used as a sawtooth oscillator to generate the linear time-base signal. The operation of the circuit is as follows: A capacitor (C28 through C33, depending upon the position of the frequency range switch) is allowed to charge from the 400-volt source through resistors. R35 and R36. Only a relatively small portion of the charging curve of the R-C network is used. With the capacitor connected from plate to cathode of the gas triode V7, the capacitor is allowed to charge only to a relatively low potential determined by the breakdown potential of the gas triode discharge tube. The discharge tube could be a gas diode, but the advantages of the three-element tube lie in the ease with which it may be synchronized to a signal applied to the grid.

b. Figure 12 gives a picture of the oscillation and the action of a synchronizing voltage applied to the grid. If no synchronizing voltage is applied, the discharge tube will start to conduct when its plate voltage falls to the extinction potential E_{ex}, conduction stops, and the cycle starts again. The rapidity with which the plate voltage will rise is dependent on the charging constants R and C, and the supply voltage. If a synchronizing voltage is applied to the grid, the firing potential will vary in accordance with it, in the manner shown in figure 12. When the firing potential is reduced by the synchronizing signal, the tube will conduct before it ordinarily would under no signal conditions. Thus, if the "free running" or unsynchronized period of the oscillator is slightly greater than the period of the synchronized signal, the discharge through the tube will occur sooner when the synchronizing voltage is applied than under the "free running" conditions. Thus the oscillator will be synchronized to the grid signal.

c. The synchronizing signal may be selected by means of S3. This signal is then fed to the sync phase inverter tube V6, triode No. 1. R29 is the plate load resistor, R27 and R28 are the cathode resistors, R26 is the grid resistor. C18 is the input coupling capacitor. The synchronizing signal is applied to the grid of the phase inverter tube. The signal appearing on the plate is of the opposite phase, whereas the signal appearing on the cathode is of the same phase. By use of R31, which is a center tapped potentiometer, it is possible to select either phase of the synchronizing signal so that the sweep circuit may be promptly synchronized. The synchronizing signal is coupled to the sweep tube by means of C22 and C23 (fig. 22).

25. Y-AXIS AMPLIFIER.

a. The Y-axis amplifier includes a three step attenuator which is coupled to the input terminal through C2 (fig. 22). The attenuator which is designated as the Y-attenuator on the schematic of the circuit is coupled to the grid of a cathode follower V1 through the grid suppressor resistor R6. The output of the cathode follower is taken off R8, the cathode load resistor, and coupled to the Y GAIN control (R9) through C8. The variable arm of the potentiometer determines the voltage applied to the grid of the first video amplifier V2.

b. The first video amplifier consists of a single 6AC7 pentode. The video amplifier is identical to an ordinary resistance-capacitance amplifier with the exception of the plate load circuit. At the higher frequencies the presence of stray circuit capacity, such as capacity from the wiring to ground, and interelectrode capacity of the vacuum tube, are important factors to be considered. These stray capacitances have the effect of decreasing the plate load impedance as the signal frequency is increased. High frequencies are therefore attenuated and will not appear in the output. By the insertion of a series inductance L1 in the plate circuit of the amplifier, a reactance increasing with frequency is added to the vacuum tube plate load to increase its impedance at high frequencies and, consequently, to maintain the amplifier gain at these frequencies. This inductance is variable and must be set at such a value that the gain of the amplifier is constant over the frequency range of the Y-axis amplifier.

c. The output of the first video amplifier is coupled to the grid of a balanced deflection amplifier, consisting of V3 and V4, through a coupling capacitor C13 (fig. 22). Balanced deflection is provided by this amplifier by means of a cathode-coupled phase-inverter circuit. The signal impressed on the grid of V3 causes variations in the plate current of that tube resulting in a varying voltage across the cathode resistor R20. The cathode of V3 is connected to the cathode of V4 and the grid of V4 is in effect connected to the grounded end of the cathode

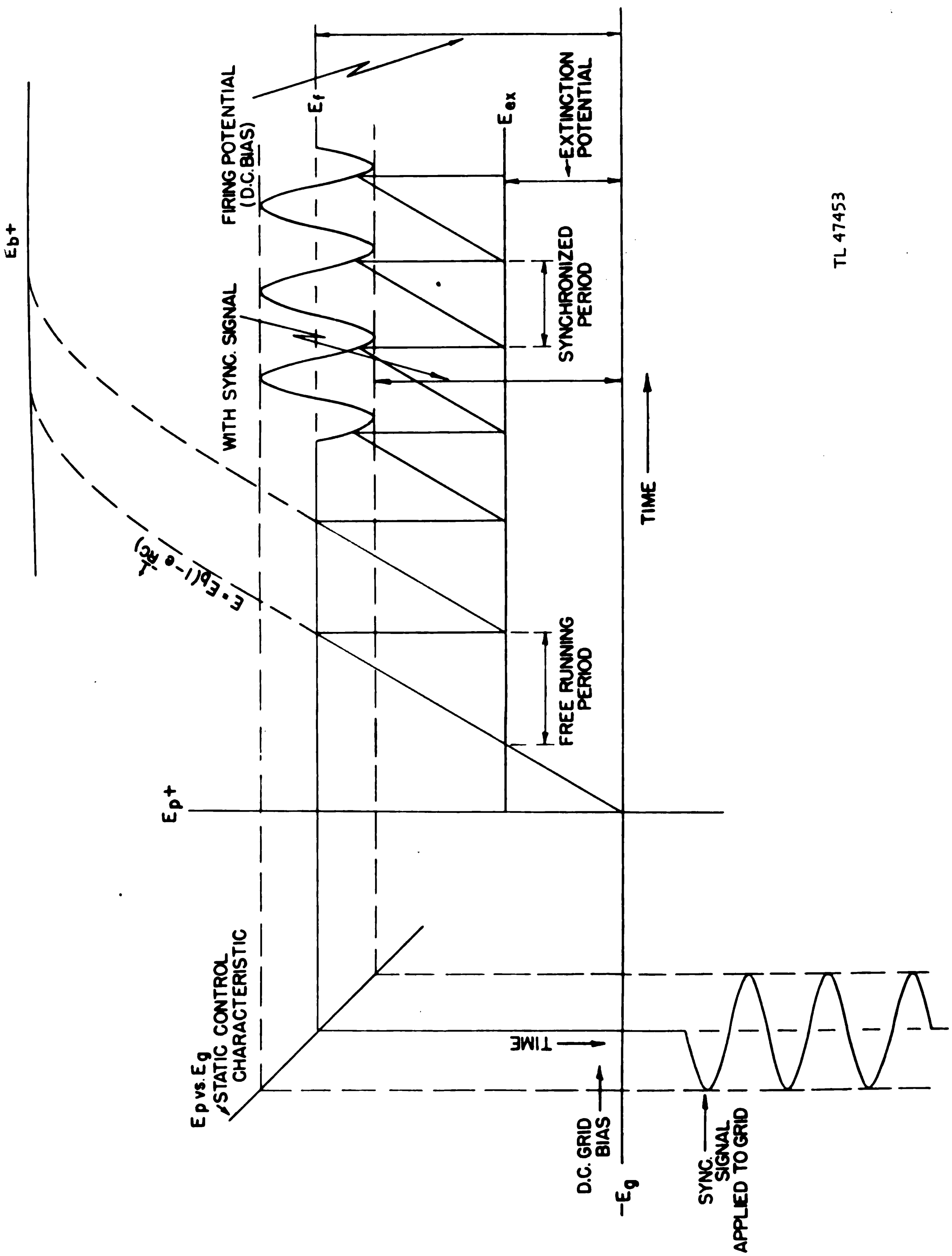


Figure 12. Action of a synchronizing voltage applied to grid of gas triode.

resistor, thus obtaining a signal voltage which is 180° out of phase with the voltage applied at V3. The signal output voltages of V1 and V2 are 180° out of phase, and this output of equal positive and negative voltages is applied to the deflection plates through coupling capacitors C16 and C17.

d. The proper bias on V3 and V4 is set by means of R19, which acts as a voltage divider in conjunction with R16. Spurious oscillations are suppressed by means of R18 and R21. The proper voltage is applied to the screen grids of the tubes through a voltage-dropping resistor R22. C15 is the screen bypass capacitor. The amplifier is peaked in the same manner as described for the first video amplifier by means of the peaking coils L2 and L3. These coils are of fixed inductance and therefore do not need any adjustment. R23 and R24 serve as the load resistance.

26. X-AXIS AMPLIFIER.

The X-axis amplifier operation is fundamentally the same as the Y-axis amplifier with the exception that only one stage of amplification is used. This stage, consisting of V8 and V9, functions in the same manner as previously described for the balanced amplifier for the Y-axis. This stage is fed from a cathode-loaded stage V6, triode No. 2.

SECTION IV
MAINTENANCE

NOTE: Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report). If Form 468 is not available, see TM 38-250. Failure or unsatisfactory performance of equipment used by Army Air Forces will be reported on Army Air Forces Form No. 54 (unsatisfactory report).

27. VACUUM TUBE REPLACEMENT.

NOTE: The pilot light (V15) and fuse (F1) may be replaced from the front panel.

a. To remove the unit from its cabinet, the seven roundhead screws on the front panel, the two binder-head screws on the bottom-rear, and the two on the lower back of the cabinet must be removed. The chassis may then be slid forward out of the cabinet.

b. To replace vacuum tubes, it is necessary first to unlock or unscrew the clamping ring or bracket which holds each tube in place. The cathode-ray tube is held in place by a clamp near its base, and this must be loosened before the cathode-ray tube is removed by sliding it forward out of the front panel.

NOTE: It should be borne in mind that, while optimum performance of this instrument requires components with values in close agreement with the schematic, satisfactory performance may often be had by emergency repairs with available components. A list of vacuum tubes used in this instrument is given below. In most cases when a substitution is made, the instrument will no longer meet all performance specifications, but will still have some utility.

TABLE I
EMERGENCY TUBE REPLACEMENT DATA

Tube	*Emergency replacement type*
V1 - 6SJ7	6AB7, 6AC7, 6SG7, 6SH7
V2 - 6AC7	6AB7, 6SJ7, 6SG7, 6SH7
V3 - 6AG7	No suitable substitute for this type.
V4 - 6AG7	No suitable substitute for this type.
V5 - 3GP1	1806/3EP1
V6 - 6SN7	6SF7
V7 - 884	6Q5G
V8 - 6SJ7	6AB7, 6AC7, 6SG7, 6SH7
V9 - 6SJ7	6AB7, 6AC7, 6SG7, 6SH7
V10 - 5U4G	5T4
V11 - 2X2	879
V12 - 6V6GT	6L6, 6Y6, 6F6
V13 - 6SJ7	6AB7, 6AC7, 6SG7, 6SH7
V14 - 991	1/4 watt bayonet base neon bulb
V15 - Mazda #47	Mazda #44

28. VOLTAGE MEASUREMENTS.

a. To measure the voltages in this instrument, it is necessary to remove the cabinet (sec. IV, par. **27**) and short out the safety switch which normally connects the power when the cabinet is removed.

WARNING: ***Voltage measurements should be made only by personnel familiar with Oscilloscope circuits and high voltages. Severe injury or death can result from shock by the voltages used in this instrument.***

b. The high-voltage section of the power supply delivers approximately 1,100 volts negative with respect to ground. The low-voltage supply delivers approximately 400 volts positive with respect to ground for the amplifiers and the sweep oscillators.

c. In addition, an electronic voltage regulator delivers 190 volts positive for the operation of all low-level stages. Its output voltage is determined by a factory adjustment. The voltages indicated on the schematic diagram are nominal, and in most cases 10 percent variations from the value given will be acceptable.

