SYLVANIA

OSCILLOSCOPE

TYPE 131

INSTRUCTION BOOK

SYLVANIA ELECTRIC PRODUCTS, INC.

TABLE OF CONTENTS

GENERAL DESCRIPTION

I. QUICK REFERENCE DATA

A. Tube Complement

1-3AP1, 1-5Y3GT/G, 2-7C7, 1-7Y4, 1-884

B. Accelerating Potential

Approximately 650 volts.

C. Input Impedance

Vert Amplifier—Approximately 1 meg., 30 mmf. at full gain.
Hor Amplifier—Approximately 1 meg., 50 mmf. at full gain.
Vert Direct—Approximately 0.68 meg., 45 mmf.
Hor Direct—Approximately 0.68 meg., 60 mmf.

D. Amplifier Frequency Response

Sine wave response uniform within 3 db. from 10 cycles to 100 kilocycles

E. Deflection Factor

Amplifiers—0.5 volts r.m.s. give a one inch peak to peak deflection.
Direct—Approximately 17 volts r.m.s. give a one inch peak to peak deflection.

F. Horizontal Sweep

Frequency Range—15 to approximately 40,000 cycles
Direction of Sweep—Left to right
Synchronizing signal sources—Internal (Vertical signal)
External, Line Frequency

G. Power Supply Source

Potential	105-125 volts
Frequency	50-60 cycles
Power Consumption	40 watts
Fuse Protection	1 ampere

H. Cabinet Size

10⅛" high, 7¾" wide, 13⅜" deep

I. Weight

18 pounds

II. BRIEF DESCRIPTION

The Sylvania Type 131 Oscilloscope is an AC operated, portable, general purpose cathode-ray oscilloscope used to study waveforms and to measure voltages and currents of various types of circuits. High impedance inputs or amplifiers permit connection to grid and other similar circuits without serious loading.

Incorporated in this unit are vertical and horizontal deflection amplifiers, a saw-tooth oscillator, power supply, and controls.

III. OPERATION

A. D-C Controls

1. Beam Centering.—The two uppermost controls on the front panel, VERTICAL CENTERING and HORIZONTAL CENTERING, are used to keep the desired part of the, or the entire, pattern on the screen of the cathode-ray tube.

2. Intensity.—The INTENSITY control is used to regulate the brilliance of the pattern on the screen and to switch the power off and on. The complete counterclockwise position of the control is POWER OFF. A slight clockwise rotation of the knob turns the unit on, but leaves the beam current cut off. It is in this position that the control should be left for the "in between" moments of intermittent use. The pilot light serves as the off-on indicator at

such times. Continued clockwise rotation will result in a pattern appearing on the screen of the cathode-ray tube with the centering controls properly adjusted. The final setting of the INTENSITY control is dependent upon the phenomena under observation and the amount of external light striking the face of the tube. When a fine line is desired, a low brilliance setting is required.

WARNING—For general use, the intensity should be kept at as low a level as permits satisfactory viewing. A spot, or trace, of high intensity, stationary on the screen for prolonged periods of time, will result in burning of the screen.

3. Focus.—The FOCUS control varies the width and definition of the trace and should be set to give the finest line possible for the required degree of brilliance in normal operation.

B. Inputs

1. With Amplifiers.—A single resistance-capacitance coupled stage of amplification is used for each deflection plate, connections being made to HOR INPUT, VERT INPUT, and GND binding posts on the front panel. The gains of the respective amplifiers are adjusted with the HOR GAIN and VERT GAIN controls.

When using the horizontal amplifier in conjunction with an external source of sweep voltage, the COARSE FREQUENCY switch must be turned to its complete counterclockwise OFF position.

2. Direct.—Direct connections to the deflection plates through the blocking condensers are made by turning the gain controls to DIRECT.

