TEKTRONIX

INSTRUCTION MANUAL

CHARACTERISTIC-CURVE TRACER TYPE 570

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INSTRUCTION MANUAL

TEKTRONIX, INC.
MANUFACTURERS OF CATHODE-RAY AND VIDEO TEST INSTRUMENTS

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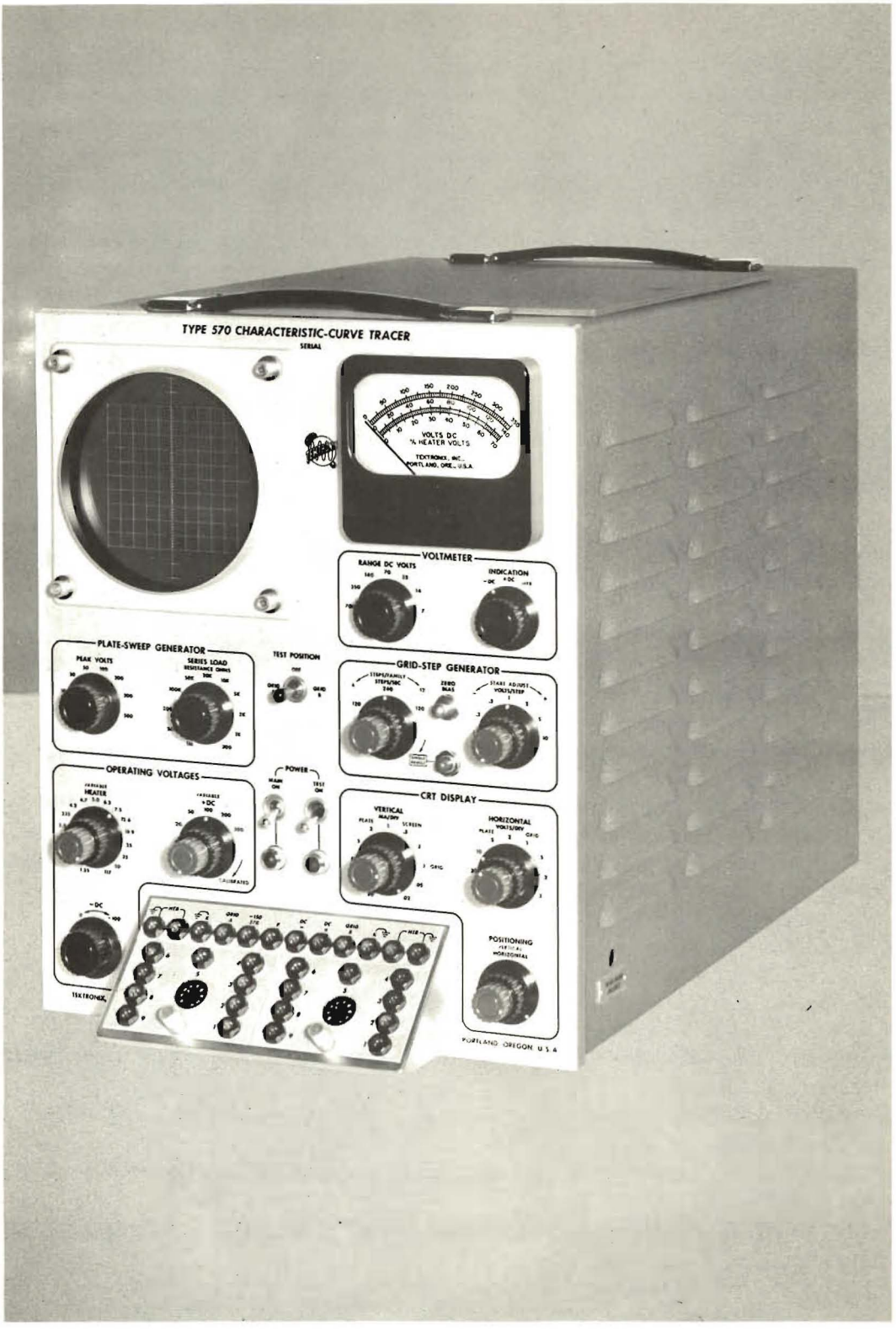
TYPE 570 CHARACTERISTIC-CURVE TRACER
SERIAL
VOLTS DC
% HEATER VOLTS
TEKTRONIX, INC.
PORTLAND, ORE., U.S.A.
VOLTMETER
RANGE DC VOLTS
INDICATION
PLATE-SWEEP GENERATOR
PEAK VOLTS
SERIES LOAD
RESISTANCE OHMS
TEST POSITION
GRID-STEP GENERATOR
ZERO BIAS
OPERATING VOLTAGES
POWER
MAIN ON
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CRT DISPLAY
VERTICAL
HORIZONTAL
POSITIONING
TEKTRONIX
PORTLAND, OREGON, U.S.A.

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SPECIFICATIONS

The Type 570 Characteristic-Curve Tracer presents a graphic analysis of vacuum-tube characteristics under a wide range of operating conditions. Calibrated horizontal and vertical deflection make it possible to measure the characteristics directly or the curves may be compared with preselected tube characteristics that have been reproduced on a mask over the cathode-ray tube. Front-panel switching between two test sockets permits rapid comparisons between two tubes or between two sections of the same tube.

Vertical Deflection Factor

Eleven steps from .02 ma/div. to 50 ma/div.

Accuracy: 3%

Horizontal Deflection Factor

Nine steps from .1 v/div. to 50 v/div.

Accuracy: 3%

Grid-Step Generator

Number of steps per family: 4 to 12.

Number of steps per second: 120 or 240.

Voltage change per step:
Seven positions from .1 to 10 volts/step.

Accuracy: 3%.

A single-family provision permits observation of tube characteristics under unusual conditions without danger of damage to the tube under test.

Maximum current: 50 ma average.
100 ma peak.

A 1/16 amp fuse protects the current measuring resistors in the .02 ma to 1 ma positions of the **VERTICAL MA/DIV.** switch.

Plate-Sweep Generator

Peak plate-sweep voltage:
Eight steps from 5 to 500 volts. Nominal voltages depending on line voltage.

Series load resistance:
Eleven steps from 300 ohms to 1 megohm.

Accuracy: 300 ohms, 30%; 1 k and 2 k, 10%; 5 k to 1 meg, 5%.

Maximum current capability
1 amp peak.
.25 amp average.

A ½ amp fuse protects the plate-sweep generator. An additional 1/16 amp fuse is inserted to protect the current measuring circuits in the .02 ma to 1 ma positions of the **VERTICAL MA/DIV.** switch when measuring plate current.

Operating Voltages

Heater Voltages:
Seventeen steps from 1.25 volts to 117 volts, each step adjustable over a range of about ±20%.

Maximum Heater Power: 30 watts.

Positive DC Voltage:
Five calibrated steps from 20 to 300 volts, 3% accuracy.

Continuously variable, uncalibrated, from 10 to 300 volts.

Maximum Current From + DC Supply:
150 ma peak.
50 ma average.

Negative DC Voltage:
Continuously variable from 0 to —100 volts.
Source impedance: 175 k.

Voltmeter

Measures positive and negative operating voltages in seven ranges from 7 to 700 volts, full scale.

In the HTR position the meter shows the heater voltage as a percentage of the figure selected by the HEATER switch.

Other Features

Tube-Socket Switch:
The **TEST POSITION** switch selects either of two tubes or two halves of one tube.

Safety Switch:
The **TEST POWER** switch removes all potentially dangerous voltages from the patch panel for safety when connections are being changed.

Regulated Power Supplies:

All power supplies affecting calibration are regulated for load and line-voltage variations. The heater, negative dc, and plate-sweep voltages are unregulated.

Cathode-Ray Tube:

Type: Tektronix T52P1

Other phosphors available.

Accelerating Potential: 4 kv.

Illuminated Graticule:

Edge lighted graticule provides either red or white illumination.

Mechanical Specifications

Ventilation: Filtered, forced air ventilation.

Construction: Aluminum alloy chassis and cabinet.

Finish: Photo-etched anodized panel, blue wrinkle cabinet.

Dimensions: 16½" high, 13" wide, 24½" deep.

Weight: 75 pounds.

Power Requirements: 105-125 or 210-250 v, 50-60 cycles, 300 to 500 watts at 117 or 234 volts.

Accessories Included

2 octal-socket adapter plates

2 nine-pin miniature adapter plates

2 seven-pin miniature adapter plates

2 blank adapter plates

10 patch cords with plug and socket connectors; 5 red, 5 black.

10 patch cords with plug connectors; 5 red, 5 black.