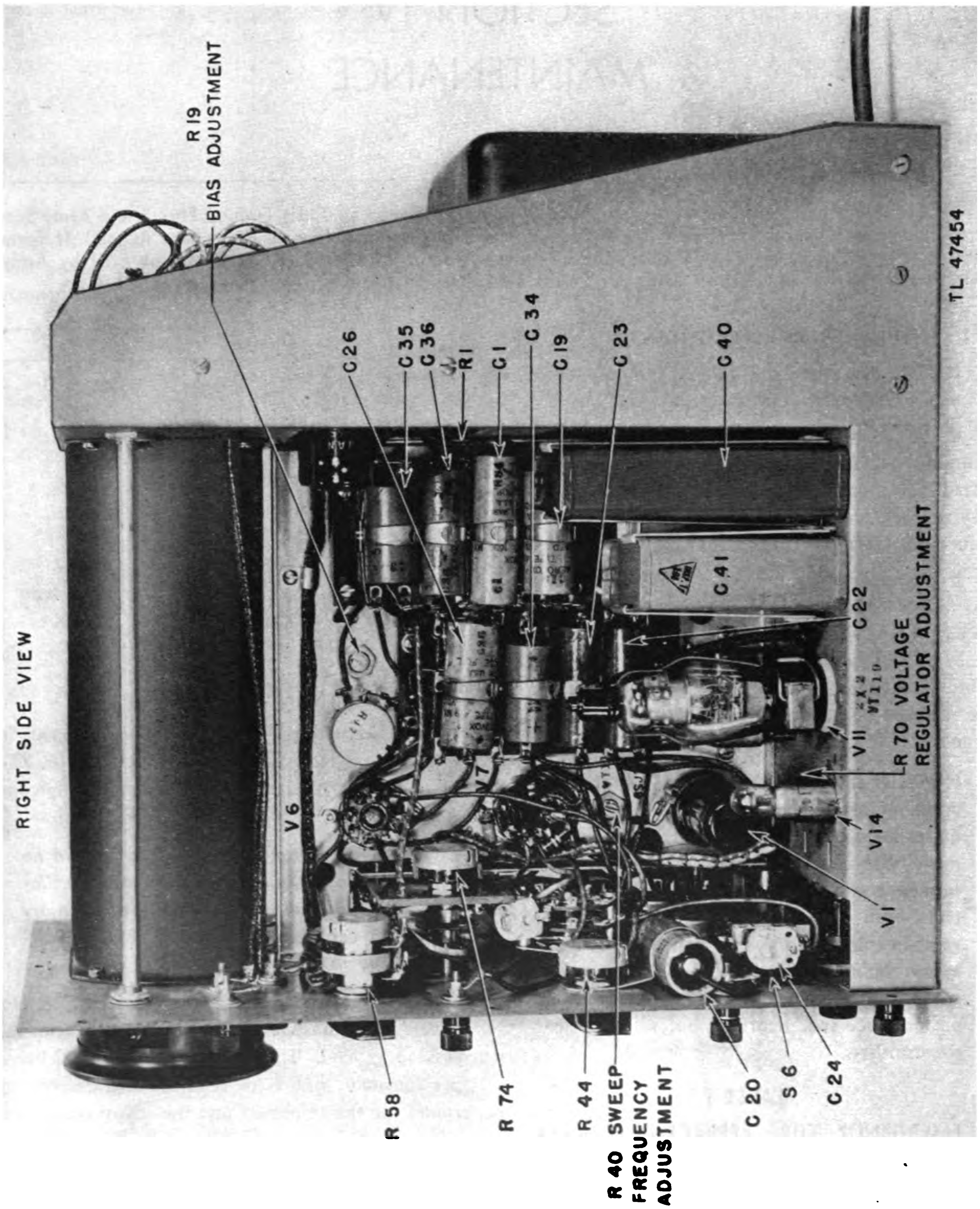


Figure 13. Oscilloscope BC-1060-A, right side.

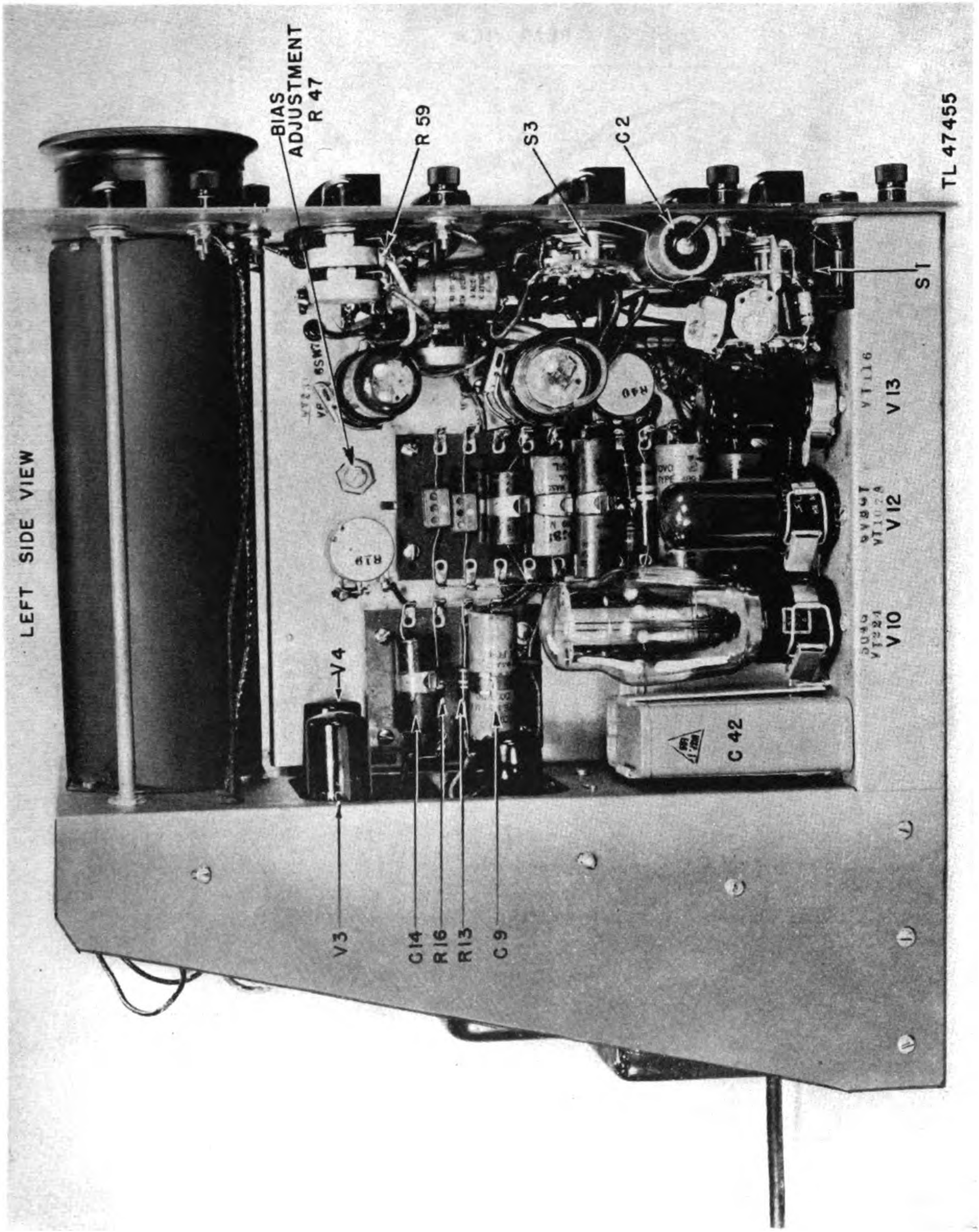


Figure 14. Oscilloscope BC-1060-A, left side.

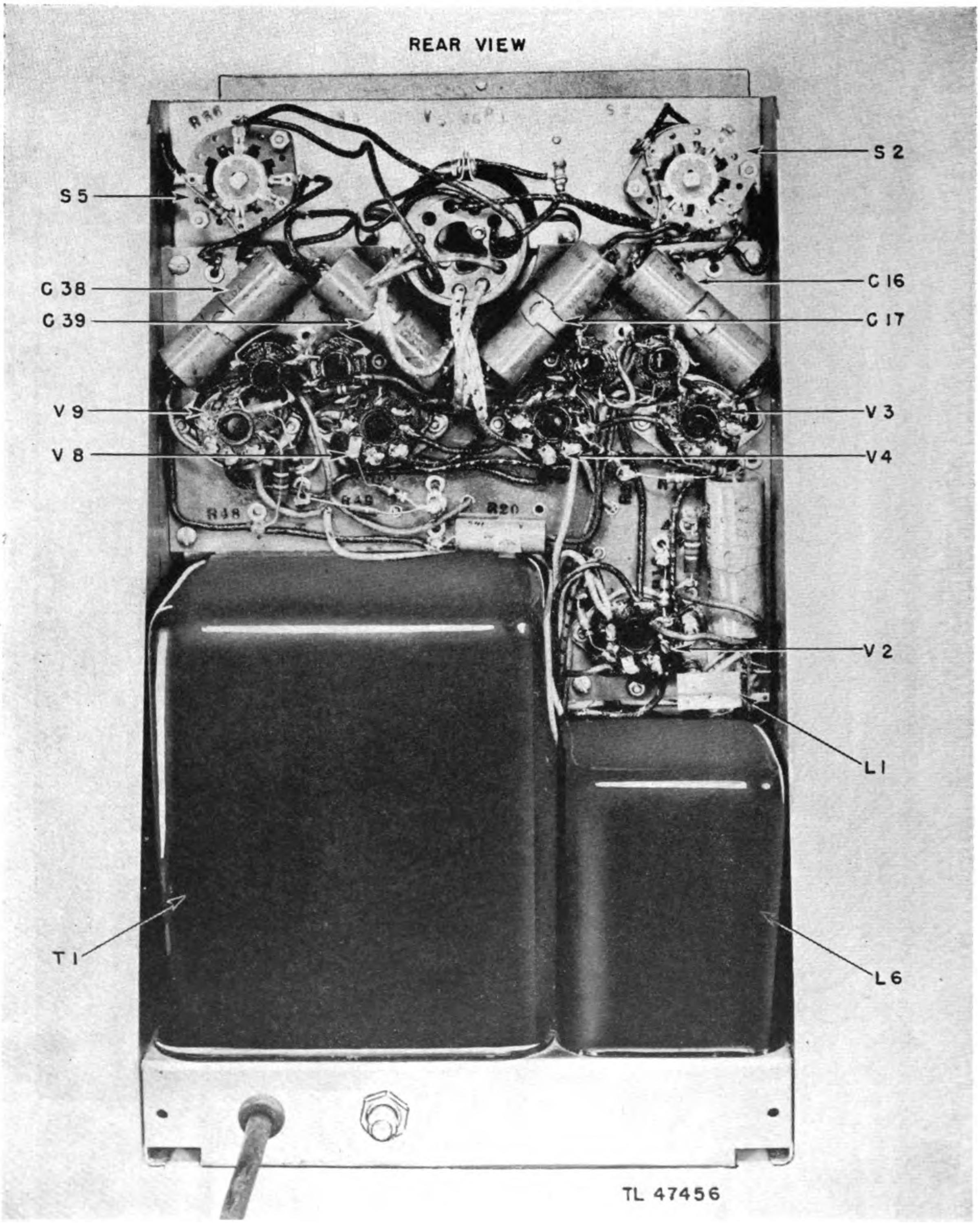


Figure 15. Oscilloscope BC-1060-A, rear view.