3. Input Voltages.—The maximum d-c plus superimposed a-c applied to the input terminals must not exceed 400 volts. Where voltages greater than 400 are encountered, place a condenser having a voltage rating greater than the maximum applied voltage in series with the oscilloscope input.

4. Input Impedance——The input impedance ratings are listed as approximate due to variations in components.

C. Sweep Circuit

1. Frequency Adjustments.—The sweep oscillator frequency is determined by the setting of the COARSE FREQUENCY and FINE FREQUENCY controls. The COARSE FREQUENCY switch is used to select a range of frequencies, the maximum and minimum being the figures each side of the knob pointer except for the complete counterclockwise OFF position. (The letter K on the panel represents multiply by 1000). The FINE FREQUENCY adjustment is used to select any frequency within the limits of the range selected with the COARSE FREQUENCY control. This sweep voltage is available for external use at the HOR INPUT binding post whenever the internal sweep is being used.

2. Synchronizing.—The pattern is held stationary on the screen by rotating the SYNC AMPLITUDE control clockwise. Advancing the control beyond the setting where the pattern stops distorts the waveform.

The source of the synchronizing voltage is controlled through the SYNC SELECTOR switch. INT position is used to synchronize the sweep at the same frequency or a sub-multiple of a signal frequency applied to the VERT INPUT. LINE FREQUENCY position is used when the signal frequency is the same as, a multiple of, or sub-multiple of the line frequency. With VERT GAIN at DIRECT, a connection must be made between the EXT SYNC and the VERT INPUT binding posts. EXT is used when the signal is fed directly into the vertical deflection plate, or when a frequency other than those available internally is desired for synchronizing.

D. Line Frequency Test Signal

The 6.3 V. A-C binding post is a convenient source of a 6.3 volt r.m.s. signal with respect to the oscilloscope ground capable of delivering up to 0.3 ampere. This voltage may be used for signal tracing or heater supply for a vacuum tube voltmeter.

IV. APPLICATIONS

A. Audio Circuit Analysis

1. Without Sawtooth Sweep.—The oscilloscope and an audio oscillator are connected as shown in figure 1. The COARSE FREQUENCY control on the oscilloscope is turned to its maximum counterclockwise, OFF, position, and the r.m.s value of the oscillator output is maintained at a voltage not in excess of 60% of the bias on the input tube of the audio circuit. The probe is connected to point A of figure 1, the pattern on the oscilloscope observed,