6 patch cords with parasitic oscillation suppression resistors; 2-100 ohm, 2-330 ohm, 2-1000 ohm.

1 6U8 vacuum tube

1 light filter

5 1/16 amp 3AG fuses

1 instruction manual

OPERATING INSTRUCTIONS

PRELIMINARY INSTRUCTIONS

CAUTION: High voltages can be present at the patch panel. The flexible operational setup facility of the Type 570 requires that potentially dangerous voltages be available at the patch panel. Turn off the **TEST POWER** switch when making or changing connections. Practice safety by connecting each lead first to the adapter plate and then to the patch panel.

Note: Fuses are used to protect some of the circuits supplying power to the patch panel. Damage to other circuits is possible by extended periods of heavy overload. In no case is any provision made to protect the vacuum tube or other device being tested.

Cooling

The Type 570 Characteristic-Curve Tracer is cooled by filtered, forced-air ventilation. The instrument must therefore be placed so the air intake is not blocked, and the filter must be clean enough to permit adequate air circulation.

Illuminated Graticule

The adjustable graticule lighting control labeled **SCALE ILLUM.**, can be adjusted to suit the lighting conditions of the room. The colored filter supplied gives maximum trace contrast in the presence of room light. This filter should normally be mounted next to the cathode-ray tube with the scribed graticule on the outside.

The graticule is scribed in ten equal divisions, horizontally and vertically. These scale markings and calibrated vertical and horizontal deflection sensitivities can be used to convert the beam position into milliamps and volts. Vertical sensitivities are calibrated in milliamps per division and horizontal sensitivities in volts per division; which, if multiplied by divisions of deflection, give milliamps and volts.

The graticule can be mounted in either of two positions rotated 180 degrees from each other. The graticule illumination is red in one position and white in the other. The white will reproduce well photographically.

50-Cycle Operation

This instrument is calibrated for a 60-cycle line frequency at the factory. For 50-cycle operation it will be necessary to readjust the step-generator phase controls. See "Step Generator Phase Adjustments" in the Maintenance Section of this manual.

234-Volt Operation

Unless it is tagged for 234-volt operation this instrument is connected for 117-volt operation. For 234-volt operation it is necessary to change the jumpers on two transformers to connect the primary windings in series. An AC Wiring Diagram is included on the Main Power Supply diagram.

For 234-volt operation remove the jumpers between pins 1 and 2 and between 3 and 4 on T501. Connect a jumper between pins 2 and 3 on T501. Check to see that the fan is connected to pins 1 and 3. Remove the jumpers between pins 1 and 2 and between pins 3 and 4 on T401. Connect a jumper between pins 2 and 3 on T401. Do not change the connections on the other transformers since these are still supplied with 117 volts. Change the fuse to a 3 amp, 3 AG Slo- Blo.

FUNCTIONS OF CONTROLS AND CONNECTORS

Plate-Sweep Generator

PEAK VOLTS	Eight-position switch selects peak voltage from plate-sweep generator.
SERIES LOAD	Eleven-position switch selects series load resistors for plate-sweep generator.

Operating Voltages

HEATER	Seventeen-position switch selects heater voltage for tube under test.
VARIABLE	Variable resistor allows heater voltage to be raised or lowered about 20%.
+ DC	Five-position switch selects screen voltage for tube under test. Voltages shown are correct only when red knob is fully clockwise.
VARIABLE (red knob)	Variable resistor allows adjustment of +dc supply between voltages indicated on +DC switch. Knob must be fully clockwise for +DC switch to be calibrated.
— DC	Variable resistor selects a portion of the voltage between ground and the negative 150 v supply for biasing purposes.

Voltmeter

RANGE DC VOLTS	Seven-position switch selects voltmeter multiplier.
INDICATION	Three-position switch connects voltmeter to —DC, +DC or heater supplies for the tube under test.

Grid-Step Generator

STEPS/SEC	Three-position switch selects a stepping rate of either 120 or 240 steps per second. (100 or 200 steps per second at 50 cycle line frequency.) The two 120 positions allow grid-voltage stepping to occur at either end of the plate-voltage sweep.
STEPS/FAMILY (red knob)	Variable resistor adjusts step generator for from four to twelve steps thereby adjusting the number of curves plotted from four to twelve.
ZERO-BIAS	Push-to-operate switch connects grid of tube under test to ground to plot a zero bias curve.
VOLTS/STEP	Seven-position switch adjusts the amplitude of the steps from the step generator.
START ADJUST	Variable resistor adjusts the dc level of the stair-step waveform thus permitting the first step to be positive or negative or at zero bias.
SINGLE FAMILY	Push-to-operate switch, effective only when the **STEPS/FAMILY** control is clockwise, displays a single family of curves after which the grid is held negative.

CRT Display

VERTICAL MA/DIV	Eleven-position switch selects vertical sensitivity.
Vertical Display Selector	Three-position switch selects the plate, screen or grid voltage for display on the vertical axis.
HORIZONTAL VOLTS/DIV	Nine-position switch selects horizontal sensitivity.
Horizontal Display Selector	Two-position switch selects the grid or plate voltage of the tube under test for display on the horizontal axis.
POSITIONING (red knob)	Variable control adjusts position of display along vertical axis.
(black knob)	Variable control adjusts position of display along horizontal axis.

Miscellaneous

TEST POSITION	Three-position lever-type switch selects either of two tubes which may be under test or removes grid waveform in center position.
POWER MAIN	On-off switch in primary of power transformer and ventilating fan lead.
TEST	On-off switch removes all voltages from patch panel.

Top Recessed Panel

FOCUS	Control to adjust the focus of the cathode-ray tube beam.
INTENSITY	Control to vary the brightness of the crt display.
ASTIGMATISM	Control to adjust the beam focus in conjunction with the **FOCUS** control.
SCALE ILLUM	Variable resistor to adjust the brightness of the graticule lights.
PLATE SWEEP FUSE	Fuse to protect the plate-sweep generator circuits.
VERT. ATTEN. CIR. FUSE	Fuse to protect the resistors in the high sensitivity ranges of the **MA/DIV.** attenuator.
VOLTS/STEP ZERO ADJUST	Screwdriver adjustment to balance the step amplifier to prevent a shift of the zero-bias step as the **VOLTS/STEP** control is rotated.

Patch Panel

HTR	Two paralleled sets of jacks connected to the heater transformer.
K	Two grounded jacks for the cathode connections.
GRID A	Jack which is connected to the grid-step voltage when the **TEST POSITION** switch is in the **GRID A** position. Jack is returned to —300 volts through a 10-megohm resistor in the other positions of the switch.
GRID B	Jack which is connected to the grid-step voltage when the **TEST POSITION** switch is in the **GRID B** position. Other characteristics as for **GRID A**.
—150,27 k	Jack connected to the regulated —150 v supply through a 27 k isolation resistor.
P	Jack connected to output of the plate-sweep generator via the series load resistor selected by the **SERIES LOAD** switch.
—DC	Jack connected to the **—DC** potentiometer providing a negative bias voltage with a source resistance of about 175 k.
+DC	Jack connected to the regulated, variable **+DC** supply.

FIRST-TIME OPERATION

This section describes in detail the procedure for setting up a typical display of the plate-characteristic curve for a triode and a pentode. A type 6U8 triode-pentode is specified. If a different tube type is used the patch-panel connections should be changed as required. Except for the heater voltage, these settings can serve as the starting point for checking most receiving-type tubes. The settings may then be altered as required to obtain a useful presentation.

Control Settings

1. Turn the **POWER** switches to **OFF**.
2. Connect the power cord to a source of 117-volt, 60-cycle power.
3. Turn the **MAIN POWER** switch to **ON**.
4. Set the controls as follows:

Top Recessed Panel	
INTENSITY	Center
FOCUS	Center
ASTIGMATISM	Center
Plate-Sweep Generator	
PEAK VOLTS	200
SERIES LOAD	10 K
Operating Voltages	
HEATER	6.3
VARIABLE	Center
+DC	100
VARIABLE	Clockwise
Voltmeter	
INDICATION	HTR
Grid-Step Generator	
STEPS/FAMILY	Center
STEPS/SEC	240
START ADJUST	Counterclockwise
VOLTS/STEP	.5
CRT Display	
VERTICAL MA/DIV	1
PLATE-SCREEN-GRID	PLATE
HORIZONTAL VOLTS/DIV	20
PLATE-GRID	PLATE
POSITIONING	Controls Centered

5. Insert a nine-pin-miniature socket adapter.
6. Connect the patch cords as follows for a type 6U8 vacuum tube:
   a. Pin 1 to **P**, the triode plate to the plate sweep.
   b. Pin 2 to **GRID B**, the pentode grid to the "B" grid connector.
   c. Pin 3 to **+DC**, the pentode screen to the **+DC** supply.
   d. Pins 4 and 5 to a pair of **HTR** jacks.
   e. Pin 6 to **P**, the pentode plate to the plate sweep.
   f. Pin 7 to **K**, the pentode cathode and suppressor to ground.
   g. Pin 8 to **K**, the triode cathode to ground.
   h. Pin 9 to **GRID A**, the triode grid to the "A" grid connector.
7. Plug a type 6U8 vacuum tube in the socket.
8. Turn the **TEST POWER** switch to **ON**.
9. Adjust the **VARIABLE** heater control to obtain a reading of 100% on the voltmeter.
10. Move the **TEST POSITION** switch to **GRID A**.
11. Adjust the positioning controls so the curves start in the lower, left-hand corner of the graticule.
12. Adjust the **FOCUS**, **ASTIGMATISM**, and **INTENSITY** controls for a sharp trace of comfortable brightness.
13. Press the **ZERO BIAS** button and upon releasing it set the **START ADJUST** control so that the uppermost curve corresponds with the zero-bias curve.