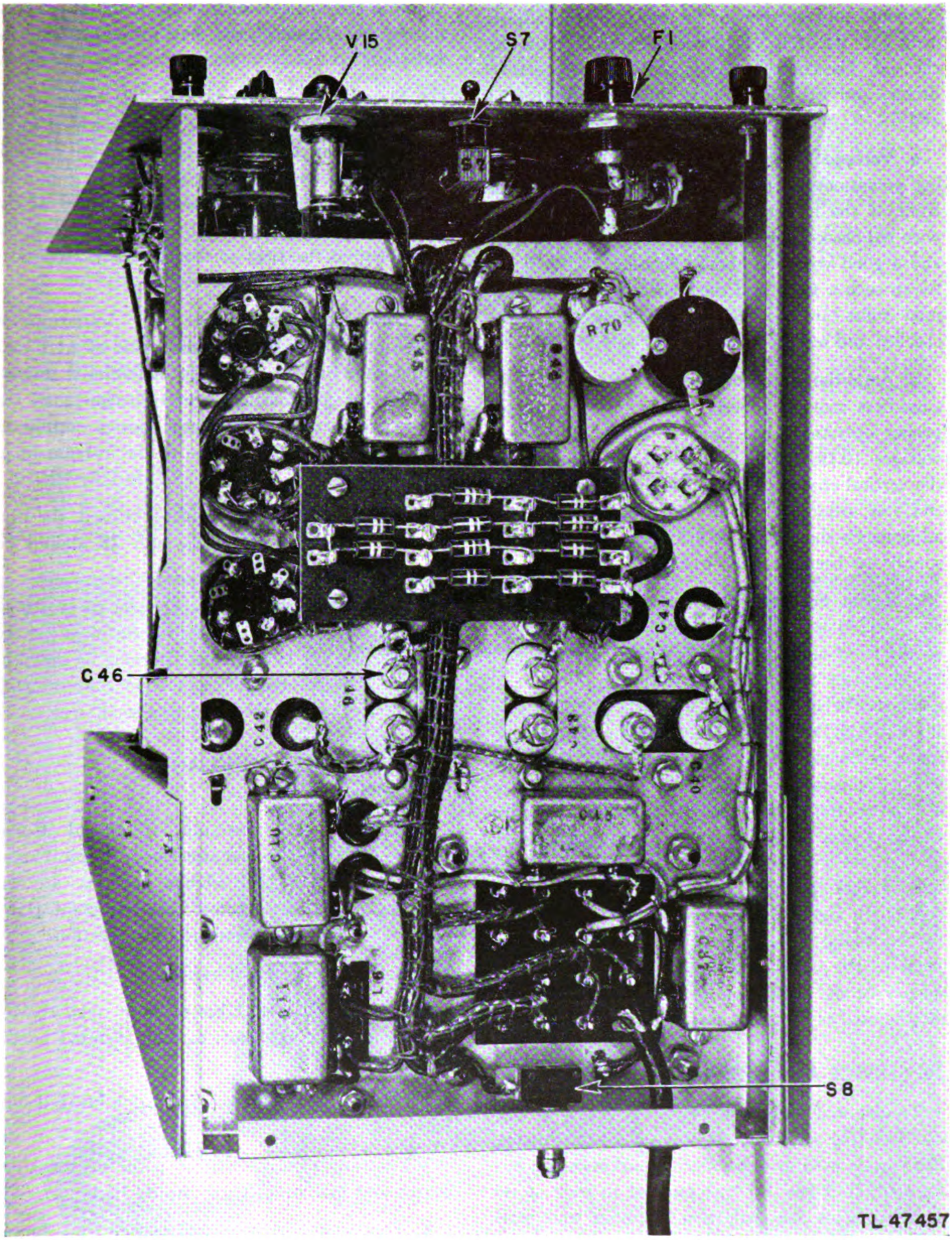


Figure 16. Oscilloscope BC-1060-A, bottom view.

29. ADJUSTMENTS.

Should any component be replaced, the adjustment of the four factory-set controls must be checked. The controls may be turned with a screwdriver, and their location is shown in figures 13 and 14.

a. Voltage Regulator Adjustment. The adjusting potentiometer (R70) is located near the right front of the horizontal chassis. Any circuit wired with red-black color code is at the regulated voltage, and a good voltmeter should measure 190 volts between such a point and the chassis. When any vacuum tubes are replaced, this voltage should be checked and reset if necessary.

b. Amplifier Bias Adjustments. Both deflection amplifiers require a positive bias of 25 volts for proper operation. The controls which adjust these voltages (R19, R47) are located near the top of the vertical chassis. In each case the end of the control not grounded should be at 25 volts. These adjustments should not be made until the regulated supply has been set (par. **a** above).

c. Sweep Frequency Adjustment. This adjustment (R40) is located near the type 884 gas triode on the front vertical chassis. It controls the range of linear sweep frequencies produced by the sweep oscillator. When both FREQUENCY RANGE and FREQUENCY VERNIER controls are set for minimum frequency, it should be adjusted so that the sweep frequency is 10 cps. This frequency may be determined by applying a signal of known frequency to the Y-axis and obtaining a Lissajous figure of known configuration which will indicate the frequency ratio between the vertical and horizontal signals. In figure 5A is shown a 10-cps sweep on the horizontal places with a 60-cycle sinewave applied to the vertical deflecting plates. If the frequency of the power line is known, the test signal may be used as the calibrating signal.

30. SERVICE AND PRECAUTIONS.

Trouble may be located by voltage checks as indicated on the schematic. If this fails, signal-tracing methods as used in radio receiver service work may be used. It is best for this purpose to start at the signal grid of the deflection amplifier and work back toward the amplifier input.

a. Magnetic and Electric Fields. (1) Magnetic shielding and electrostatic shielding have been provided for in the design of this instrument. However, its use in strong fields such as are found near transmitters, transformers, etc., may introduce spurious deflection.

(2) Electrostatic pick-up by the wide range amplifiers may be minimized by the use of shielded input cables and connections with a good electrical ground. Magnetic deflection may be eliminated by removing the instrument from the immediate vicinity of the source of the magnetic field, or by orienting the instrument in the field so that the deflection is at a minimum.

b. Power Line Regulation. (1) Variations of ± 10 percent from the nominal value of 115 volts should cause little change in the operating characteristics of the instrument. Greater changes than the above may cause the regulated power supply to cease regulating and operation of the instrument to become erratic.

(2) If a primary voltage regulator is used, the precautions of section IV, paragraph **28** should be observed.

c. Screen Burning. A fine trace or spot of high intensity should not be allowed to remain stationary on the screen for long periods. Burning or discoloration of the screen may result from concentrating the entire energy of the beam to a small area.

31. MOISTUREPROOFING AND FUNGIPROOF.

a. General. The operation of Signal Corps equipment requires special attention in tropical areas where temperature and relative humidity are extremely high. The following items represent problems which may be encountered in operation:

(1) Resistors and capacitors fail.

(2) Electrolytic action takes place in coils, chokes, transformer windings, etc., causing eventual breakdown.

(3) Hook-up wire and cable insulation break down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical paths on terminal boards and insulating strips causing flash-over.

b. Treatment. A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture- and fungi-resistant lacquer applied with a spray gun or brush. Refer to TB Sig 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment.

CAUTION: Varnish spray may have toxic effects if inhaled. To avoid inhaling spray, use respirator if available; otherwise, fasten cheesecloth or other cloth material over nose and mouth.

c. Step-by-Step Instructions for Treating Oscilloscope BC-1060-A.

(1) PREPARATION. Make all repairs and adjustments necessary for the proper operation of the equipment.

(2) DISASSEMBLY.

(a) Remove the seven screws from around the edges of the front panel.

(b) Remove the two screws from the rear of the case.

(c) Remove the two screws from the bottom of the case.

(d) Remove the chassis from the case.

(e) Loosen the clamps on tubes V6, V7, V10, V12, and V13 and remove the tubes from the chassis.

(f) Remove the eight screws from the two phenolic terminal boards mounted on the top and left side of the chassis. Pull both terminal boards gently away from the panel.

(g) Remove the eight screws from the two phenolic terminal boards mounted on the right side of the chassis. Pull the two terminal boards gently side of the chassis. Pull both terminal boards gently away from the panel.

(h) Remove the clamps from capacitors C40 and C41 on the right side of the chassis.

(i) Remove the clamp of V14 from its mounting on the right side of the chassis.

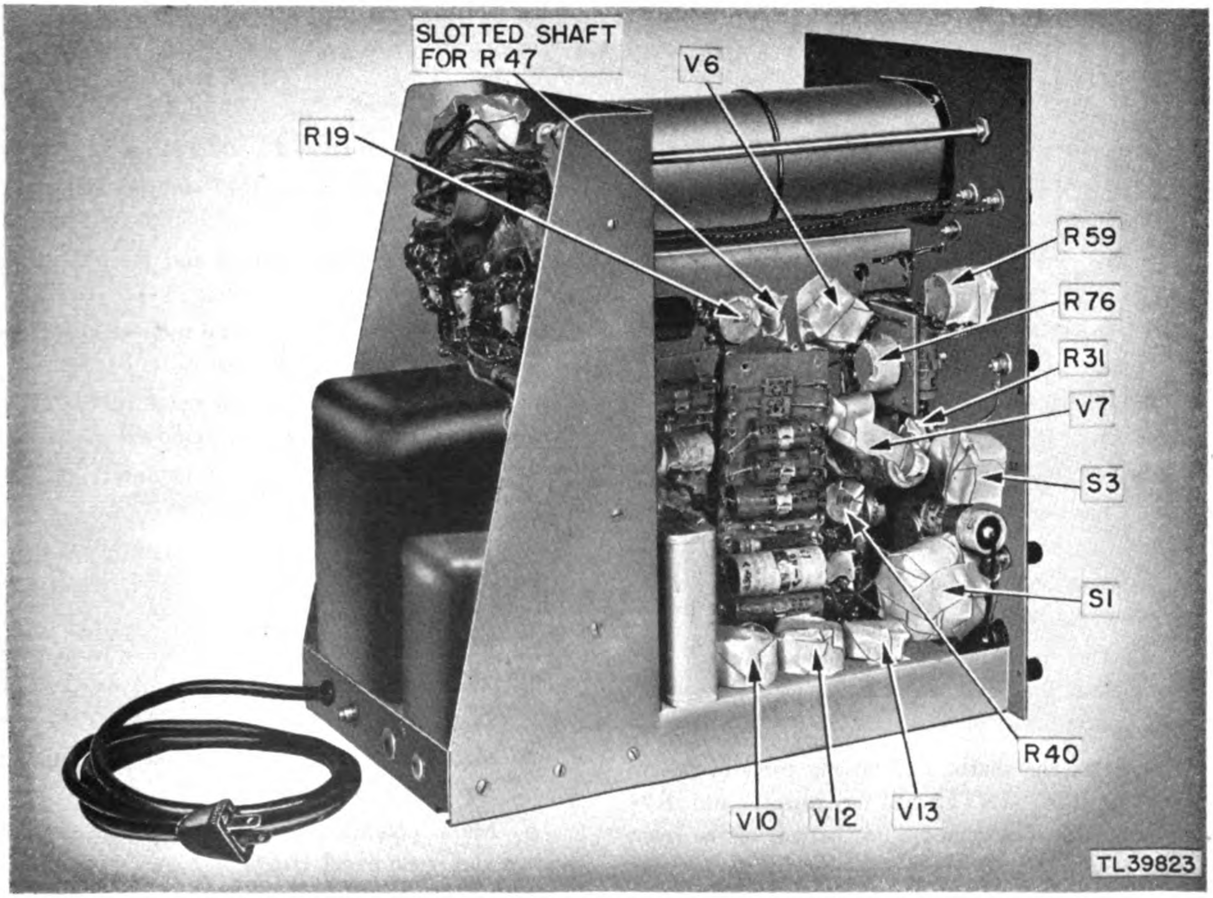


Figure 17. Oscilloscope BC-1060-A, left side of chassis with masking.

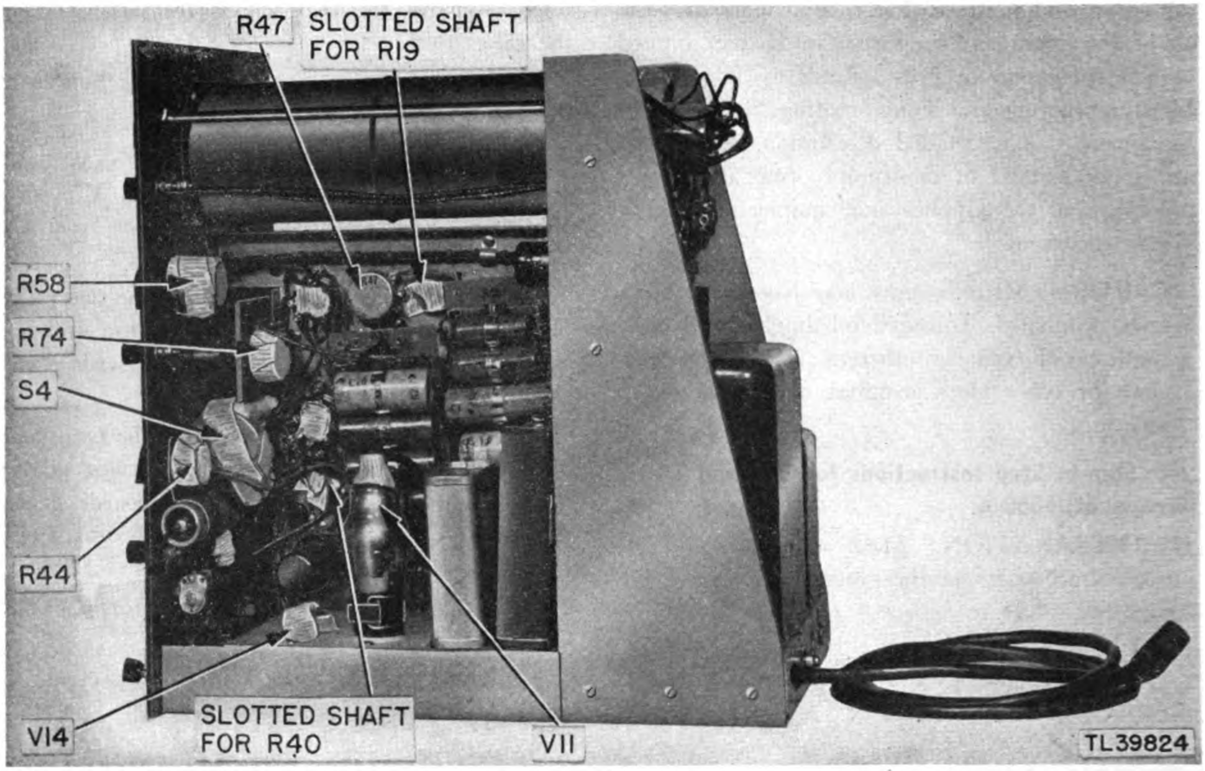


Figure 18. Oscilloscope BC-1060-A, right side of chassis with masking.