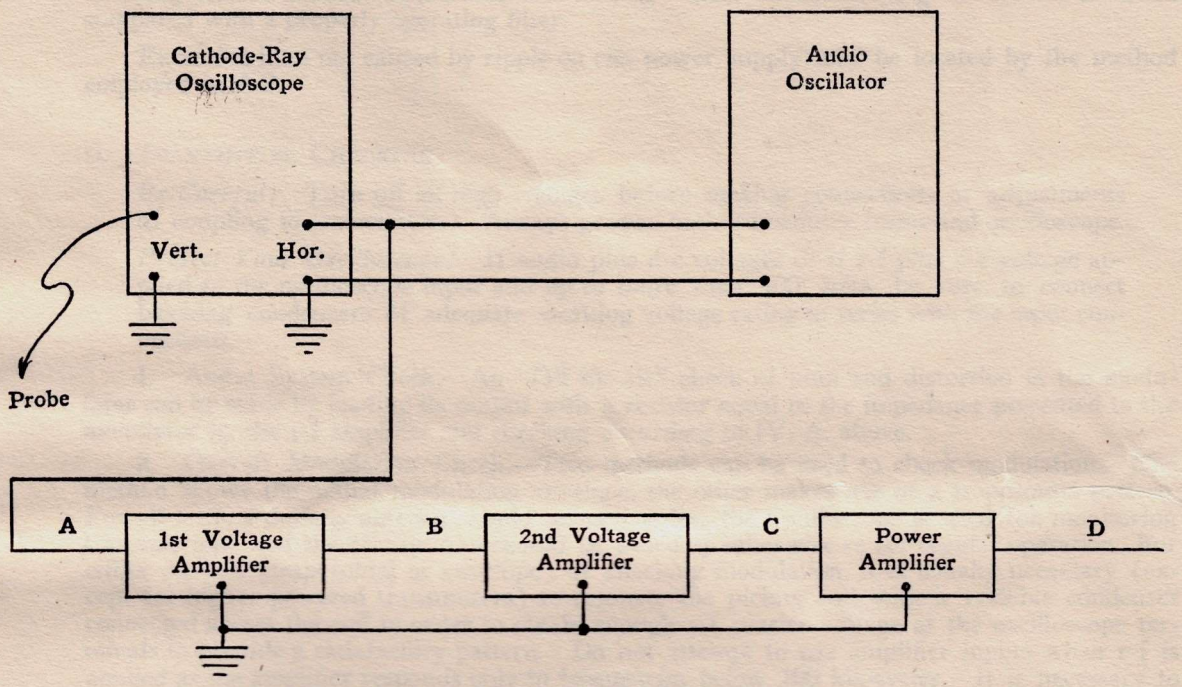


Fig. 1 Audio Circuit Analysis Connections

and the probe advance to B, C, and D. The faulty stage will precede the point at which a straight line is no longer observed on the scope. A trace as shown in figure 2a is an indication of phase shift, and 2b shows overloading.

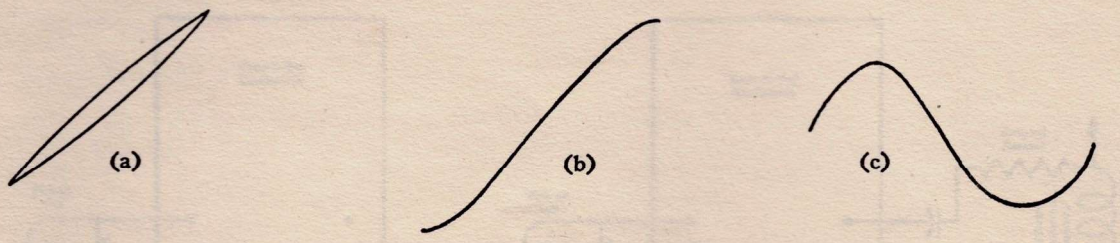


Fig. 2 Phase and Amplitude Distortion

2. With Sawtooth Sweep.—Connections are the same as figure 1 except for the removal of the lead to the HOR INPUT of the oscilloscope. The sweep should be adjusted to display two or three cycles of the test signal. Flattened or rounded peaks, as in figure 2 (c) indicate overloading. Distortion of only one peak may indicate incorrect biasing.

B. Receiver Alignment

Receiver alignment is performed the same as with an output meter. The oscilloscope is connected to a convenient point in the audio circuit. The wave shape of the modulating voltage may be studied if the sawtooth oscillator is used for horizontal deflection.

C. Filter Circuit and Hum Analysis

The ripple voltage of a receiver or amplifier may be checked to find objectionable hum by connecting the VERT INPUT of the oscilloscope to the output of the filter circuit and using the sawtooth sweep. The cause of excessive ripple voltage, if present, may be isolated by checking various sections of the filter and finding where the smoothing action varies when compared with a properly operating filter.

Excessive hum not caused by ripple on the power supply may be located by the method employed in A.2.

D. Transmitter Checking

Be Careful! Turn off all high voltages before making connections or adjustments of coupling to transmitters. Always ground both transmitter frame and oscilloscope.

Protect Your Oscilloscope! If audio plus d-c voltages or if r-f plus d-c voltage applied to the oscilloscope input add up to more than 400 volts, be sure to connect blocking condensers of adequate working voltage rating in series with the input connections.

1. Audio System Check.—An "Off-the-air" check of hum and distortion in the modulator can be made by loading its output with a resistor equal to the impedance presented to the modulator by the r-f amplifier and checking according to IV. A. above.