You are now displaying the 6U8 triode plate-characteristic curve. Move the **STEPS/SEC** control to each of the 120 positions and note that the grid-step generator switches at only one end of the sweep in each of these positions.

Now move the **TEST POSITION** switch to **GRID B**. You are now displaying the 6U8 pentode plate-characteristic curve. Move the red knob, concentric with the **VERTICAL MA/DIV** control, to **SCREEN**. This is screen current plotted against plate voltage. Return the controls to plot the triode curve.

Now move the **PEAK VOLTS** control down three positions to 20, the **VERTICAL MA/DIV**

three positions to .1 and the **HORIZONTAL VOLTS/DIV** three positions to 2. This is an expanded display of lower left corner of the first triode characteristic curve.

You will notice that the curves are not plotted all the way to the origin and that the curves intersect the current axis above the origin. These are normal effects and do not indicate miscalibration of the instrument. The correct horizontal positioning can be determined by momentarily grounding the plate connector, P. The line which results should lie along the current axis.

The initial velocity of the emitted electrons causes plate current to flow at zero plate voltage as indicated by the curves intersecting the current axis above the origin. This effect is more pronounced with increased series load resistance. A similar effect in the plate-sweep-generator rectifiers prevents the plate-sweep voltage from dropping completely to zero.

THERMIONIC DIODE CURVES

To plot diode curves, connect the diode in the normal manner with the cathode to ground, K, and the plate to the plate-sweep generator, P. Set the **CRT DISPLAY** controls to read plate current and plate voltage. Before turning the **TEST POWER** switch on, set the **PEAK VOLTS** control to a low voltage. After the **TEST POWER** switch is turned on, wait until the cathode of the tube under test has reached operating temperature before raising the plate-sweep voltage. The plate-sweep voltage can then be raised until maximum operating conditions are reached.

It is sometimes of interest to sweep the plate voltage negative with respect to the cathode, beyond the point of plate-current cutoff. This can be done by connecting a battery between the cathode and ground to raise the cathode positive. Three volts is normally sufficient. The +DC supply can be used instead of a battery if the peak plate current is to be less than 50 ma. To use the +DC supply, connect the cathode of the tube under test to **+DC**. Set the **+DC** controls to minimum, about ten volts. Connect a 200 ohm, 2 watt resistor from the cathode to ground to keep the power supply in regulation. The curve can now be plotted in the normal manner. The zero voltage point can be determined by momentarily connecting the plate to the cathode. Be sure there is sufficient series resistance in the plate-sweep generator to limit the current to a safe value when you do this. Position the line which you obtain behind a graticule line. This line will then be the vertical axis.

TRIODE CURVES

By setting the **CRT DISPLAY** controls to the proper positions the following curves can be plotted: plate current-plate voltage, grid current-plate voltage, plate current-grid voltage, and grid current-grid voltage.

Grid-Step Waveform

Triode curves involve the use of the grid-step generator in addition to the circuits used in plotting diode curves. The grid-step wave form is a stair-step waveform starting at zero or some positive voltage and going negative for from four to twelve steps. It can be set to have as many as eight positive steps. The position of the zero-bias curve can be determined by pushing the **ZERO BIAS** button.

The **STEPS/SEC** control provides a means of selecting the stepping point of the step generator. In the right hand position, labeled **120**, the generator steps while the plate voltage is at maximum and in the left hand position the generator steps when the plate voltage is at a minimum. In the **240** position, stepping occurs at both maximum and minimum voltage points, and the faster switching rate reduces flicker.

If either end of the plate sweep is particularly important, it is usually better to set the step generator to switch at the opposite end. However, in some cases where no error is introduced, the switching lines help to plot a continuous curve between steps.

Plate Current-Plate Voltage

To display plate current-plate voltage curves the tube to be tested is connected in the normal manner with the cathode to ground, K, the grid to **GRID A**, or B and the plate to **P**. Turn the vertical- and horizontal-display-selector controls to **PLATE.**

The following control settings should be checked when a particular tube type is being tested the first time:

1. Set the **HEATER** control to the correct voltage.
2. Set the step generator **START ADJUST** control nearly counterclockwise to avoid a positive grid voltage.
3. Set the plate-sweep generator **PEAK VOLTS** control for a safe peak voltage.
4. If high plate current is expected, set the **VERTICAL MA/DIV** control nearly counterclockwise to protect the small, low-current measuring resistors.

The other controls can be set after the **TEST POWER** switch is turned on and the tube cathode has come up to operating temperature. Once the desired settings have been obtained for a given tube type, other tubes of the same type can be inserted without resetting the controls.

Grid Current-Plate Voltage

Grid current can be plotted against plate voltage by setting the controls as for the plate current-plate voltage display and moving the vertical display selector to **GRID**. Increase the vertical sensitivity as required. Normally the grid current will not be measurable until the g id approaches zero bias or goes positive.

Plate Current-Grid Voltage

To display plate current plotted against grid voltage, set the controls as for the plate current-plate voltage curves and switch the horizontal display selector to **GRID**. This automatically positions the display to the right. It will normally be necessary to increase the horizontal sensitivity and reposition the display slightly.

The display obtained consists of vertical lines which show the variation of plate current as the plate is swept from zero to maximum voltage. The part of the curve of primary interest is formed by the tops of these lines. This is the dynamic characteristic for the combined tube and load resistance. However, if the **SERIES LOAD** is set to **300** the effect of the load resistance is very slight.

The voltage from the plate-sweep generator depends upon the line voltage and it is not intended that the calibration of the **PEAK VOLTS** control be exact. If the actual peak plate voltage is desired, switch the horizontal display selector to **PLATE** and read the peak voltage from the screen.

A method of plotting a more conventional-looking transfer characteristic is to connect the plate to the +DC supply. If the vertical display selector is turned to **SCREEN** the plate current will be plotted. The advantages of this connection are that the vertical lines are not displayed and the plate voltage is continuously variable and indicated by the voltmeter. Disadvantages are that the maximum current and voltage capability of the +DC supply is less than that of the plate-sweep generator, and the continuous voltage applied to the tube under test increases the average plate dissipation in this tube.

Grid Current-Grid Voltage

After displaying plate current-grid voltage curves the grid current-grid voltage display can be obtained by switching the vertical display selector to **GRID**. Increased vertical sensitivity may be required. The vertical lines can be eliminated by connecting the plate to the +DC connector as for the transfer characteristic.

Tube Switching

Two tubes or two sections of one tube can be connected at once for comparison purposes or to speed testing. The grid of one tube should be connected to **GRID A** and the other to **GRID B**. Both plates should be connected to the plate-sweep generator at **P**. The tube to be tested is now selected by the **TEST POSITION** switch. The other tube is held cut off by a 10 megohm resistor connected to —300 volts. Occasionally a defective tube will still conduct under these conditions, causing an error in the presentation. If you suspect that this is occuring, switch the **TEST POSITION** switch to **OFF**. This connects the grids of both tubes to the 10 megohm resistor and there should be no indication of plate current on the screen.

PENTODE CURVES

In addition to the curves which can be plotted for a triode, pentode screen current can be plotted against either plate or control-grid voltage. The pentode curves are plotted in the same manner as the triode curves with the +DC supply used for screen voltage. This prevents the alternate connection mentioned in the triode section under Plate Current-Grid Voltage in which the +DC supply is used as the plate supply.

Screen Current-Plate Voltage

This curve can be plotted by setting the controls as for the plate current-plate voltage display with the exception that the vertical display selector is set to **SCREEN**. If switching lines interfere with the display at the left, the **STEPS/SEC** control should be moved to the right hand **120** position.