(j) Remove the four screws from the phenolic terminal board mounted on the under side of the chassis and pull it gently forward.

(k) Clean all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed.

(3) MASKING.

(a) Mask the clamps of tubes V6, V10, V12, and V13 on the left side of the chassis (fig. 17).

(b) Mask the tube socket clamps and shield of tube V7 on the left side of the chassis (fig. 17).

(c) Mask switches S1, S3, and S4 mounted on the rear of the front panel (figs. 17 and 18).

(d) Mask switches S2 and S5 mounted on the rearpanel(fig. 19).

(e) Mask potentiometers R44, R58, and R59 mounted on the rear of the front panel (figs. 17 and 18).

(f) Mask the shafts and moving parts of potentiometers R76 (INTENSITY control) and R74 (FOCUS control) mounted on the rear of the front panel (figs. 17 and 18).

(g) Mask the slotted control shaft of potentiometers R19, R40, and R47 mounted on the center panel of the chassis (figs. 17 and 18).

(h) Mask potentiometer R47 on the right side of the chassis (fig. 18).

(i) Mask potentiometers R19 and R40 mounted on the left side of the chassis (fig. 17).

(j) Mask both sides of the octal tube sockets from which tubes have been removed.

(k) Mask the bottoms of all octal tube sockets from which tubes have not been removed.

(l) Mask potentiometer R70 mounted on the under side of the chassis (fig. 20).

(m) Mask the tube connector cap of tube V11 mounted on the right and top side of the chassis (fig. 18).

(n) Mask the pilot light socket assembly of tube V15 mounted on the right side of the lower chassis (fig. 18).

(o) Mask the threaded stud of coil L1 mounted on the rear panel (fig. 19).

(p) Mask potentiometer R31 mounted on the rear of the front panel (fig. 17).

(4) DRYING. Place equipment in oven or under heat lamps and dry for 6 hours at 140°.

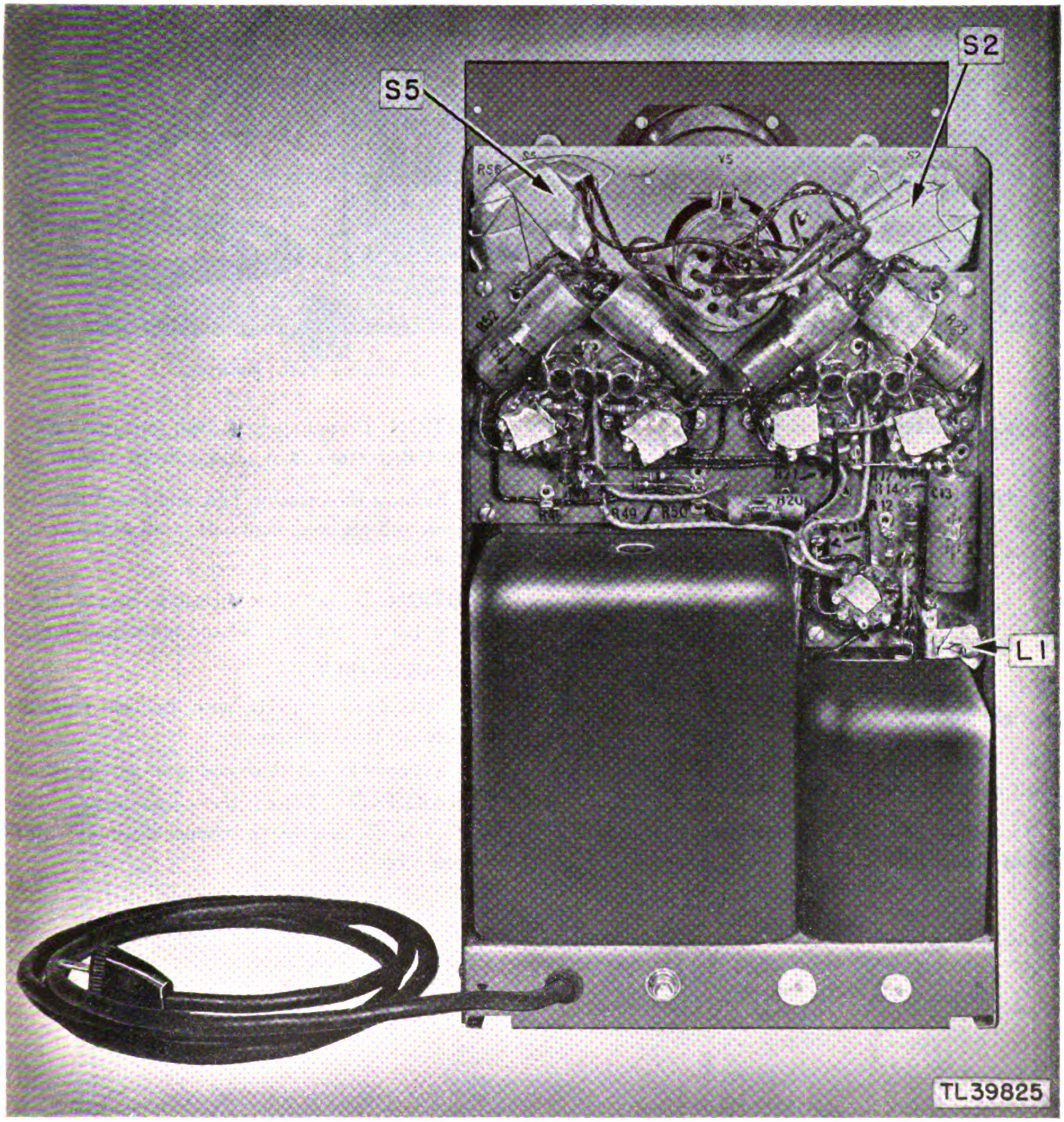


Figure 19. Oscilloscope BC-1060-A, rear of chassis with masking.

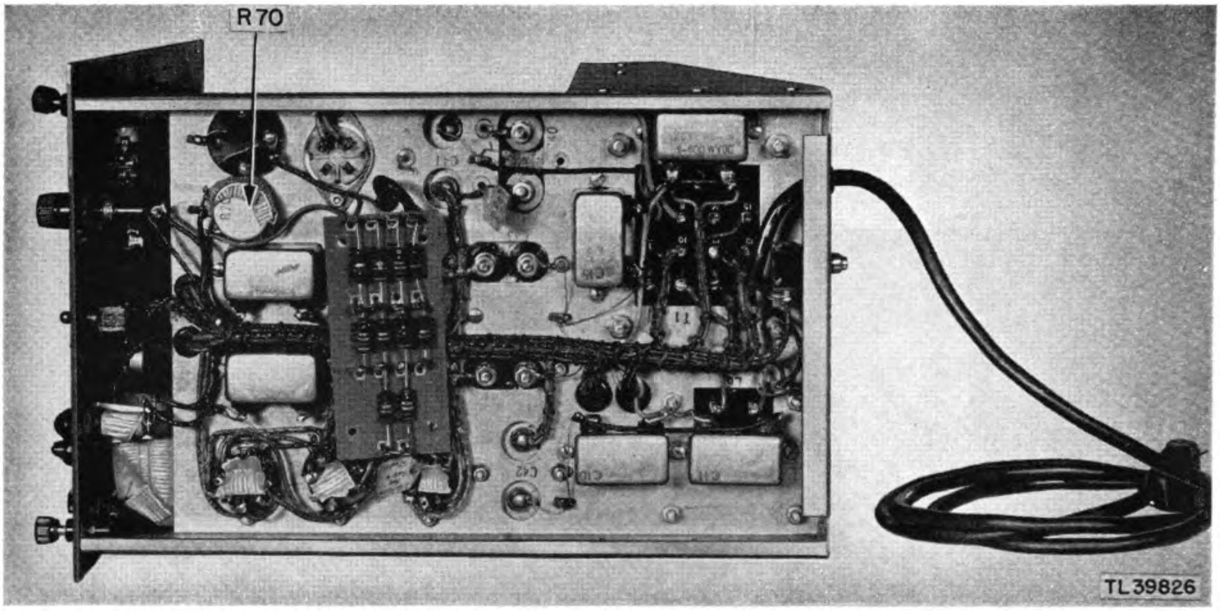


Figure 20. Oscilloscope BC-1060-A, bottom of chassis with masking.

(5) VARNISHING.

(a) Apply three coats of Lacquer, Fungus-resistant, Spec No. 71-2202 (Stock No. 6G1005.3) or equal.

(b) Spray the rear of the front panel.

(c) Spray all unmasked surfaces mounted on the left and top side of the chassis.

(d) Spray all unmasked surfaces mounted on the right and top side of the chassis.

(e) Spray both sides of the phenolic terminal board mounted on the rear panel.

(f) Spray all unmasked surfaces on the under side of the chassis.

CAUTION: Do not allow varnish to contact the control shafts mounted on the front panel.

(g) Remove the masking tape and brush-coat the wire leads and phenolic materials of all switches and potentiometers.

CAUTION: Do not allow varnish to contact the moving parts of the switches and potentiometers.

(6) REASSEMBLY.

(a) Clean all contacts with varnish remover, and burnish the contacts.

(b) Reassemble the unit and test its operation.

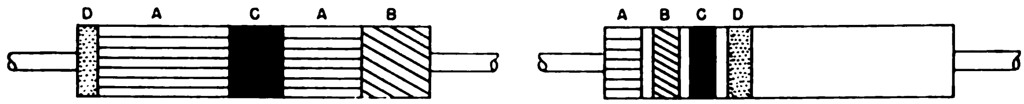
(7) MARKING. Mark the equipment with "MFP" and the date of treatment. *Example:* MFP —8 June 1944.

SECTION V
SUPPLEMENTARY DATA

32. COMPONENT COLOR CODING.

Figure 21 below indicates the proper method of determining the correct values of resistors and capacitors when marked with the RMA (Radio Manufacturers Association) color code.