2. Overall Modulation Check.—Two methods can be used to check modulation. One method shows the actual modulation envelope, the other makes use of a trapezoidal pattern. For all tests, a dummy antenna should be used unless the oscilloscope is used for monitoring transmissions and the transmitter should be tuned up otherwise as for regular operation. For either method (trapezoidal or envelope) of checking modulation, it is usually necessary (except for higher powered transmitters) to resonate the pickup coil with a variable condenser connected across the coil in order to obtain enough r-f carrier voltage at the oscilloscope terminals to provide a satisfactory pattern. Do not attempt to use amplifier inputs when r-f is applied as the amplifier responds only to frequencies below 100 kilocycles. It is necessary to obtain directly from the transmitter enough r-f voltage to give a satisfactory deflection through the direct input.

Checking modulation by viewing the modulated envelope of the carrier is accomplished by connecting a pick-up coil coupled to the modulated amplifier tank coil or antenna coupler to VERT INPUT and GND of the oscilloscope as in figure 3, and grounding the oscilloscope. Feed an audio signal into the modulator, turn the VERT GAIN control to DIRECT, adjust the COARSE and FINE FREQUENCY controls to give two or three audio cycles of the modu-

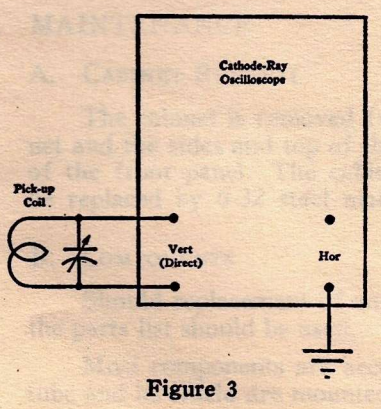


Figure 3

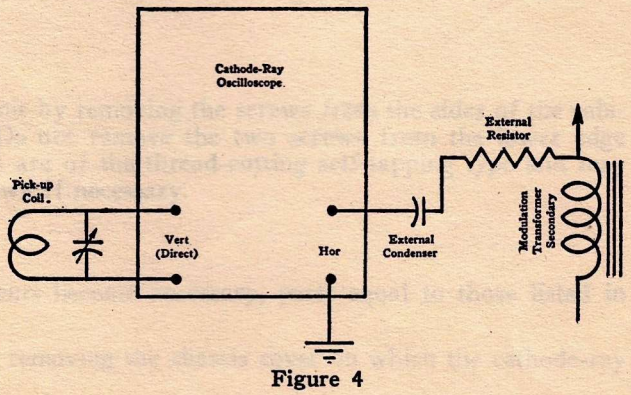
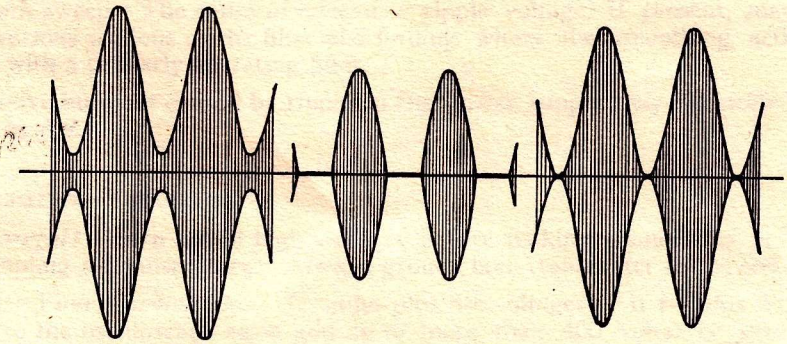