Screen Current-Grid Voltage

This curve is similar to the plate current-grid voltage curve. It is obtained by setting the vertical display selector to **SCREEN** and the horizontal display selector to **GRID**. Adjust the **HORIZONTAL VOLTS/DIV** as required to obtain a full screen display and position the display as desired. If the **STEPS/SEC** control is set to the right hand position the switching lines will form a continuous curve indicating the screen current at maximum plate voltage as set by the **PEAK VOLTS** control. The vertical lines represent the variation of screen current as the plate voltage is swept from zero to maximum.

SINGLE-FAMILY DISPLAY

Characteristics of a tube in the region where its power rating is exceeded can be obtained by means of the single-family feature. When this feature is used, the grid is held negative until the **SINGLE FAMILY** button is pushed at which time it runs through one family of curves and again stops with the grid negative.

To use this feature, first set up the controls to plot a family of curves that is within the safe operating limits of the tube. Then turn the **STEPS/FAMILY** control clockwise to the stop. Make the desired changes to the operating and generator voltages. As these adjustments are being made push the **SINGLE FAMILY** button occasionally to determine the operating point that has been reached. When the desired operating point is reached push the **SINGLE FAMILY** button to obtain the single display.

The maximum voltage swing from the grid-step generator as it plots a family of curves and comes to rest is equivalent to about 14 steps at any setting of the **VOLTS/STEP** control. Thus, if the step generator is set for the maximum number of positive steps, it will rest five steps negative until the **SINGLE FAMILY** button is pushed. This will be between .5 volts and 50 volts negative depending on the setting of the **VOLTS/STEP** controls. In many cases this will not hold a tube cut off but it will usually be in a safe operating region. If the **START ADJUST** control is backed off from its most positive position the voltage at which the grid rests can be increased up to a maximum of 140 volts negative.

The current ratings of the +DC supply and grid-step generator can also be safely exceeded by use of the single-family feature. The grid-step generator will deliver a peak current of from 200 to 250 ma if a few seconds are allowed between each presentation for the circuits to recover. The +DC supply will deliver 500 ma for a single family with a voltage drop of less than one volt. A second or two is required for the +DC supply circuits to recover before a second family can be plotted.

SEMICONDUCTOR DEVICES

The Type 570 was designed specifically for testing vacuum tubes. However, it is useful for plotting semiconductor diode characteristics and some transistor characteristics.

Semiconductor diode curves are plotted in the same way for vacuum tubes described under Thermionic Diodes. To protect the diode, maximum resistance consistent with adequate voltage swing should be used in the plate-sweep generator. If you connect the diode between the plate-sweep generator, P, and the +DC connector, be sure to load the +DC supply with an external resistor. This supply will lose regulation if current through the diode exceeds the current though the resistor by more than 2 ma. This resistor should be selected to draw 50 ma or less.

SPECIAL-APPLICATIONS

The Type 570 can be used to display the characteristics of special circuits and tubes. Resistors can be added between cathode and ground to show the effect of degeneration. Two triodes can be connected in a cascode circuit to obtain their characteristics in this connection. Similarly, two triodes can be cascaded although this connection may be less useful.

Curves can be plotted of current versus voltage for gas diodes. For instance, in this way you can obtain the firing potential and voltage drop of a voltage reference tube. Other special applications may occur to you from time to time. Be sure to check the current requirements of a special circuit. The step generator, plate-sweep generator and +DC supply are designed for electron flow from ground into the supply only. A certain amount of current can be drawn from these supplies in the reverse direction but they quickly drop out of regulation. The amount of current which can be drawn in the reverse direction can be increased by appropriate external loads such as described under Thermionic Diode Curves.

OSCILLATION OF DISPLAY

Occasionally a tube will oscillate when placed in the test socket. This oscillation will be indicated on the screen by obvious oscillations or by unexplained discontinuities in the display. This will almost certainly occur if two tubes are connected in parallel. For this reason, parasitic-oscillation-suppression resistors have been built into special patch cords. Usually these resistors will prevent any oscillation if they are connected to the control grid of the tube under test. If these resistors are used, the effect of any grid current which may flow should be considered when evaluating the curves.

CIRCUIT DESCRIPTION

BLOCK DIAGRAM

The Block Diagram shows interconnections of the functional parts of the instrument, except for the power supplies. Functions of the switches are shown instead of their actual connections.

Stepping-Voltage Shaper

The stepping-voltage shaper shifts the phase of the transformer waveform and shapes it to provide a current pulse of fixed amplitude to drive the step generator. This pulse occurs at a 120-cycle or 240-cycle rate as set by the **STEPS/SEC** control.

Step Generator

The step generator is a Miller integrator which receives the current pulse from the shaper and converts it to a voltage step. The step generator is controlled by a multivibrator which recycles it after a number of steps as selected by the **STEPS/FAMILY** control.

Step Amplifier

The positive-going waveform from the step generator is amplified and inverted by the step amplifier for application to the tube under test. Any current drawn from this amplifier by the tube under test is measured by the vertical amplifier in the **GRID** position of the vertical-display selector.

+DC Supply

The +DC supply provides a variable regulated voltage for application to the tube under test. Current drawn from this supply is measured by the vertical amplifier in the **SCREEN** position of the vertical-display selector.

Plate-Sweep Generator

The plate-sweep generator rectifies the transformer waveform to provide positive-going sweeps of plate voltage. Current drawn from this circuit is measured by the vertical amplifier in the **PLATE** position of the vertical-display selector. The **SERIES LOAD** control selects the series resistance for the plate-sweep generator.

Horizontal Amplifier

The horizontal-display selector connects the grid or plate of the tube under test to the horizontal amplifier. The horizontal amplifier amplifies the signal and converts it for push-pull application to the deflection plates.

Vertical Amplifier

The vertical amplifier amplifies the signal selected by the vertical-display selector and applies it to the vertical deflection plates. For a more complete diagram of the vertical-display selector see the Vertical-Display Switching diagram.

STEP-GENERATOR DIAGRAM

General

The Step Generator diagram includes the circuitry of the stepping-voltage-shaper and step-generator blocks in the Block Diagram.

Phase Inverters

The main power transformer, T401, supplies 35 volts at line frequency to the phase-shifting networks, R6, C6 and R35, C35. PHASE ADJ. A has a small range of adjustment to permit this circuit to be adjusted to coincide with the phase of the plate-sweep waveform. PHASE-ADJ. B has additional range to permit its output to be set at 90 degrees with respect to the A circuit. V8A and V38A are split-load phase inverters with equal resistance in the plate and cathode circuits. The waveform at the plate is 180 degrees out of phase at the cathode. The dc component of the waveform is blocked by coupling capacitors, C8, C10, C38 and C40; and the waveform is rectified by full-wave rectifiers.

Shaper Amplifiers

The output from each pair of rectifiers is applied to a pentode amplifier. The rectifier output is a negative-going rectified sine wave of sufficient amplitude to hold the pentodes cut off except for short pulses as the grids approach ground potential. Since the pentodes have a common plate-load resistor, the pulses from both pentodes appear at the grid of the shaper cathode follower.

The **STEP/SEC** switch biases one of the shaper amplifiers below cutoff in each of the 120 positions. This eliminates the corresponding pulses and reduces the stepping rate from 240 to 120 steps per second.

The cathode of the shaper cathode follower, V55A, is held positive by divider R55 and R56. The grid of the cathode follower rests at a point selected by the VOLTS/STEP ADJ. control, R25, and a divider consisting of R26 and R27, when the shaper amplifiers are cut off. When the shaper amplifiers conduct the grid of the cathode follower is driven below plate-current cut off. The amplitude of the pulse from the cathode follower can therefore be closely controlled by the VOLTS/STEP ADJ. control.

Clamp and Coupling Diodes

The clamp and coupling diodes, V95A and B, differentiate the pulse from the shaper cathode follower. During the positive-portion of the pulse waveform the capacitor is charged through V95B. When the negative-going pulse occurs, this charge is released through V95A and adds to the charge in C85.

Step Generator

Because of their interdependence the multivibrator, disconnect diodes, step generator and associated circuitry will be considered at one time. To provide a starting place, single-family operation will be considered first.

For the single-family type of presentation the **STEPS/FAMILY** control, R91, is turned clockwise so that the arm is at the most negative end of its range. In this condition, the voltage on the cathode of the step-control cathode follower, V55B, is sufficiently negative to hold one half of the multivibrator, V65A, cut off. The multivibrator consists of V65A and V65B in a dc-coupled circuit. In the quiescent state the grid of V65A is held at about —100 volts and the grid of V65B is at about —65 volts. V65B is conducting and its plate rests at —10 volts.