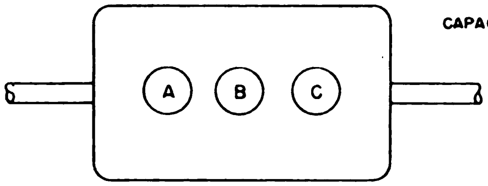
RESISTOR COLOR CODE



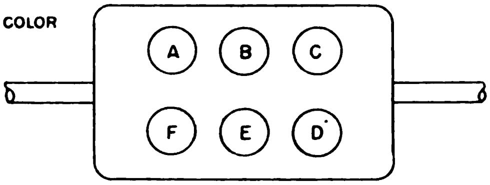
OLD STYLE

NEW STYLE

OLD STYLE	COLOR	NEW STYLE
BODY A	INDICATES FIRST SIGNIFICANT FIGURE OF RESISTANCE IN OHMS	BAND A
END B	INDICATES SECOND SIGNIFICANT FIGURE	BAND B
BAND OR DOT C	INDICATES MULTIPLIER	BAND C
END D	IF ANY, INDICATES TOLERANCE IN PER CENT OF THE NOMINAL RESISTANCE VALUE. IF NO COLOR APPEARS TOLERANCE IS ±20%	BAND D



CAPACITOR COLOR CODE



ONE ROW DOTS	COLOR	TWO ROWS OF DOTS
DOT A	INDICATES FIRST SIGNIFICANT FIGURE OF CAPACITANCE VALUE IN MICROMICROFARADS	DOT A
DOT B	INDICATES SECOND SIGNIFICANT FIGURE	DOT B
	INDICATES THIRD SIGNIFICANT FIGURE	DOT C
DOT C	INDICATES MULTIPLIER	DOT D
USUAL TOLERANCE ±20%	INDICATES TOLERANCE IN PER CENT OF THE NOMINAL CAPACITANCE VALUE. IF NO COLOR APPEARS TOLERANCE IS 20%	DOT E
RATED VOLTAGE USUALLY 500 VOLTS	USUALLY INDICATES THE RATED VOLTAGE. SOMETIMES INDICATES DESIGN CHARACTERISTICS	DOT F

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE PER CENT (IF GIVEN)	RATED VOLTAGE (IF GIVEN)
BLACK	0	1	20	
BROWN	1	10		100
RED	2	100	2	200
ORANGE	3	1,000		300
YELLOW	4	10,000		400
GREEN	5	100,000		500
BLUE	6	1,000,000		600
VIOLET	7	10,000,000		700
GRAY	8	100,000,000		800
WHITE	9	1,000,000,000		900
GOLD		0.1	5	1,000
SILVER		0.01	10	2,000
NO COLOR			20	500

TL 39617

Figure 21. Resistor and capacitor color code.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R1	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R2	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R3	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R4	3Z6620-5	RESISTOR: 20,000 ohm ±5%; ½ w.						*
R5	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R6	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R7	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R8	3Z4567	RESISTOR: 1,000 ohm ±10%; ½ w.						*
R9	2Z7268.63	POTENTIOMETER: 1,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R10	3RC20BE111J	RESISTOR: 110 ohm ±5%; ½ w.						*
R11	3RC20BE106K	RESISTOR: 10 meg ±10%; ½ w.						*
R12	3Z6700-54	RESISTOR: 100,000 ohm ±10%;½ w.						*
R13	3Z6682-7	RESISTOR: 82,000 ohm ±10%; 1 w.						*
R14	3ZK6240-13	RESISTOR: 2,400 ohm ±5%; 1 w.						*
R15	3Z6610-18	RESISTOR: 10,000 ohm; 2 w.						*
R16	3Z6700-66	RESISTOR: 100,000 ohm ±10%;1 w.						*
R17	3Z6682-4	RESISTOR: 82,000 ohm ±10%; ½ w.						*
R18	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R19	2ZK7276.26	POTENTIOMETER: 25,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R20	3Z6050-149	RESISTOR: wire-wound; 500 ohm; 5 w; noninductive.						*
R21	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R22	3Z6615-91	RESISTOR: wire-wound; 15,000 ohm; 10 w.						*
R23	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R24	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R25	3ZK6633-20	RESISTOR: 33,000 ohm ±10%; ½ w.						*
R26	3Z6801A5-6	RESISTOR: 1.5 meg ±10%; ½ w.						*
R27	3RC20BE152K	RESISTOR: 1,500 ohm ±10%; ½ w.						*
R28	3Z6582-2	RESISTOR: 8,200 ohm ±10%; ½ w.						*
R29	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R30	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R31	2Z7271.20	POTENTIOMETER: 200,000 ohm; ½ w; center-tapped; ⅜" shaft; linear taper; 320° maximum rotation.						*
R32	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R33	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R34	3ZK6610-87	RESISTOR: 10,000 ohm ±10%; ½ w.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd)*.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R35	2Z7274-46	POTENTIOMETER: 4 meg; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R36	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R37	3Z6682-5	RESISTOR: 82,000 ohm; 2 w.						*
R38	3Z4567	RESISTOR: 1,000 ohm ±10%; ½ w.						*
R39	3Z6220-3	RESISTOR: 2,200 ohm ±10%; ½ w.						*
R40	2Z7268.64	POTENTIOMETER: 1,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R41	3Z6803A3-6	RESISTOR: 3.3 meg ±10%; ½ w.						*
R42	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R43	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R44	2Z7269.34	POTENTIOMETER: 10,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R45	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R46	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R47	2ZK7276.26	POTENTIOMETER: 25,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R48	3Z6180-10	RESISTOR: 1,800 ohm ±10%; 1 w.						*
R49	3ZK6802A2-15	RESISTOR: 2.2 meg ±5%; ½ w.						*
R50	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R51	3Z6683	RESISTOR: 82,000 ohm; 2 w.						*
R52	3Z6640-6	RESISTOR: wire-wound; 40,000 ohm; 5 w.						*
R53	3Z6640-6	RESISTOR: wire-wound; 40,000 ohm; 5 w.						*
R54	3Z6622-10	RESISTOR: 22,000 ohm ±10%; ½ w.						*
R55	3Z6622-10	RESISTOR: 22,000 ohm ±10%; ½ w.						*
R56	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R57	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R58	2Z7284-49	POTENTIOMETER: 4 meg; dual; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R59	2Z7284-49	POTENTIOMETER: 4 meg; dual; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R60	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R61	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R62	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R63	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R64	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R65	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R66	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R67	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd).*

Ref symbol	*Signal Corps stock No.*	*Name of part and description*	*Quan per unit*	*Orgn stock 1st ech*	*Orgn stock 2d ech*	*3d ech*	*4th ech*	*Depot stock*
R68	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R69	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R70	2Z7273-42	POTENTIOMETER: 500,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R71	3Z6722-15	RESISTOR: 220,000 ohm ±10%; 1 w.						*
R72	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R73	3Z6722-15	RESISTOR: 220,000 ohm ±10%; 1 w.						*
R74	2Z7272-14	POTENTIOMETER: 500,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R75	3Z6718-7	RESISTOR: 180,000 ohm ±10%; 1 w.						*
R76	2Z7271-94	POTENTIOMETER: 100,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R77	3Z6768-11	RESISTOR: 680,000 ohm ±5%; ½ w.						*
R78	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
C1	3DA50-121	CAPACITOR: paper; 0.05 mf +20% −10%; 1,600 vdcw.						*
C2	3DA250-69.1	CAPACITOR: paper; 0.25 mf +20% −10%; 600 vdcw.						*
C3	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C4	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C5	3K301021A	CAPACITOR: mica; 0.001 mf ±20%; 500 vdcw; ASA type CM30A102M.						*
C6	3D9070-2.1	CAPACITOR: mica; 70 mmf; 500 vdcw.						*
C7	3DA250-69.7	CAPACITOR: paper; 0.25 mf +20% −10%; 400 vdcw.						*
C8	3DB100-18	CAPACITOR: electrolytic; 100 mf; 50 vdcw.						*
C9	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C10	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C11	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C12	3DKB4-70	CAPACITOR: paper; 4 mf ±10%; 600 vdcw.						*
C13	3DA500-255	CAPACITOR: paper; 0.5 mf ±20%; 200 vdcw.						*
C14	3DB25-32	CAPACITOR: electrolytic; 25 mf; 50 vdcw.						*
C15	3DA500-97.21	CAPACITOR: paper; 0.5 mf; 600 vdcw.						*
C16	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C17	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%. 600 vdcw.						*
C18	3DA50-44.8	CAPACITOR: paper; 0.05 mf +20% −10%; 400 vdcw.						*
C19	3DA250-69.1	CAPACITOR: paper; 0.25 mf; 400 vdcw.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C20	3DA250-69.1	CAPACITOR: paper; 0.25 mf; 400 vdcw.						*
C21	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C22	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C23	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C24	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C25	3D9070-2.1	CAPACITOR: mica; 70 mmf; 500 vdcw.						*
C26	3DA250-69.1	CAPACITOR: paper; 0.25 mf +20% −10%; 600 vdcw.						*
C27	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C28	3K201511	CAPACITOR: mica; 150 mmf ±10%; 500 vdcw; ASA type CM20A151K.						*
C29	3K2556111	CAPACITOR: mica; 600 mmf ±10%; 500 vdcw; ASA type CM25A561K.						*
C30	3DKA2.500-4.1	CAPACITOR; mica; 2,500 mmf ±10%; 500 vdcw.						*
C31	3DA10-30.3	CAPACITOR: paper; 0.01 mf ±10%; 400 vdcw.						*
C32	3DA40-12.1	CAPACITOR: paper; 0.04 mf ±10%; 400 vdcw.						*
C33	3DA150-11	CAPACITOR: paper; 0.15 mf ±10%; 400 vdcw.						*
C34	3DB100-18	CAPACITOR: electrolytic; 100 mf; 50 vdcw.						*
C35	3DB25-48	CAPACITOR: electrolytic; 25 mf; 50 vdcw.						*
C36	3DA500-255	CAPACITOR: paper; 0.5 mf; 200 vdcw.						*
C37	3F3630-1060A /C3	CAPACITOR: paper; 0.5 mf; 600 vdcw.						*
C38	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C39	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C40	3DB4-70.1	CAPACITOR: paper; 4 mf ±10%; 1,000 vdcw.						*
C41	3DKB4-70	CAPACITOR: paper; 4 mf ±10%; 600 vdcw.						*
C42	3DKB4-70	CAPACITOR: paper; 4 mt ±10%; 600 vdcw.						*
C43	3DA500-86	CAPACITOR: paper; 0.5 mf ±10%; 2,000 vdcw.						*
C44	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C45	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C46	3DA500-86	CAPACITOR: paper; 0.5 mf ±10%; 2,000 vdcw.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd).*

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C47	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C48	3DA50-44.8	CAPACITOR: paper; 0.05 mf +20% −10%; 400 vdcw.						*
C49	3D9030V-6	TRIMMER: ceramic; 4-30 mmf; 500 vdcw.						*
V1	2J6SJ7	TUBE, electron: type 6SJ7.						*
V2	2J6AC7	TUBE, electron: type 6AC7.						*
V3	2J6AG7	TUBE, electron: type 6AG7.						*
V4	2J6AG7	TUBE, electron: type 6AG7.						*
V5	2J3GP1	TUBE, electron: cathode-ray; type 3GP1.						*
V6	2J6SN7GT	TUBE, electron: type 6SN7GT.						*
V7	2J884	TUBE, electron: thyratron; type 884						*
V8	2J6SJ7	TUBE, electron: type 6SJ7.						*
V9	2J6SJ7	TUBE, electron: type 6SJ7.						*
V10	2J5U4G	TUBE, electron: type 5U4G.						*
V11	2J2X2	TUBE, electron: type 2X2.						*
V12	2J6V6GT	TUBE, electron: type 6V6GT.						*
V13	2J6SJ7	TUBE, electron: type 6SJ7.						*
V14	2C4348H/R5	LAMP, glow: neon; 1/4 w; double contact bayonet base; type 991.						*
V15	2Z5952	LAMP, incandescent: pilot; 6.3 v; 0.15 amp; bayonet base; brown bead.						*
L1 L2	3F3630-1060A /C3	COIL: peaking; 70-250 μh, to be varnish impregnated per spec CESL-44.						*
L3	3F3630-1060 /C1	COIL: peaking; 170 μh; 6 ohm; to be varnish impregnated per spec CESL-44.						*
L4 L5	3F3630-1060A /C2	COIL: peaking; 8.5 μh; 50 ohm; to be varnish impregnated per spec CESL-44.						*
L6	3C317-39	CHOKE: filter; 19 h at 150 ma; 400 ohm.						*
T1	2Z9613.276	TRANSFORMER, power.						*
F1	3Z1950	FUSE: 3 amp; 250 v.						*
S1	3Z9826-34.1	SWITCH, rotary: DP3T; Y-attenuation.						*
S2 S5	3Z9826-34.2	SWITCH, rotary: DPDT; deflecting plate.						*
S3	3Z9825-62.33	SWITCH, rotary: SP3T; sync selector.						*
S4	3Z9826-34	SWITCH, rotary: DP7T; frequency range.						*
S6	3ZK9846.4	SWITCH, toggle: SPDT; X-attenuation.						*
S7	3Z9857.50	SWITCH, toggle: SPST; power.						*
S8	3Z9559	SWITCH: safety; normally open; 3 amp; 115 v.						*
	3Z3285-2	HOLDER, fuse: finger operated.						*
	3Z737-13	POST, binding: plain, with 1/32" base.						*
	2Z7590-15	KNOB, bar: black; 1 1/4" long, with brass insert.						*
	2Z8659-6	SOCKET: octal; black or natural bakelite.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A (*contd*).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
	2Z8659-5.1	SOCKET: high-voltage; 4-prong; molded.						*
	4G5033.3/S50	SOCKET: bayonet base; 2-contact.						*
	2Z5883-13	PILOT LIGHT ASSEMBLY: green smooth frosted jewel; metal parts of jewel black oxide finish; 11-prong magnal socket.						*
	2Z7235-1	CONNECTOR, female: chassis; single pole; shielded; black oxide finish.						*
	3F3630-1060 /B1	BUSHING: bearing; for 1/4" shaft.						*
	3F3630-1060A /D1	SCALE: calibrated; 3"; type 216-A.						*