Figure 4

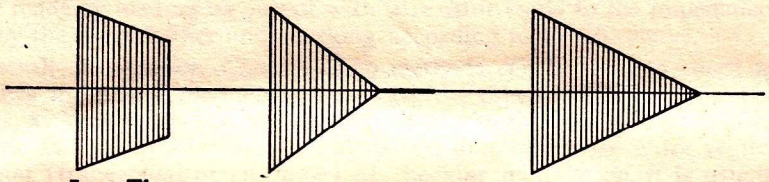
lated carrier, adjust the HOR GAIN for 1.5 to two inches of sweep, and adjust the pick-up loop, or resonate condenser, to give a maximum pattern height of 1.5 to two inches. Connect a lead from EXT SYNC to a point in the audio circuit to give a stationary pattern with SYNC SELECTOR in EXT and a moderate SYNC AMPLITUDE setting. See figure 5 for sample patterns. For more complete analysis by this method see "The Cathode-Ray Tube at Work" by John F. Rider.

Checking modulation with the aid of trapezoidal patterns is accomplished by using a pick-up coil the same as for the envelope method and connecting the output of the modulator to the



Less Than 100% Modulation **Overmodulation** **100% Modulation**

Figure 5



Less Than 100% Modulation **Overmodulation** **100% Modulation**

Figure 6

HOR INPUT as shown in figure 4. The condenser (in figure 4) in the lead to the secondary of the modulation transformer should be approximately 0.01 mf. and have a d-c voltage rating twice the d-c plate voltage of the class C amplifier. The resistance is not a single component. It should be made up of ½ megohm one watt resistors. The quantity should be: One up to 400 volts and one for each additional 250 volts of plate voltage on the class C stage. This will protect the oscilloscope components in the HOR INPUT circuit should the blocking condenser fail.

V. MAINTENANCE

A. Cabinet Removal

The cabinet is removed from the unit by removing the screws from the sides of the cabinet and the sides and top of the panel. Do not remove the two screws from the lower edge of the front panel. The cabinet screws are of the thread-cutting self-tapping type and may be replaced by 6-32 steel machine screws if necessary.

B. Components

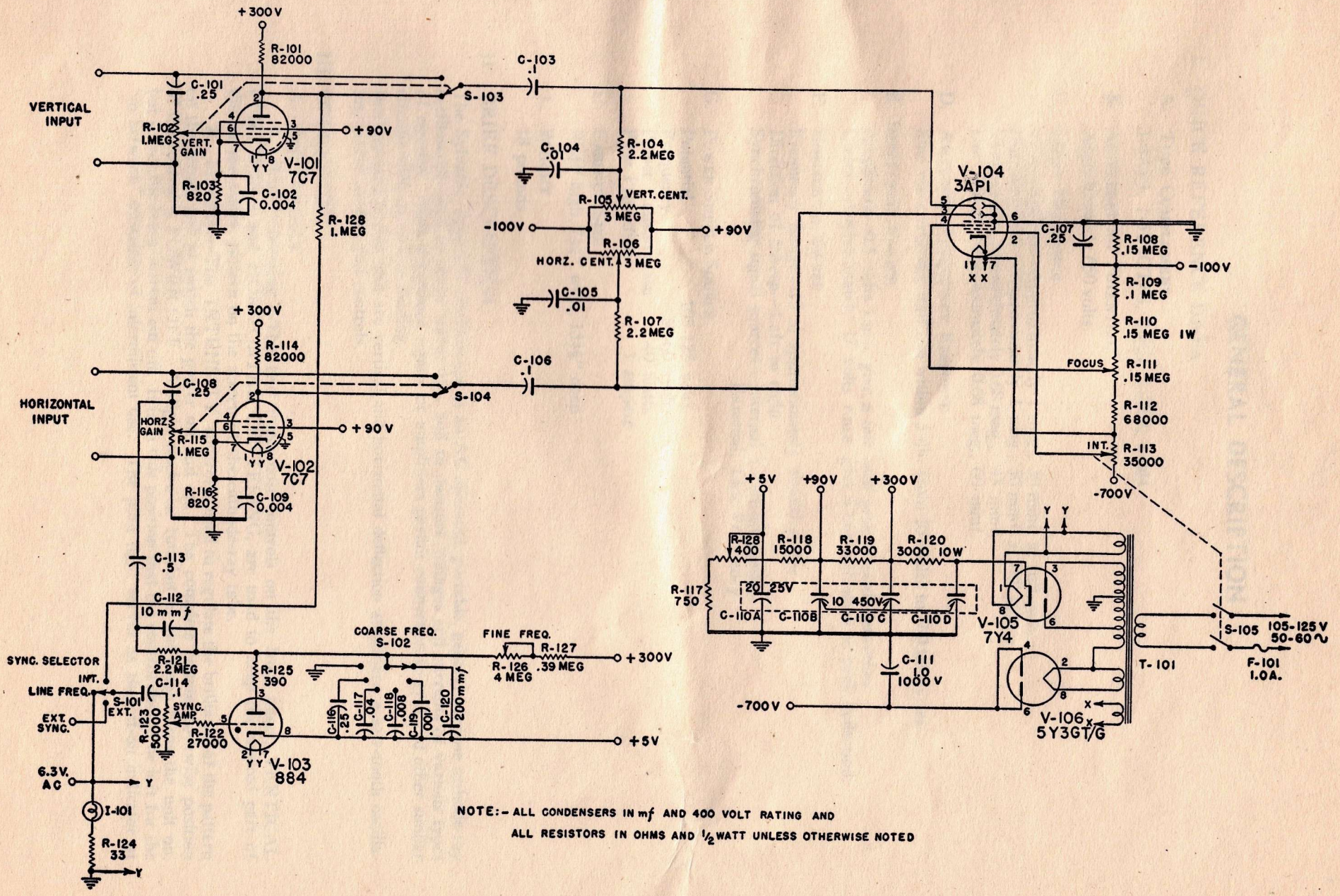
Should replacement of any components become necessary, parts equal to those listed in the parts list should be used.