When the single-family button is pushed, C88 is discharged into C90 and the grid of V65A is raised so that V65A begins to conduct. The multivibrator switches so that V65A is conducting and V65B is cut off. The grid of V65A begins to go negative immediately as C90 loses the charge it received and the multivibrator returns to its quiescent condition. The result is a short positive pulse at the plate of V65B.

In the quiescent condition, the step generator tube, V86, is cut off. Its grid is held negative as a result of current flow through V95, V76B and cathode follower V75B. The grid of V75B is held at —10 volts by the multivibrator resulting in —8 volts on the grid of V86. The grid and cathode of V75A rest at about 200 volts as a result of the divider action of R81, NE80, and R82. C85 is charged to about 210 volts.

The positive pulse from the multivibrator passes through the cathode follower, V75B, and diode V76B to raise the grid of V86 to ground potential. V86 conducts and its plate voltage drops cutting off cathode follower, V75A. C85 discharges through R85, R91 and R92 until clamped by V76A. When the multivibrator reverts, both diodes are cut off and the resistors R85, R91 and R92 tend to pull the capacitor and the grid of V86 negative. At this point the plate of V86 resumes control and any tendency of the grid to go negative is compensated by a rise in plate voltage. The step generator is now ready for its first step. The time required for the preceding operation after the **SINGLE FAMILY** button is pushed is less than the duration of one step.

The step is formed as follows: C95 has charged through V95B. When the negative pulse is applied to C95 it tends to pull the grid of V86 down with it. The rapid rise in the plate voltage of V86 is coupled back through V75A to C85. This reduces the voltage change on the grid to a very small step. The result is a step in the voltage across C85 as the charge from C95 is transferred to C85. Between pulses no current reaches the grid circuit and the output voltage does not change.

The steps are repeated for 12 or 13 steps at which time the plate of V86 loses control, the grid of V86 goes negative to plate-current cut off and the quiescent condition is reached.

If the recurrent mode of operation is used, the arm of the **STEPS/FAMILY** control is set to a more positive position. The stepping waveform is developed across the divider consisting of R85, R91 and R92. As the waveform goes positive, a point will be reached where the voltage from the step-control cathode follower, V55B, is sufficient to switch the multivibrator. When this happens C85 is discharged and the step generator starts over again. R85 labeled **MIN. NO. OF CURVES** is normally adjusted so the step generator will have four steps when the **STEPS/FAMILY** control is counterclockwise.

STEP AMPLIFIER

Input Cathode Follower

The incoming step waveform passes through a level-setting voltage divider, R112, R115 and R120, and into cathode follower V115B. V115A serves as a voltage regulator to regulate the voltage from the unregulated +400-volt supplies used for this stage.

Input Amplifiers

V110 and V135 are common-cathode, phase-splitter amplifiers. The **VOLTS/STEP ZERO ADJ.** control, R105, sets the level of the grid of V110 to balance the amplifier so the zero bias trace does not shift as the **VOLTS/STEP** control is rotated. C125 and C126 reduce the bandwidth of this stage to maintain stability with the large amount of feedback used.

Output Amplifiers

The output amplifiers, V150A and V150B, amplify the waveform and reconvert it to single-ended output. The network including the neon diode NE170 reduces the dc level of the signal at the grid of V180 without attenuation of the signal.

Output Cathode Follower

The output cathode follower, V180, provides the necessary low impedance to drive the grid of the tube being tested. The **ZERO BIAS** switch, SW180, grounds the output to provide a zero-bias reference curve. The **TEST POSITION** selector connects the output of the step amplifier to either the **GRID A** or **GRID B** connector on the patch panel.

Volts/Step Control

The **VOLTS/STEP** control varies the amount of feedback and thus, the gain of the amplifier in seven fixed steps. This determines the grid-voltage change between the curves in the display.

Grid-Current Measurement

In order to measure grid current in the tube being tested, the grid current must flow through the current measuring circuits. Any current used to operate the step amplifier must be kept separate. To do this the output cathode follower is supplied with plate and cathode voltage from an ungrounded or floating power supply. The only path through which current will flow from ground into this power supply is from grid to cathode in the tube being tested and through the current-measuring resistors.

Since the input cathode follower is connected to the output cathode follower by the feedback resistors, it is connected to the floating supply also.

HORIZONTAL AMPLIFIER

Volts/Div. Switch

The input cathode follower, V215, presents a high impedance to the circuits being measured and a low impedance to the part of the **VOLTS/DIV** switch in its cathode circuit. Part of the attenuation of the **VOLTS/DIV** switch is placed in the grid circuit so that the input voltage will not exceed the capabilities of the input cathode follower. This attenuator in the grid circuit is switched so that the current it draws will not be measured by the current measuring circuits in any position of the vertical-display switch.

The VOLTS/DIV BAL control R214, adjusts the dc level on the grid of cathode follower V210. This control is set so there is no shift of the zero-voltage line as the **VOLTS/DIV** control is rotated. The VOLTS/DIV CAL control compensates for the loading effect of the attenuator on the cathode follower.

Amplifiers

The first amplifiers, V240 and V241, are common-cathode, phase-splitter amplifiers. The bandwidth of this stage is limited by C242 for stability with feedback. The second stage, V245A and V245B, provides additional gain to drive the crt deflection plates. The HORIZ. GAIN ADJ. control adjusts the overall gain by varying the amount of feedback. The **HORIZONTAL POSITIONING** control positions the trace by varying the voltage on the grid at V241. One wafer of the horizontal display selector, SW205B, positions the beam to the right in the **GRID** position.

CRT-Display Switching

The CRT-Display Switching diagram shows the vertical-display switch in detail with the associated circuitry shown in block form. The horizontal-display switch and the **VOLTS/DIV** attenuator resistor are shown in the horizontal-amplifier block to show the path of the load current drawn by this resistor.

The floating, unregulated power supply shown at the left of the diagram is an auxiliary power supply. Its only return to ground is through SW510F which connects it to the current measuring resistors in the **GRID** and **SCREEN** positions of this switch.

In the **GRID** position of the vertical-display selector, this floating power supply is connected to the circuits in the step amplifier which supply current to the grid of the tube under test. In the **SCREEN** position of the vertical-display selector, this floating power supply is connected to the +DC-supply series regulator and the current which flows through the current measuring resistors is screen current. In the **PLATE** position of the vertical-display selector, the floating supply remains connected to the series regulator, but it is now disconnected from the current measuring resistors and grounded by SW510F.

The plate-sweep generator is also an ungrounded supply. It is connected to the current measuring resistors in the **PLATE** position of the vertical-display selector by SW510G. In the other two positions of this switch the plate-sweep generator is grounded.

The horizontal amplifier is connected to the plate or the grid of the tube under test by the horizontal-display selector. If the **VOLTS/DIV** attenuator resistor were grounded, current drawn by this resistor would pass through the current measuring resistors of the vertical amplifier. To avoid this, a section of the horizontal-display selector connects the ground return back to appropriate places on the vertical-display selector.

VERTICAL AMPLIFIER

MA/DIV Switch

The **VERTICAL MA/DIV** switch selects the resistance to ground in the current measuring circuit and thus selects the sensitivity of the measurement. The grid of the input amplifier, V281, is connected to R255 instead of the arm of the switch to prevent any error that might be caused by contact resistance. R254 maintains a current path at all times as the switch is rotated between positions. Fuse F255 protects the high value resistors in the attenuator but is shorted out in the high-current positions of the switch.

Amplifiers

The input amplifiers, V281 and V280, are common cathode, phase-splitter amplifiers. R270 positions the crt display vertically by varying the voltage on the grid of V280. C280 limits the bandwidth of the input stage to maintain stability with the feedback used. The VERT. GAIN ADJ. control varies the gain by changing the amount of negative feedback. The output amplifiers provide the additional gain necessary to drive the crt deflection plates.

PLATE-SWEEP GENERATOR

Transformer

The plate-sweep transformer, T310, is supplied from taps on the primary of the main power transformer, T401. Both primary and secondary windings are shielded to provide maximum control over capacitive currents. The PLATE TRANS. CURRENT BALANCE control, C315, balances the stray capacitances to ground associated with this winding. These currents would otherwise flow in the current measuring circuits.

Series Load Resistance

Full-wave rectification of the incoming sinusoidal waveform occurs in V315 and V316. The resulting waveform is applied to the plate of the tube under test by way of the **SERIES LOAD** switch. In the 300 ohm position of this switch, the transformer and rectifiers provide the resistance. Since the rectifiers are non-linear, this resistance varies from more than 300 ohms at low current to less than 200 ohms at maximum current.