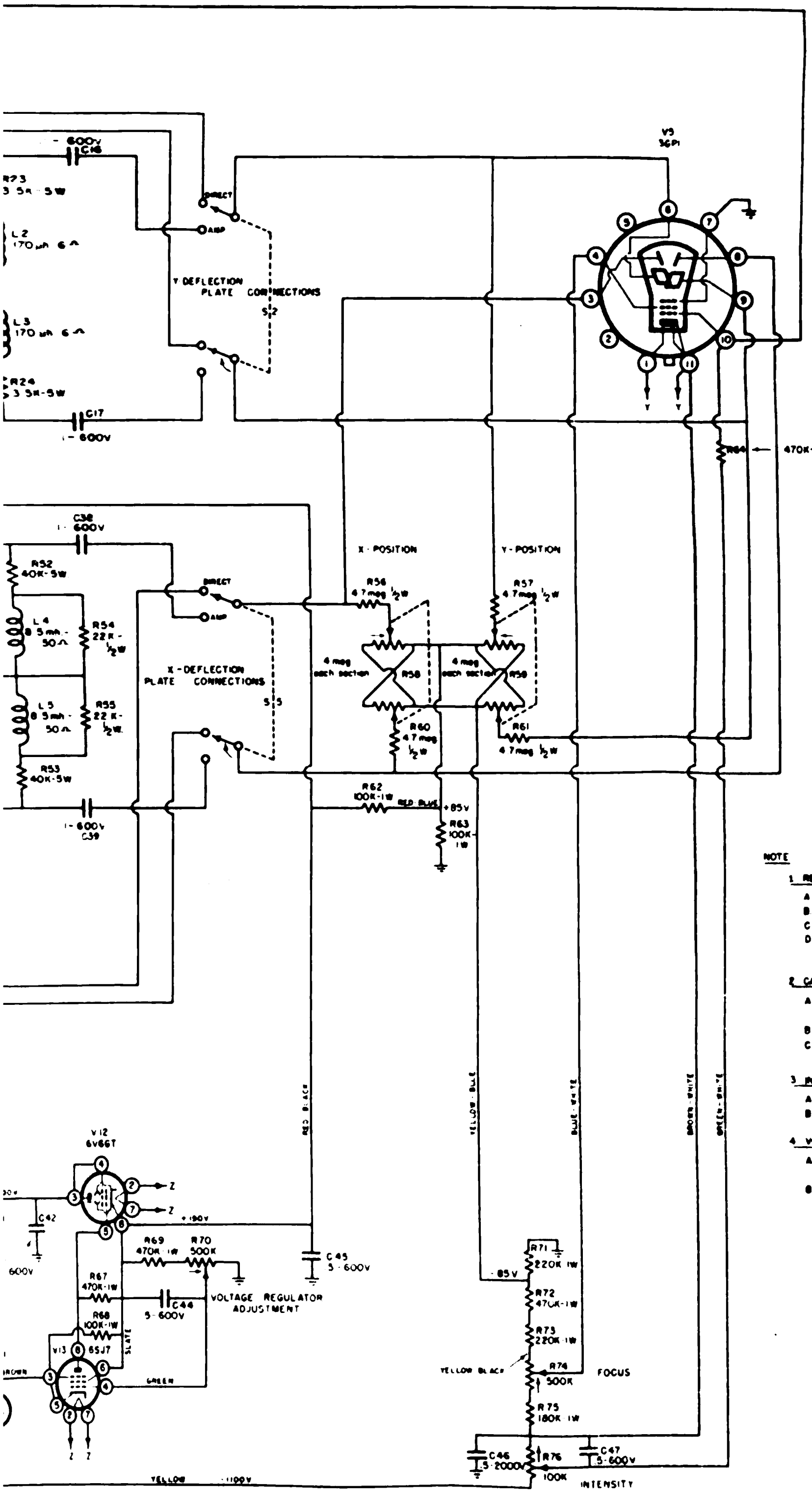
* Stock available.

Order No. 835-SCGSS-43; 4,500 copies, 13 November 1944.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock		3d ech	4th ech	Depot stock
				1st ech	2d ech			
R1	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R2	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R3	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R4	3Z6620-5	RESISTOR: 20,000 ohm ±5%; ½ w.						*
R5	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R6	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R7	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R8	3Z4567	RESISTOR: 1,000 ohm ±10%; ½ w.						*
R9	2Z7268.63	POTENTIOMETER: 1,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R10	3RC20BE111J	RESISTOR: 110 ohm ±5%; ½ w.						*
R11	3RC20BE106K	RESISTOR: 10 meg ±10%; ½ w.						*
R12	3Z6700-54	RESISTOR: 100,000 ohm ±10%;½ w.						*
R13	3Z6682-7	RESISTOR: 82,000 ohm ±10%; 1 w.						*
R14	3ZK6240-13	RESISTOR: 2,400 ohm ±5%; 1 w.						*
R15	3Z6610-18	RESISTOR: 10,000 ohm; 2 w.						*
R16	3Z6700-66	RESISTOR: 100,000 ohm ±10%;1 w.						*
R17	3Z6682-4	RESISTOR: 82,000 ohm ±10%; ½ w.						*
R18	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R19	2ZK7276.26	POTENTIOMETER: 25,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R20	3Z6050-149	RESISTOR: wire-wound; 500 ohm; 5 w; noninductive.						*
R21	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R22	3Z6615-91	RESISTOR: wire-wound; 15,000 ohm; 10 w.						*
R23	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R24	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R25	3ZK6633-20	RESISTOR: 33,000 ohm ±10%; ½ w.						*
R26	3Z6801A5-6	RESISTOR: 1.5 meg ±10%; ½ w.						*
R27	3RC20BE152K	RESISTOR: 1,500 ohm ±10%; ½ w.						*
R28	3Z6582-2	RESISTOR: 8,200 ohm ±10%; ½ w.						*
R29	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R30	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R31	2Z7271.20	POTENTIOMETER: 200,000 ohm; ½ w; center-tapped; ⅜" shaft; linear taper; 320° maximum rotation.						*
R32	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R33	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R34	3ZK6610-87	RESISTOR: 10,000 ohm ±10%; ½ w.						*

* Stock available.



PIN NO.	TUBE ELEMENTS
11	HEATER-CATHODE
10	CONTROL ELECTRODE (GRID)
4	FIRST ANODE
7	SECOND ANODE
6 & 9	Y-DEFLECTION PLATES
3 & 8	X-DEFLECTION PLATES
1	HEATER

NOTE

1 RESISTORS
- A K = OHMS X 1000 (EXAMPLE 15K = 15,000 OHMS)
- B MEG = OHMS X 1,000,000
- C W = WATTAGE RATING
- D Ω = OHMS

2 CAPACITORS
- A UNLESS OTHERWISE INDICATED, CAPACITANCE IS GIVEN IN MICROFARADS.
- B µµf = MICROMICROFARADS
- C VOLTAGE RATING IS DC WORKING

3 INDUCTORS
- A µh = MICROHENRY
- B mh = MILLIHENRY

4 VOLTAGES
- A ALL VOLTAGES ARE NOMINAL AS MEASURED BY A 20,000 OHM-PER-VOLT METER
- B AC VOLTAGES ARE RMS

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Figure 22. Oscilloscope BC-1060-A, schematic diagram.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd).*

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R68	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R69	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R70	2Z7273-42	POTENTIOMETER: 500,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R71	3Z6722-15	RESISTOR: 220,000 ohm ±10%; 1 w.						*
R72	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R73	3Z6722-15	RESISTOR: 220,000 ohm ±10%; 1 w.						*
R74	2Z7272-14	POTENTIOMETER: 500,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R75	3Z6718-7	RESISTOR: 180,000 ohm ±10%; 1 w.						*
R76	2Z7271-94	POTENTIOMETER: 100,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R77	3Z6768-11	RESISTOR: 680,000 ohm ±5%; ½ w.						*
R78	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
C1	3DA50-121	CAPACITOR: paper; 0.05 mf +20% −10%; 1,600 vdcw.						*
C2	3DA250-69.1	CAPACITOR: paper; 0.25 mf +20% −10%; 600 vdcw.						*
C3	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C4	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C5	3K301021A	CAPACITOR: mica; 0.001 mf ±20%; 500 vdcw; ASA type CM30A102M.						*
C6	3D9070-2.1	CAPACITOR: mica; 70 mmf; 500 vdcw.						*
C7	3DA250-69.7	CAPACITOR: paper; 0.25 mf +20% −10%; 400 vdcw.						*
C8	3DB100-18	CAPACITOR: electrolytic; 100 mf; 50 vdcw.						*
C9	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C10	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C11	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C12	3DKB4-70	CAPACITOR: paper; 4 mf ±10%; 600 vdcw.						*
C13	3DA500-255	CAPACITOR: paper; 0.5 mf ±20%; 200 vdcw.						*
C14	3DB25-32	CAPACITOR: electrolytic; 25 mf; 50 vdcw.						*
C15	3DA500-97.21	CAPACITOR: paper; 0.5 mf; 600 vdcw.						*
C16	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C17	3DA100-26	CAPACITOR· paper; 0.1 mf +20% −10%. 600 vdcw.						*
C18	3DA50-44.8	CAPACITOR: paper; 0.05 mf +20% −10%; 400 vdcw.						*
C19	3DA250-69.1	CAPACITOR: paper; 0.25 mf; 400 vdcw.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd)*.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C20	3DA250-69.1	CAPACITOR: paper; 0.25 mf; 400 vdcw.						*
C21	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C22	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C23	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C24	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C25	3D9070-2.1	CAPACITOR: mica; 70 mmf; 500 vdcw.						*
C26	3DA250-69.1	CAPACITOR: paper; 0.25 mf +20% −10%; 600 vdcw.						*
C27	3DK9012V-2	TRIMMER: ceramic; 3-12 mmf; 500 vdcw.						*
C28	3K201511	CAPACITOR: mica; 150 mmf ±10%; 500 vdcw; ASA type CM20A151K.						*
C29	3K2556111	CAPACITOR: mica; 600 mmf ±10%; 500 vdcw; ASA type CM25A561K.						*
C30	3DKA2.500-4.1	CAPACITOR; mica; 2,500 mmf ±10%; 500 vdcw.						*
C31	3DA10-30.3	CAPACITOR: paper; 0.01 mf ±10%; 400 vdcw.						*
C32	3DA40-12.1	CAPACITOR: paper; 0.04 mf ±10%; 400 vdcw.						*
C33	3DA150-11	CAPACITOR: paper; 0.15 mf ±10%; 400 vdcw.						*
C34	3DB100-18	CAPACITOR: electrolytic; 100 mf; 50 vdcw.						*
C35	3DB25-48	CAPACITOR: electrolytic; 25 mf; 50 vdcw.						*
C36	3DA500-255	CAPACITOR: paper; 0.5 mf; 200 vdcw.						*
C37	3F3630-1060A /C3	CAPACITOR: paper; 0.5 mf; 600 vdcw.						*
C38	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C39	3DA100-26	CAPACITOR: paper; 0.1 mf +20% −10%; 600 vdcw.						*
C40	3DB4-70.1	CAPACITOR: paper; 4 mf ±10%; 1,000 vdcw.						*
C41	3DKB4-70	CAPACITOR: paper; 4 mf ±10%; 600 vdcw.						*
C42	3DKB4-70	CAPACITOR: paper; 4 mf ±10%; 600 vdcw.						*
C43	3DA500-86	CAPACITOR: paper; 0.5 mf ±10%; 2,000 vdcw.						*
C44	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C45	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C46	3DA500-86	CAPACITOR: paper; 0.5 mf ±10%; 2,000 vdcw.						*

* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A (*contd*).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
C47	3DA500-97.21	CAPACITOR: paper; 0.5 mf +20% −10%; 600 vdcw.						*
C48	3DA50-44.8	CAPACITOR: paper; 0.05 mf +20% −10%; 400 vdcw.						*
C49	3D9030V-6	TRIMMER: ceramic; 4-30 mmf; 500 vdcw.						*
V1	2J6SJ7	TUBE, electron: type 6SJ7.						*
V2	2J6AC7	TUBE, electron: type 6AC7.						*
V3	2J6AG7	TUBE, electron: type 6AG7.						*
V4	2J6AG7	TUBE, electron: type 6AG7.						*
V5	2J3GP1	TUBE, electron: cathode-ray; type 3GP1.						*
V6	2J6SN7GT	TUBE, electron: type 6SN7GT.						*
V7	2J884	TUBE, electron: thyratron; type 884						*
V8	2J6SJ7	TUBE, electron: type 6SJ7.						*
V9	2J6SJ7	TUBE, electron: type 6SJ7.						*
V10	2J5U4G	TUBE, electron: type 5U4G.						*
V11	2J2X2	TUBE, electron: type 2X2.						*
V12	2J6V6GT	TUBE, electron: type 6V6GT.						*
V13	2J6SJ7	TUBE, electron: type 6SJ7.						*
V14	2C4348H/R5	LAMP, glow: neon; 1/4 w; double contact bayonet base; type 991.						*
V15	2Z5952	LAMP, incandescent: pilot; 6.3 v; 0.15 amp; bayonet base; brown bead.						*
L1 L2	3F3630-1060A /C3	COIL: peaking; 70-250 μh, to be varnish impregnated per spec CESL-44.						*
L3	3F3630-1060 /C1	COIL: peaking; 170 μh; 6 ohm; to be varnish impregnated per spec CESL-44.						*
L4 L5	3F3630-1060A /C2	COIL: peaking; 8.5 μh; 50 ohm; to be varnish impregnated per spec CESL-44.						*
L6	3C317-39	CHOKE: filter; 19 h at 150 ma; 400 ohm.						*
T1	2Z9613.276	TRANSFORMER, power.						*
F1	3Z1950	FUSE: 3 amp; 250 v.						*
S1	3Z9826-34.1	SWITCH, rotary: DP3T; Y-attenuation.						*
S2 S5	3Z9826-34.2	SWITCH, rotary: DPDT; deflecting plate.						*
S3	3Z9825-62.33	SWITCH, rotary: SP3T; sync selector.						*
S4	3Z9826-34	SWITCH, rotary: DP7T; frequency range.						*
S6	3ZK9846.4	SWITCH, toggle: SPDT; X-attenuation.						*
S7	3Z9857.50	SWITCH, toggle: SPST; power.						*
S8	3Z9559	SWITCH: safety; normally open; 3 amp; 115 v.						*
	3Z3285-2	HOLDER, fuse: finger operated.						*
	3Z737-13	POST, binding: plain, with 1/32" base.						*
	2Z7590-15	KNOB, bar: black; 1 1/4" long, with brass insert.						*
	2Z8659-6	SOCKET: octal; black or natural bakelite.						*

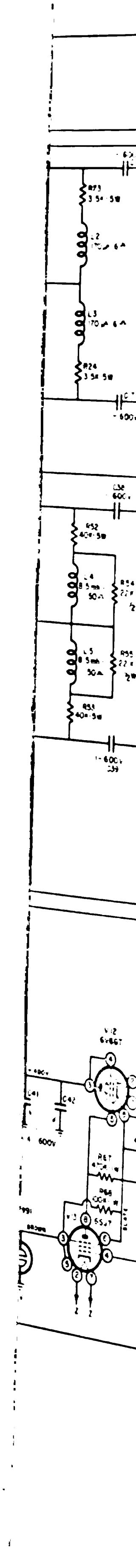
* Stock available.

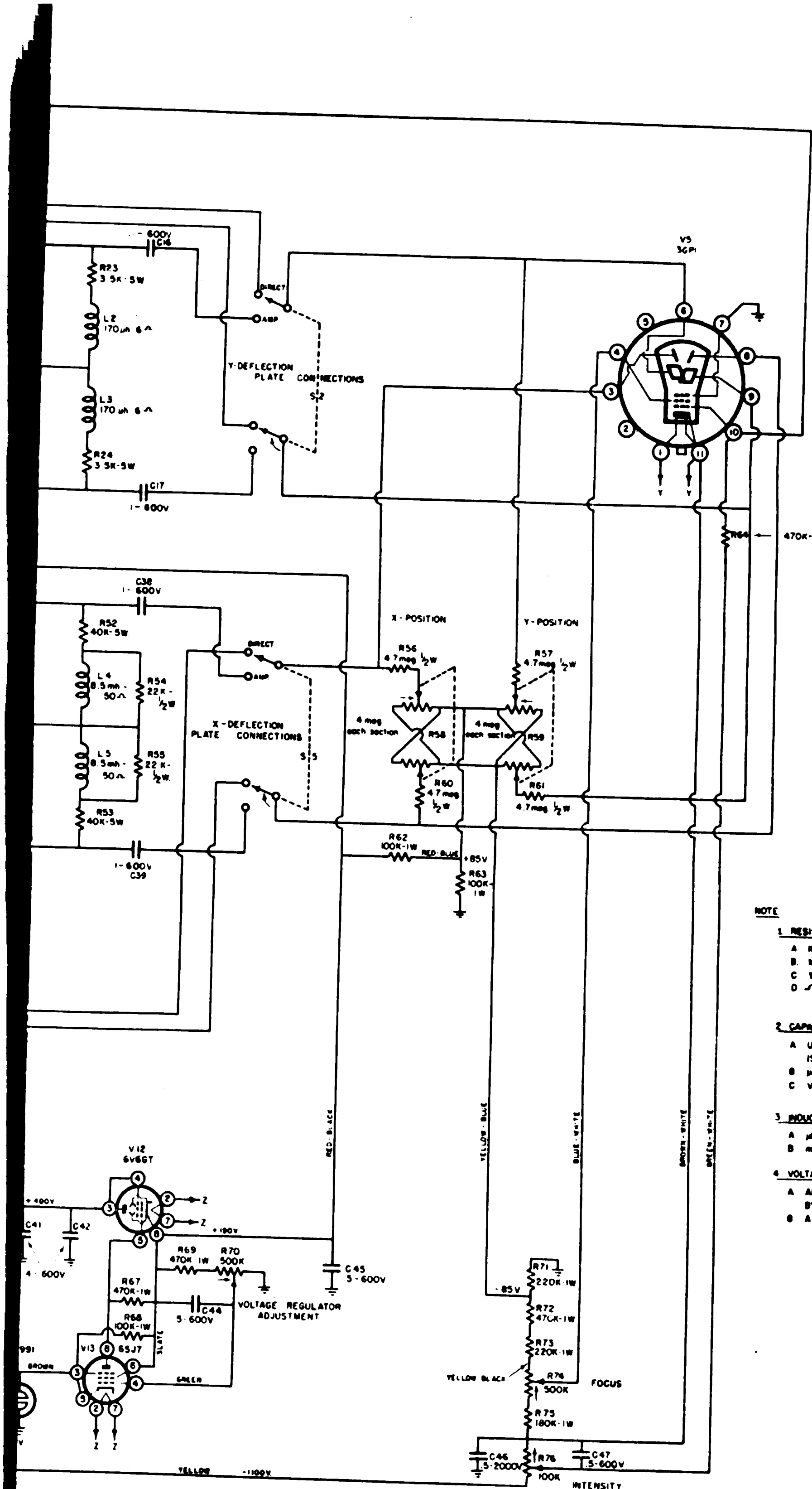
33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd).*

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
	2Z8659-5.1	SOCKET: high-voltage; 4-prong; molded.						*
	4G5033.3/S50	SOCKET: bayonet base; 2-contact.						*
	2Z5883-13	PILOT LIGHT ASSEMBLY: green smooth frosted jewel; metal parts of jewel black oxide finish; 11-prong magnal socket.						*
	2Z7235-1	CONNECTOR, female: chassis; single pole; shielded; black oxide finish.						*
	3F3630-1060 /B1	BUSHING: bearing; for ¼" shaft.						*
	3F3630-1060A /D1	SCALE: calibrated; 3"; type 216-A.						*

* Stock available.

Order No. 835-SCGSS-43; 4,500 copies, 13 November 1944.





PIN NO.	TUBE ELEMENTS
11	HEATER-CATHODE
10	CONTROL ELECTRODE (GRID)
4	FIRST ANODE
7	SECOND ANODE
6 & 9	Y-DEFLECTION PLATES
3 & 8	X-DEFLECTION PLATES
1	HEATER

NOTE

1. RESISTORS
   - A K = OHMS X 1000 (EXAMPLE 15K = 15000 OHMS)
   - B MEG = OHMS X 1,000,000
   - C W = WATTAGE RATING
   - D Ω = OHMS

2. CAPACITORS
   - A UNLESS OTHERWISE INDICATED, CAPACITANCE IS GIVEN IN MICROFARADS.
   - B µµf = MICROMICROFARADS
   - C VOLTAGE RATING IS DC WORKING

3. INDUCTORS
   - A µh = MICROHENRY
   - B mh = MILLIHENRY

4. VOLTAGES
   - A ALL VOLTAGES ARE NOMINAL AS MEASURED BY A 20,000 OHM-PER-VOLT METER
   - B AC VOLTAGES ARE RMS

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Figure 22. Oscilloscope BC-1060-A, schematic diagram.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A.

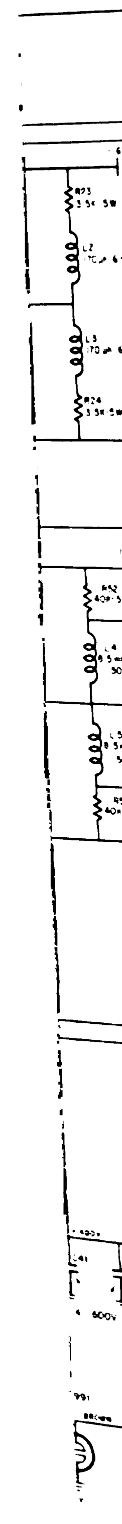
Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R1	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R2	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R3	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R4	3Z6620-5	RESISTOR: 20,000 ohm ±5%; ½ w.						*
R5	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R6	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R7	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R8	3Z4567	RESISTOR: 1,000 ohm ±10%; ½ w.						*
R9	2Z7268.63	POTENTIOMETER: 1,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R10	3RC20BE111J	RESISTOR: 110 ohm ±5%; ½ w.						*
R11	3RC20BE106K	RESISTOR: 10 meg ±10%; ½ w.						*
R12	3Z6700-54	RESISTOR: 100,000 ohm ±10%;½ w.						*
R13	3Z6682-7	RESISTOR: 82,000 ohm ±10%; 1 w.						*
R14	3ZK6240-13	RESISTOR: 2,400 ohm ±5%; 1 w.						*
R15	3Z6610-18	RESISTOR: 10,000 ohm; 2 w.						*
R16	3Z6700-66	RESISTOR: 100,000 ohm ±10%;1 w.						*
R17	3Z6682-4	RESISTOR: 82,000 ohm ±10%; ½ w.						*
R18	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R19	2ZK7276.26	POTENTIOMETER: 25,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R20	3Z6050-149	RESISTOR: wire-wound; 500 ohm; 5 w; noninductive.						*
R21	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R22	3Z6615-91	RESISTOR: wire-wound; 15,000 ohm; 10 w.						*
R23	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R24	3Z6350-40	RESISTOR: wire-wound; 3,500 ohm; 5 w; noninductive.						*
R25	3ZK6633-20	RESISTOR: 33,000 ohm ±10%; ½ w.						*
R26	3Z6801A5-6	RESISTOR: 1.5 meg ±10%; ½ w.						*
R27	3RC20BE152K	RESISTOR: 1,500 ohm ±10%; ½ w.						*
R28	3Z6582-2	RESISTOR: 8,200 ohm ±10%; ½ w.						*
R29	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R30	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R31	2Z7271.20	POTENTIOMETER: 200,000 ohm; ½ w; center-tapped; ⅜" shaft; linear taper; 320° maximum rotation.						*
R32	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R33	3Z6724-2	RESISTOR: 240,000 ohm ±5%; ½ w.						*
R34	3ZK6610-87	RESISTOR: 10,000 ohm ±10%; ½ w.						*