Most components are accessible by removing the chassis cover on which the cathode-ray tube and its shield are mounted.

PARTS LIST

Symbol	Description	Rating	Tol. %	Sylvania Part No.
C-101	Condenser, Tubular Paper	0.25 uf., 400 V.	+30 —20	Pc. 13103
C-102	Condenser, Tubular Paper	0.004 uf., 400 V.	+20 —10	Pc. 13740
C-103	Condenser, Tubular Paper	0.1 uf., 400 V.	+30 —20	Pc. 12796
C-104	Condenser, Tubular Paper	0.01 uf., 400 V.	+30 —20	Pc. 13098
C-105	Same as C-104			
C-106	Same as C-103			
C-107	Same as C-101			
C-108	Same as C-101			
C-109	Same as C-102			
C-110	Condenser, Can Type Electrolytic	10-10-10/20 uf. 450/25 V.		Pc. 12784
C-111	Condenser, Can Type Paper	1.0 uf., 1000 V.		Pc. 12785
C-112	Condenser, Mica	10 uuf., 500 V.	±10	Pc. 13095
C-113	Condenser, Tubular Paper	0.5 uf., 400 V.	+30 —20	Pc. 13102
C-114	Same as C-103			
C-116	Condenser, Tubular Paper	0.25 uf., 400 V.	±20	Pc. 13100
C-117	Condenser, Tubular Paper	0.04 uf., 400 V.	±20	Pc. 13099
C-118	Condenser, Tubular Paper	0.008 uf., 400 V.	±20	Pc. 13101
C-119	Condenser, Mica	1000 uuf., 500 V.	±10	Pc. 13097
C-120	Condenser, Ceramic	200 uuf., 500 V.	±10	Pc. 13315
F-101	Fuse, Type 3AG	1 ampere		Pc. 2422
I-101	Lamp—Incandescent Bayonet S-47	6-8 V., 0.15 A.		Pc. 2828
R-101	Resistor—Composition	82,000 ohms, ½ W.	±10	Pc. 1020
R-102	Resistor—Variable, linear taper	1 meg., 1/3 W.	±20	Pc. 12791
R-103	Resistor—Composition	820 ohms, ½ W.	±10	Pc. 936
R-104	Resistor—Composition	2.2 meg. ½ W.	±10	Pc. 1080
R-105	Resistor—Variable, linear taper	3 meg., 1/3 W.	±20	Pc. 12792
R-106	Same as R-105			
R-107	Same as R-104			
R-108	Resistor—Composition	0.15 meg., ½ W.	±10	Pc. 1031
R-109	Resistor—Composition	0.1 meg., ½ W.	±10	Pc. 1024
R-110	Same as R-108			
R-111	Resistor—Variable, linear taper	0.15 meg., 1/3 W.	±20	Pc. 12790
R-112	Resistor—Composition	68,000 ohms, ½ W.	±10	Pc. 1017
R-113	Resistor—Variable, linear taper	35,000 ohms, 1/3 W.	±20	Pc. 12788