Plate-Sweep Balance

The current-balance cathode follower compensates for capacitive current to ground in the **SERIES LOAD** switch and associated wiring. The plate sweep waveform is applied to the grid of the cathode follower by divider R316 and R317. Current is then added to the negative return lead by C310 and C311 which is opposite in phase to that drawn by the stray capacitance. C311 can be adjusted so no capacitive current flows in the current measuring resistors.

Voltmeter

The voltmeter consists of a 200 μa meter and associated multiplier's. The **INDICATION** switch selects either the +DC, —DC or Heater supplies for application to the meter. The heater voltage is taken from fixed taps on the heater transformer and rectified in V350 and V351. The meter indicates heater voltage as a percentage of the voltage selected by the **HEATER** switch.

MAIN POWER SUPPLY

Transformer

The main power transformer, T401, supplies plate and heater power to all circuitry in the instrument except the floating supply tubes and circuitry. The two primary windings can be connected in series for 234-volt operation or in parallel for 117-volt operation. One primary winding is tapped to supply the voltages required by the plate-sweep transformer.

Negative Supply

Terminals 7 and 9 connect to V405 in a full-wave circuit to supply voltage to the negative voltage regulator. A gas-diode voltage-reference tube, V407, establishes the reference voltage for the regulator. This reference voltage is applied to the cathode of a comparator tube, V410, and compared with the voltage on a divider connected between the —150-volt bus and ground. R413, labeled —150 V ADJ., determines the percentage of voltage that appears at the grid of V410 and thereby determines the total voltage across the divider.

Any variation from the normal grid to cathode voltage on V410 appears as an amplified error signal at the plate. This error signal is applied to the grid of the series regulator tube, V412. This dc-coupled error signal controls the plate resistance of the series regulator tube changing it in the right direction to compensate for any change in output voltage. C412 increases the ac gain of the feedback loop to reduce the ripple.

V403 is connected in a full wave circuit with its output added to the —150-volt supply to provide a 300-volt unregulated supply. This supply is used to supply other regulators or circuits which are insensitive to voltage variations.

Positive Supplies

V483 and V484 supply +400 volts, unregulated, to the positive-voltage regulators and other circuits which are insensitive to voltage variations.

The —150-volt supply is used as the reference voltage for the positive-supply regulators. In the +300-volt regulator, the voltage at the tap on the divider, R492, R493, between +300 volts and —150 volts is compared with ground potential in V489. The amplified error signal is applied to the series tube, V495. R496 reduces the current through the series tube. C492 increases the high-frequency gain of the feedback loop.

The +100-volt regulator is similar to the +300-volt regulator, with V470B as the comparator tube and V470A as the series regulator.

FLOATING POWER SUPPLY

Transformer

Transformer T501 supplies plate and heater voltage for the floating power supply and regulator. Shields are used around the primary winding, the floating supply winding and the regulator circuit windings to minimize the effects of capacitive currents.

Rectifiers

V505 and V506 supply +400 volts and —300 volts with respect to the common lead. This supply is sometimes grounded directly and at other times connected to the current-measuring resistors as shown on the CRT-Display Switching diagram. C502 balances the stray capacitive current to ground so that this current does not flow through the current measuring resistors.

Regulator

The +DC-supply regulator receives +400 volts and —300 volts, unregulated, from either the main power supply or the floating power supply. This is determined by the setting of the horizontal-display switch shown in the CRT-Display Switching diagram. The output of the regulator is variable from 10 to 300 volts.

Screen voltage for the series regulator tube, V515, is obtained from the full-wave rectifier, V510. C510A and C510B with R510 reduce the ac ripple on the screen. The negative side of the supply is tied to the cathode of V515 so that the screen to cathode voltage remains the same as the output voltage is changed. C509 balances the capacitive current to ground in the screen supply.

Reference voltage is obtained from the —150-volt supply. V540B isolates the reference voltage supply from the regulator so that no current will flow between the two circuits. V525A and V525B are comparator tubes. The voltage at a tap on the divider between the output of the regulator and the reference voltage is compared with ground potential. The amplified error signal at the plate of V525B is applied to the grid of the series tube, V515. B515 and B516 reduce the dc level of signal at this grid without attenuation of the signal.

The +**DC** switch changes the divider ratio in the divider at the grid of the comparator tube, V525B. The **VARIABLE** +**DC** control changes the reference voltage at the bottom of this divider. These two controls provide continuous variation of the output of the regulator from 10 volts to 300 volts.

CRT CIRCUIT

Accelerating voltage for the cathode-ray tube is obtained by rectifying a 60-kc ac voltage produced by a vacuum tube oscillator. V610 is the oscillator tube with the primary of T620 serving as a tapped inductor. Rectifiers V630 and V631 supply —1700 volts to the crt cathode and +2300 volts to the post acceleration anode for a total of 4 kv accelerating voltage.

The high voltage is adjusted by means of R626 in the regulator circuit. The voltage at this point is compared with —150 volts in V605A. The amplified error signal is applied to the grid of the shunt regulator tube, V605B, which varies the screen voltage of the oscillator tube.

The **INTENSITY**, **FOCUS**, and **ASTIGMATISM** controls adjust the crt operating voltages for the desired intensity and focus the beam. The **GEOM. ADJ.** control adjusts the voltage on the second anode of the crt for best linearity at the extremes of deflection.

MAINTENANCE

Replacement of Components

Tektronix will supply replacement components at current net prices. However, since most of the components are standard electronic and radio parts we suggest you get them from your local dealer if you can. Be sure to consult your instruction manual first to see what tolerances are required.

We specially select some of the components, whose values must fall within prescribed limits, by sorting through our regular stocks. The components so selected will have standard RETMA color-code marks showing the values and tolerances of the stock they were selected from, but they will not in general be replaceable from dealers stocks.

Such selected parts, as well as the parts we manufacture at Tektronix, are identified in the parts lists either by notes or by our own stock numbers. Order these parts from the Tektronix factory in Portland, Oregon.

Parts-Ordering Information

You will find a serial number on the frontispiece of this manual. This is the serial number of the instrument the manual was prepared for. Be sure the manual number matches the number of the instrument when you order parts.

A Tektronix instruction manual usually contains hand-made changes to diagrams and parts lists, and sometimes text. These changes are in general only appropriate to the instrument the manual was prepared for, the instrument whose serial number appears on the manual frontispiece. The hand-made changes show changes to the instrument that have been made after the printing of the manual.

We make some of the instrument changes during the factory test procedure. Our technicians hand-tailor the circuits, if it seems appropriate, to provide the widest possible latitude of operation. Other changes are made to include the latest circuit improvements as they are developed in our engineering department, or when improved components become available. In any event, the changes are to your benefit. We have tried to give you the best instrument we can.

Soldering Precaution

The solder used on the ceramic terminals in this instrument must contain a small percentage of silver. If for any reason you resolder, be sure the solder you use contains silver. Silver-bearing solder is used in printed-circuit techniques, and is therefore available from all solder manufacturers. Repeated use of ordinary tin-lead solder will dissolve the fused bond of silver that makes the solder adhere to the porcelain, especially if the soldering iron is quite hot.

Color Coding

We use color coded wires in this instrument to help you identify the various circuits. The +300-volt bus is white and coded 3-0-0 (orange-black-brown beginning with the widest stripe). The —150-volt bus is black and coded 1-5-0. The heater leads are coded 6-1, 6-2, etc., not to indicate that the voltages are different but to differentiate between the leads. All signal leads have a single stripe. A few wire colors are indicated by small, lower-case letters on the diagrams.

Air Filter

The Type 570 Characteristic-Curve Tracer is cooled by filtered, forced air. The air filter is washable aluminum wool coated with adhesive. If it gets too dirty it will restrict the flow of cooling air and may cause the instrument to overheat.

To clean the filter, run hot water through it from the side that was inside. Or slosh it around in hot soapy water and rinse it in clean water. Then dry it thoroughly and coat it with new adhesive. When new, the filter is coated with "Filter Coat", a product of the Research Products Corporation. Pint cans are available under the name "Handi-Koter" from some air-conditioner suppliers. Other adhesive materials are no doubt satisfactory.

Fan Motor

The fan motor bearings will require oiling every few months or every thousand hours of operation. Use a good grade of light machine oil, and apply only a drop or two.

Removing the Covers

Before removing the covers, be doubly sure that the difficulty you are having is due to some misadjustment of the front-panel controls. To remove the covers, turn the fasteners to the left about one turn. This should release the catches, allowing the removal of the cover. When you replace a cover, be sure the catch is positioned behind the edge of the oscilloscope frame before you tighten the fastener.