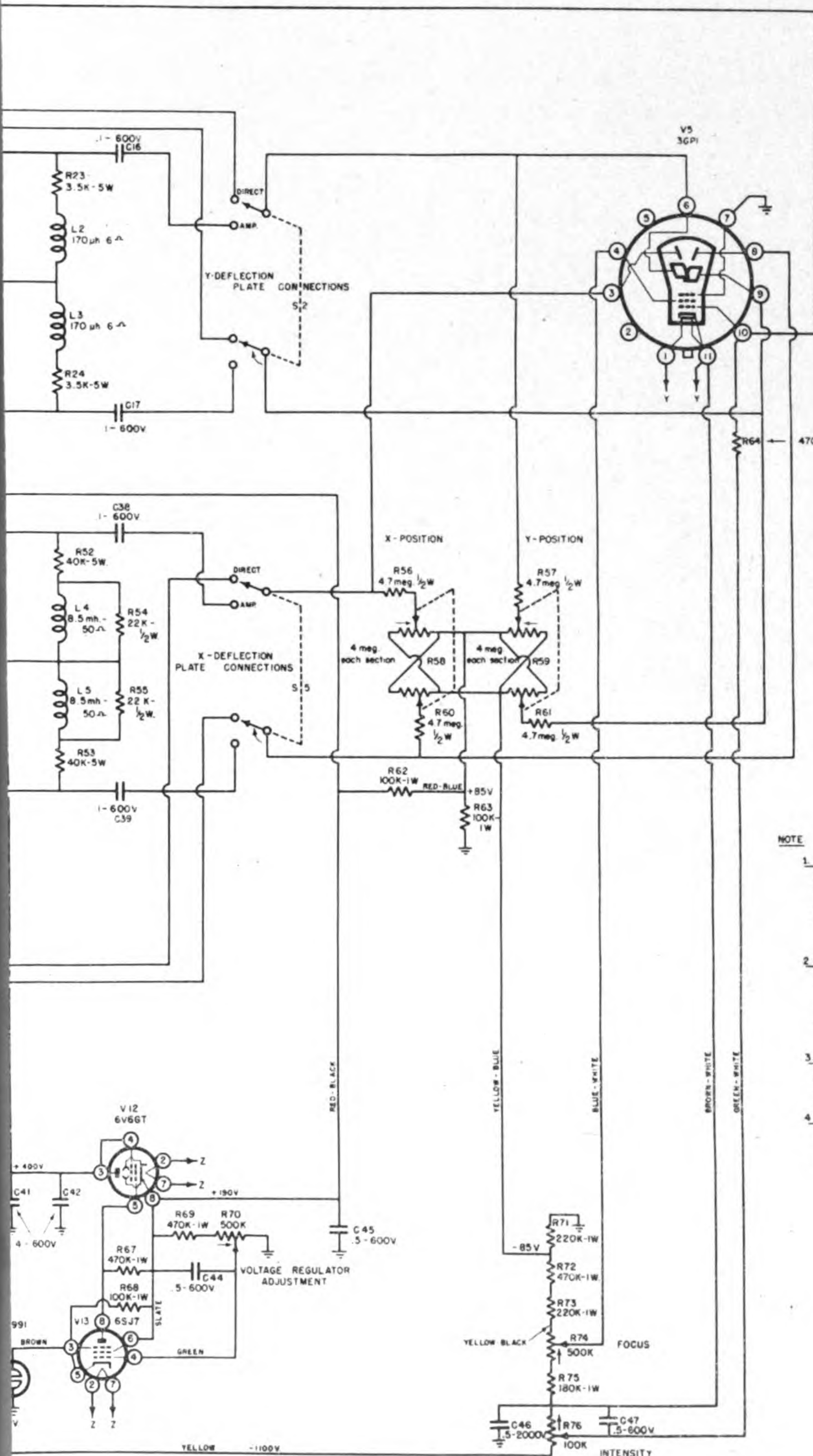
* Stock available.

33. MAINTENANCE PARTS LIST FOR OSCILLOSCOPE BC-1060-A *(contd).*

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
R35	2Z7274-46	POTENTIOMETER: 4 meg; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R36	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R37	3Z6682-5	RESISTOR: 82,000 ohm; 2 w.						*
R38	3Z4567	RESISTOR: 1,000 ohm ±10%; ½ w.						*
R39	3Z6220-3	RESISTOR: 2,200 ohm ±10%; ½ w.						*
R40	2Z7268.64	POTENTIOMETER: 1,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R41	3Z6803A3-6	RESISTOR: 3.3 meg ±10%; ½ w.						*
R42	3Z6802-10	RESISTOR: 2 meg ±5%; ½ w.						*
R43	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R44	2Z7269.34	POTENTIOMETER: 10,000 ohm; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R45	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R46	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R47	2ZK7276.26	POTENTIOMETER: 25,000 ohm; ½ w; ⅛" slotted shaft; linear taper; 320° maximum rotation.						*
R48	3Z6180-10	RESISTOR: 1,800 ohm ±10%; 1 w.						*
R49	3ZK6802A2-15	RESISTOR: 2.2 meg ±5%; ½ w.						*
R50	3Z6004A7-11	RESISTOR: 47 ohm ±10%; ½ w.						*
R51	3Z6683	RESISTOR: 82,000 ohm; 2 w.						*
R52	3Z6640-6	RESISTOR: wire-wound; 40,000 ohm; 5 w.						*
R53	3Z6640-6	RESISTOR: wire-wound; 40,000 ohm; 5 w.						*
R54	3Z6622-10	RESISTOR: 22,000 ohm ±10%; ½ w.						*
R55	3Z6622-10	RESISTOR: 22,000 ohm ±10%; ½ w.						*
R56	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R57	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R58	2Z7284-49	POTENTIOMETER: 4 meg; dual; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R59	2Z7284-49	POTENTIOMETER: 4 meg; dual; ½ w; ⅜" shaft; linear taper; 320° maximum rotation.						*
R60	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R61	3Z6804A7-1	RESISTOR: 4.7 meg ±10%; ½ w.						*
R62	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R63	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R64	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*
R65	3Z6610-59	RESISTOR: 10,000 ohm ±10%; 1 w.						*
R66	3Z6700-66	RESISTOR: 100,000 ohm ±10%; 1 w.						*
R67	3Z6747-17	RESISTOR: 470,000 ohm ±10%; 1 w.						*

* Stock available.





PIN NO.	TUBE ELEMENTS
11	HEATER-CATHODE
10	CONTROL ELECTRODE (GRID)
4	FIRST ANODE
7	SECOND ANODE
6 & 9	Y-DEFLECTION PLATES
3 & 8	X-DEFLECTION PLATES
1	HEATER

NOTE

1. RESISTORS
   - A. K = OHMS X 1000 (EXAMPLE 15K = 15,000 OHMS)
   - B. MEG. = OHMS X 1,000,000
   - C. W = WATTAGE RATING
   - D. Ω = OHMS
2. CAPACITORS
   - A. UNLESS OTHERWISE INDICATED, CAPACITANCE IS GIVEN IN MICROFARADS.
   - B. µµf. = MICROMICROFARADS
   - C. VOLTAGE RATING IS D.C. WORKING
3. INDUCTORS
   - A. µh = MICROHENRY
   - B. mh. = MILLIHENRY
4. VOLTAGES
   - A. ALL VOLTAGES ARE NOMINAL AS MEASURED BY A 20,000 OHM-PER-VOLT METER
   - B. A.C. VOLTAGES ARE R.M.S.

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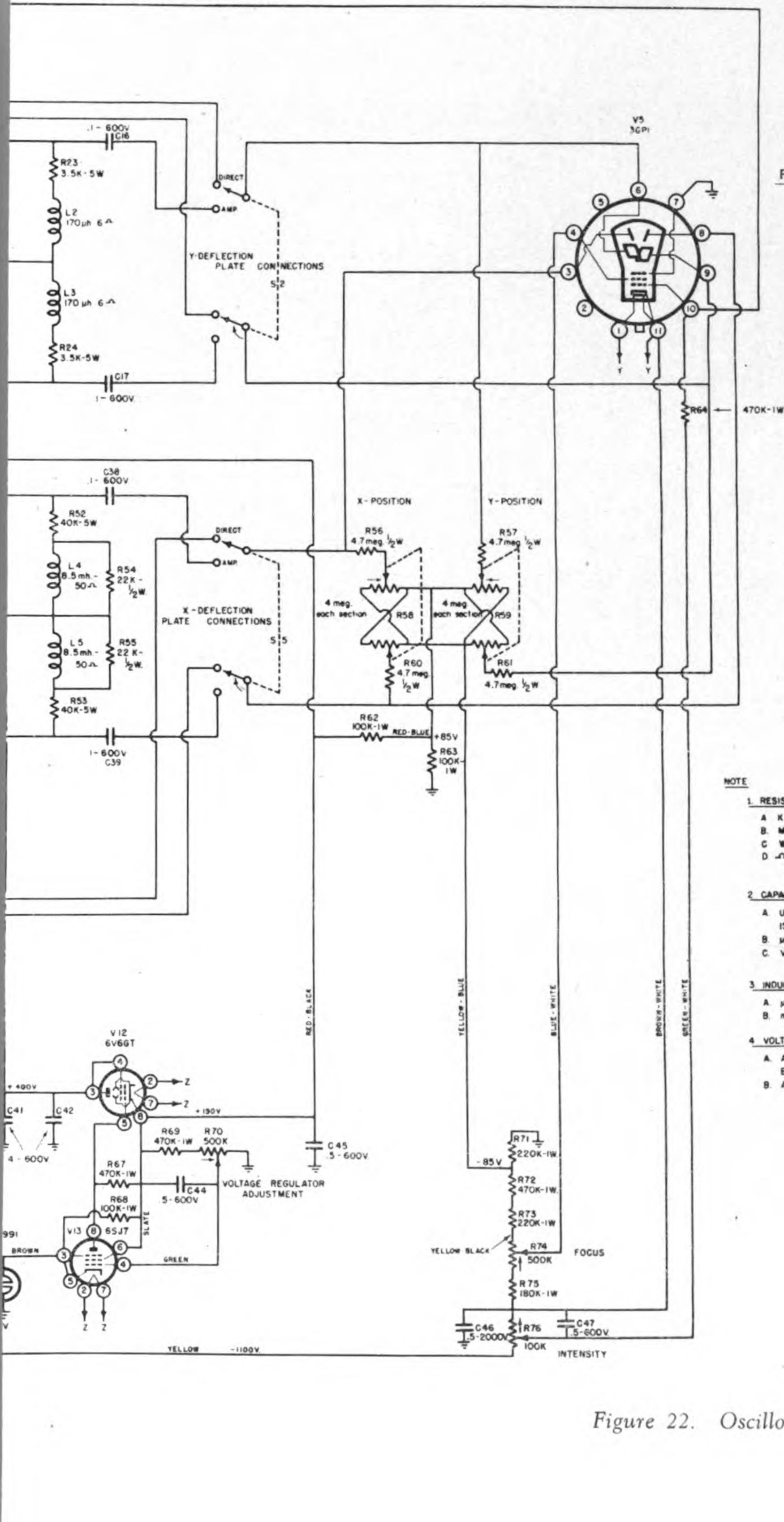
Figure 22. Oscilloscope BC-1060-A, schematic diagram.



PIN NO.	TUBE ELEMENTS
11	HEATER-CATHODE
10	CONTROL ELECTRODE (GRID)
4	FIRST ANODE
7	SECOND ANODE
6 & 9	Y-DEFLECTION PLATES
3 & 8	X-DEFLECTION PLATES
1	HEATER

NOTE

1. RESISTORS
   - A. K = OHMS X 1000 (EXAMPLE 15K = 15000 OHMS)
   - B. MEG. = OHMS X 1,000,000
   - C. W = WATTAGE RATING
   - D. Ω = OHMS

2. CAPACITORS
   - A. UNLESS OTHERWISE INDICATED, CAPACITANCE IS GIVEN IN MICROFARADS.
   - B. μμf. = MICROMICROFARADS
   - C. VOLTAGE RATING IS D.C. WORKING

3. INDUCTORS
   - A. μh = MICROHENRY
   - B. mh. = MILLIHENRY

4. VOLTAGES
   - A. ALL VOLTAGES ARE NOMINAL AS MEASURED BY A 20,000 OHM-PER-VOLT METER
   - B. A.C. VOLTAGES ARE R.M.S.

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Figure 22. Oscilloscope BC-1060-A, schematic diagram.