Symbol	Description	Rating	Tol. %	Sylvania Part No.
R-114	Same as R-101			
R-115	Same as R-102			
R-116	Same as R-103			
R-117	Resistor—Composition	750 ohms, ½ W.	± 5	Pc. 935
R-118	Resistor—Composition	15,000 ohms, 1 W.	±10	Pc. 1244
R-119	Resistor—Composition	33,000 ohms, 2 W.	±10	Pc. 1513
R-120	Resistor—Wire Wound	3000 ohms, 10 W.	± 5	Pc. 12787
R-121	Same as R-104			
R-122	Resistor—Composition	27,000 ohms, ½ W.	±10	Pc. 999
R-123	Resistor—Variable, Audio taper	50,000 ohms, ½ W.	±20	Pc. 12789
R-124	Resistor—Composition	33 ohms, ½ W.	±10	Pc. 877
R-125	Resistor—Composition	390 ohms, ½ W.	±10	Pc. 922
R-126	Resistor—Variable, linear taper	4 meg., 1/3 W.	±20	Pc. 12941
R-127	Resistor—Composition	0.39 meg., ½ W.	±10	Pc. 1048
R-128	Resistor—Composition	1.0 meg., ½ W.	±10	Pc. 1066
R-129	Resistor—Adjustable wire wound	400 ohms	± 5	Pc. 11925
S-101	Switch—Rotary, S.P., 3T Non-shorting			Pc. 12650
S-102	Switch—Rotary, D.P., 6T Non-shorting			Pc. 12515
S-103	Switch—Variable Resistor Mounting S.P. 2T.			
S-104	Switch—Variable Resistor Mounting S.P. 2T.			
S-105	Switch—Variable Resistor Mounting 2P S.T.			
V-101	Tube, Sylvania Type 7C7			
V-102	Same as V-101			
V-103	Tube, Sylvania Type 884			
V-104	Tube, Sylvania Type 3AP1			
V-105	Tube, Sylvania Type 7Y4			
V-106	Tube, Sylvania Type 5Y3GT/G			



NOTE:- ALL CONDENSERS IN mf AND 400 VOLT RATING AND ALL RESISTORS IN OHMS AND 1/2 WATT UNLESS OTHERWISE NOTED

WARRANTY

Sylvania Electric Products Inc. warrants each new Oscilloscope manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use and service discloses such defect, provided the unit is delivered by the owner to us or to our authorized wholesaler from whom purchased, intact, for our examination, with all transportation prepaid to our factory, within 90 days from the date of sale to original purchaser and provided such examination discloses in our judgement that it is thus defective.

This warranty does not extend to any Oscilloscope which has been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, not to units which have been repaired or altered outside of our factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith not of our own manufacture.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other warranty liability.

This warranty is void unless warranty card included with instrument is filled out completely and mailed upon initial sale of the instrument by the distributor.

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