Warning: When you have the covers off the instrument, be careful of high voltages. The lower-voltage buses are potentially more dangerous than the crt accelerating voltages because of the higher current capabilities of these supplies. When you reach into the instrument while it is turned on, do not hold the metal frame with the other hand. If possible, stand on an insulating floor and use insulated tools.

Trouble Shooting

Troubles are usually caused by tube failure, and you can frequently correct them by finding the bad tube and replacing it with a good one. However sometimes a tube burns up resistors or overstresses capacitors when it fails. In these cases you will also have to find the bad components. Sometimes you can find them by visual inspection. One way to find bad tubes is to try replacing suspected tubes with good ones. If possible, replace all suspected tubes at one time, and if the trouble is eliminated, return the old tubes, one at a time, until the offending one is discovered.

Correct operation of the power supply is necessary for correct operation of most other circuits in the instrument. So an early step to take when you look for troubles is to check the voltages of the power supplies. All the regulated supplies should be within five per cent of their rated values and should remain steady as the line voltage is varied from 105 to 125 volts or 210 to 250 volts.

The cathode-ray tube display should help in locating the source of trouble. If the instrument fails to operate at all, including the fan and pilot light, check the source of power and determine that the power-cord plug is securely in place. Then check the fuse at the back of the instrument near the power receptacle.

If there is a horizontal trace on the screen but no vertical deflection, check the fuses in the top recessed panel. If no spot is visible check the positioning controls. Then advance the intensity control to see if there is a glow indicating a spot positioned off the screen. If no spot can be obtained short the horizontal deflection plates together and the vertical plates together. If no spot is obtained check the high voltage power supply or the crt.

If the spot is returned to the screen by shorting the deflection plates, check the deflection amplifier concerned.

If a display is obtained on the crt which is abnormal, refer to the Block Diagram and determine whether the trouble is associated with the step amplifier, +DC supply, plate-sweep generator or deflection amplifiers. Similar block titles are silk screened on the chassis.

Heater-to-cathode leakage in certain critical tubes will cause vertical hum, especially in the more sensitive positions of the MA/DIV switch. If this appears only in the PLATE position of the vertical-display selector the most likely tubes are V315 and V316 in the plate-sweep generator. If it appears only in the GRID position of the vertical-display selector, suspect V115 or V180 in the step amplifier.

Calibration Procedure

The following calibration procedure is based on that used in our test department. Normally it will not be necessary to make all of these adjustments at any one time after the original calibration of the instrument. However, any adjustments which are to be made should be made in the sequence given below. For instance the crt supply voltage should not be set before the —150-volt supply is adjusted as the latter will change the setting of the first adjustment. Similarly, the horizontal and vertical sensitivities should not be set if the crt-supply voltage is to be changed later.

1. Adjust —150-Volt Supply.

This supply is the one to which all other regulated supplies are referenced. Since the calibration of the +DC supply depends on this voltage, this adjustment is made for correct calibration of the +DC supply.

a. Set +DC controls to **100, CALIBRATED.**

b. Set the voltmeter controls to **140, +DC.**

a. Adjust the —150 ADJ. control on the right-hand, top side of the power chassis so the meter reads 100. This reading can also be checked with an accurate dc meter.

2. Adjust Crt Supply.

This adjustment sets the total accelerating voltage on the crt and thus affects the deflection sensitivity.

a. Connect a voltmeter, having a resistance of 5000 ohms per volt or higher, from terminal 24 or 25 of T401 to ground.

b. Adjust the —1700 ADJ. control to obtain —1700 volts at this point.

3. Voltmeter AC Calibration.

This adjustment sets the series resistance in the ac voltmeter circuit to calibrate this meter.

a. Set the **HEATER** control to **6.3.**

b. Set the voltmeter **INDICATION** control to **HTR.**

c. Connect an accurate, at least 1%, ac voltmeter to the patch-panel **HTR** terminals.

d. Set the **VARIABLE HEATER** control to obtain a reading of 6.3 volts.

e. Adjust R350, located on the **INDICATION** switch, so the meter reads 100.

4. Geometry Adjustment.

The GEOM. ADJ. control varies the second anode voltage to obtain the best linearity near the edge of the graticule.

a. Set the plate-sweep controls to **100** volts, **10K.**

b. Connect the plate connector, **P**, to ground **K**.

c. Set the crt-display controls for a bar pattern (plate current-grid voltage).

d. Set the GEOM. ADJ. control so that the lines near the edges of the graticule are straight.

5. Step-Generator Phase Adjustment.

The phase controls adjust the step generator phase so that the steps occur at the ends of the plate sweeps.

a. Display the bar pattern as in 4.

b. Set the **STEPS/SEC** control to 240.

c. Adjust PHASE A and B, at the rear of the top chassis, for symmetry at the top and bottom of the bar pattern.

6. Vertical Gain Adjustment.

The vertical gain is set to calibrate the **MA/DIV** control with the graticule. The full-scale current drawn by the voltmeter is within 1% of 200 μa and can be used as a standard.

a. Set the **MA/DIV** control to .02 and the vertical-display switch to **SCREEN**.

b. Set the voltmeter **INDICATION** control to **+DC**.

c. Adjust the **+DC VARIABLE** control to set the needle at full scale.

d. Alternately move the voltmeter **INDICATION** control from **+DC** to **HTR** and set the VERT. GAIN ADJ. control in the top row of controls to obtain 10 divisions of deflection. As an alternative, a precision resistor can be used to draw current from the +DC supply.

7. Volts/Div Balance.

This adjustment is made so there is no shift of the zero-voltage line as the **VOLTS/DIV** control is rotated.

a. Set the **SERIES LOAD** switch to **1M**.

b. Connect the plate connector, **P**, to ground, **K**.

c. Set the horizontal-display selector to **PLATE**.

d. Rotate the **VOLTS/DIV** control and adjust the VOLTS/DIV. BAL. control, accessible from the bottom near the front, until the spot does not move as the **VOLTS/DIV** control is rotated.

8. Volts/Div Compensation.

This adjustment compensates the attenuator in the horizontal amplifier so that the attenuation for the high frequencies is the same as for low frequencies.

a. Set the plate-sweep controls to 100 volts, 10 K.

b. Connect the plate connector, **P**, to ground **K**.

c. Set the crt-display controls for a bar pattern (plate current-grid voltage).

d. Set the **VOLTS/DIV** control to 20.

e. Set the **VOLTS/STEP** control to 10.

f. Set the **STEPS/SEC** control to the left-hand position labeled 120.

g. Observe the point on the bar pattern where the retrace joins the first bar and adjust C205 so the corner is sharp with no overshoot.

9. Volts/Step Zero Adjustment.

This adjustment is made so there is no shift of the zero-voltage step as the **VOLTS/STEP** control is rotated.

a. Set the **VOLTS/DIV** control to .2.

b. Set the horizontal-display switch to **GRID**.

c. Push the **ZERO BIAS** button and position the spot behind the center line with the **HORIZONTAL POSITIONING** control.

d. Set the **VOLTS/STEP** control to .1.

e. With the **START ADJUST** control position the second spot from the right behind the center graticule line.

f. Turn the **VOLTS/STEP** control to 10 keeping the second spot behind the center graticule line with the **START ADJUST** control.

g. Return the **VOLTS/STEP** control to .1 and position the second spot behind the graticule line with the **VOLTS/STEP ZERO ADJ.** control, located on the top recessed panel.

h. Repeat steps f and g until there is no remaining interaction.

10. Horizontal Gain Adjustment.

This is the first of two adjustments to calibrate the **VOLTS/DIV** control. (See 13 below.) The HORIZ. GAIN ADJ. control varies the gain of the horizontal amplifier by varying the feedback.

a. Set the +DC controls to 100, **CALIBRATED**.

b. Set the **VOLTS/DIV** control to 10 and the horizontal-display selector to **PLATE**.

c. Set the **SERIES LOAD** switch to **1M**.

d. Alternately connect the plate connector, **P**, to ground **K**, and to **+DC**, and set the HORIZ. GAIN ADJ. control, located in the top row of controls, so the spot shifts exactly 10 divisions.

11. Volts/Step Adjustment.

This adjustment sets the gain of the step amplifier to calibrate the **VOLTS/STEP** control.

a. Set the horizontal-display control to **GRID** and the **VOLTS/DIV** control to 10.

b. Set the **VOLTS/STEP** control to 10.

c. Adjust the VOLTS/STEP ADJ. control, located in the top row of controls, so the steps correspond with the graticule lines.

12. Minimum Number of Curves.

The instrument is set at the factory to plot a minimum of four curves. This is done to reduce the maximum duty cycle on the tube under test since each step takes the grid negative. A minimum of from one to seven or eight curves can be selected by the MIN. NO. OF CURVES control. If a minimum of one curve is selected, check to see that the step generator can still be disabled by turning the **STEPS/FAMILY** control completely clockwise.

a. Set the horizontal-display selector to **GRID.**

b. Turn the **STEPS/FAMILY** control counter clockwise.

c. Adjust the MIN. NO. OF CURVES control for four steps.

13. Volts/Div Calibrate.

This adjustment compensates for a change in gain in the horizontal amplifier as the loading caused by the **VOLTS/DIV** control is changed.

a. Set the **VOLTS/DIV** control to .1, and set the horizontal-display selector to **GRID.**

b. Set the **VOLTS/STEP** control to .1.

c. Adjust the HORIZ. GAIN ADJ. control so the steps correspond with the graticule lines.

d. Move the **VOLTS/STEP** and **VOLTS /DIV** controls to 10.

e. Adjust the VOLTS/DIV CAL. control, R227, located on the **VOLTS/DIV** switch, so the steps correspond with the graticule.

f. Repeat steps d and e as necessary to overcome any interaction.

14. Plate Hum Balance.

The two balance capacitors in the plate sweep circuit balance the 60- and 120-cycle capacitive currents to ground which would otherwise introduce hum in the current-measuring circuits.

a. Set the vertical-display selector to **PLATE.**

b. Set the **MA/DIV** control to .02.

c. Set horizontal-display switch to **PLATE** and **VOLTS/DIV** switch to 50.

d. Set the **PEAK VOLTS** to 500.

e. Adjust C315 and C311, located on the right side of the lower chassis, for minimum trace width.

15. Grid Hum Balance.

The **GRID** transformer capacitive current balance capacitor, C502, balances the capacitive current to ground in the floating power supply.

a. Set the vertical-display selector to **GRID** and the **MA/DIV** control to .02.

b. Adjust C502, located on the right side of the lower chassis, for minimum trace width.

16. Screen Hum Balance.

The **SCREEN** transformer capacitive current balance capacitor, C509, balances the capacitive current to ground in the screen regulator.

a. Set the vertical-display selector to **SCREEN** and the **MA/DIV** control to .02.

b. Adjust C509, located on the right side of the lower chassis, for minimum trace width.

TYPE 570 PARTS LIST MODIFICATION

Certain changes have been made in the design of your instrument to improve its performance and reliability. If parts in the instrument do not agree with those in your manual, refer to this list.

X000 Part first added at this serial number.
000X Part removed after this serial number.

Mod w/ Simple replacement not recommended. Modify to value for later instruments along with other circuit numbers listed.

CAPACITORS

Values are fixed unless marked variable.
Tolerance +or- 20% unless otherwise indicated.

							Tektronix Part No.
C7	X5170-up	1000 μμf	Cer.		500 v	+or- 94 μμf	281-536
C36	X5170-up	1000 μμf	Cer.		500 v	+or- 94 μμf	281-536
C73	X155-up	470 μμf	Cer.		500 v	10%	281-525
C315	101-140	7-45 μμf	Cer.	Var.			281-012
	141-up	4.5-25 μμf	Cer.	Var.			281-010
C316	X141-up	10 μμf	Cer.			10%	281-504
C484	101-352	2x40 μf	EMC		450 v		use 290-058
	353-up	80 μf	EMC		500 v		290-058
C502	101-226	1.5-7 μμf	Cer.	Var.			use 281-012
	227-up	7-45 μμf	Cer.	Var.			281-012
C505	101-352	2x40 μf	EMC		450 v		use 290-057
	353-up	80 μf	EMC		500 v		290-057
C506	101-365	2x40 μf	EMC		450 v		use 290-057
	366-up	80 μf	EMC		500 v		290-057
C509	101-226	1.5-7 μμf	Cer.	Var.			use 281-012
	227-up	7-45 μμf	Cer.	Var.			281-012
C610	101-353	.047 μf	PTM		400 v		use 285-520
	354-up	.047 μf	PTM		600 v	10%	285-520
C628	101-5214	.0068 μf	PT		3000 v		285-508
	5215-up	.01 μf	Cer.		2000 v		283-011
C630	101-5214	.0068 μf	PT		3000 v		285-508
	5215-up	.01 μf	Cer.		2000 v		283-011
C640	101-5214	.0068 μf	PT		3000 v		285-508
	5215-up	.01 μf	Cer.		2000 v		283-011

RESISTORS

Resistors are fixed, composition, +or- 10% unless otherwise indicated.

					Tektronix Part No.
R7	101-5169	1 k	1/2 w		302-102
	5170-up	680 k	1/2 w		302-684
R9	101-155	12 k	1 w		use 302-123
	156-up	12 k	1/2 w		302-123
R28	101-116	100 k	1/2 w		use 306-104
	117-up	100 k	2 w		306-104

R36	101-5169	1 k	1/2 w				302-102
	5170-up	1 meg	1/2 w				302-105
R39	101-155	12 k	1 w				use 302-123
	156-up	12 k	1/2 w				302-123
R55	101-142	47 k	1/2 w				use 306-473
	143-up	47 k	2 w				306-473
R67	101-116	220 k	1/2 w				use 302-124
	117-up	120 k	1/2 w				302-124
R69	101-335	27 k	1/2 w				use 304-273
	336-up	27 k	1 w				304-273
R70	101-154	4.7 k	1/2 w				302-472
	155-up	10 k	1/2 w				302-103
R72	X155-up	47 k	1/2 w				302-473
R73	X155-up	100 k	1/2 w				302-104
R75	101-155X	1 k	1/2 w				302-102
R85	101-149	100 k	2 w				use 311-023
	150-up	50 k	2 w				311-023
R96	X5026-up	100 k	1/2 w				302-104
R97	X5026-up	1 k	1/2 w				302-102
R111	X293-up	22 meg	1/2 w				302-226
R117	101-142	470 k	1/2 w				use 304-474
	143-up	470 k	1 w				304-474
R150	101-142	220 k	1 w				use 306-224
	143-up	220 k	2 w				306-224
R208	X5073-up	1 k	1/2 w				302-102
R260	101-5001	50 Ω	1/2 w		Prec.	1%	use 310-542
	5002-up	50 Ω	5 w		Mica Plate	1%	310-542
R261	101-5059	30 Ω	3 w		WW	1%	use 310-540
	5060-up	30 Ω	1/2 w		Mica Plate	1%	310-540
R262	101-5050	10 Ω	.6 w		WW	1%	use 310-547
	5051-up	10 Ω	1/2 w		Prec.	1%	310-547
R263)		5 Ω	.3 w		WW	1%)	
R264)	101-5050	3 Ω	.18 w		WW	1%)	use 310-546
R265)		2 Ω	.12 w		WW	1%)	
R263)		5 Ω	3 w		Prec.	1%)	
R264)	5051-up	3 Ω	3 w		Prec.	1%)	310-546
R265)		2 Ω	3 w		Prec.	1%)	
R277	101-208	33 k	1/2 w				Mod w/ R278
	209-up	22 k	1/2 w				302-223
R278	101-208	10 k	2 w			20%	Mod w/ R277
	209-up	20 k	2 w			20%	311-018
R329	101-291	300 k	1/2 w		Prec.	1%	309-125
	292-up	333 k	1/2 w		Prec.	1%	309-053
R330	101-291	1 meg	1/2 w		Prec.	1%	309-014
	292-up	1.11 meg	1/2 w		Prec.	1%	309-015
R350	101-5120	5 k	.1 w	Var.			311-074
	5121-up	1 k	.1 w	Var.			311-131
R351	101-5120	15 k	1/2 w				302-153
	5121-up	2.7 k	1/2 w				302-272

R355	101-5120	250 k	2 w			311-061
	5121-up	50 k	2 w			311-023
R356	101-5120	82 k	1/2 w			302-823
	5121-5179	18 k	1/2 w			use 302-153
	5180-up	15 k	1/2 w			302-153
R357	101-142	27 k	1 w			use 306-273
	143-up	27 k	2 w			306-273
R359	101-155	82 k	1 w			304-823
	156-up	82 k	1/2 w			302-823
R360	101-5120	34 k	1/2 w	Prec.	1%	309-129
	5121-up	6.5 k	1/2 w	Prec.	1%	309-262
R361	101-5120	69 k	1/2 w	Prec.	1%	309-130
	5121-up	13.5 k	1/2 w	Prec.	1%	309-263
R362	101-5120	174 k	1/2 w	Prec.	1%	309-151
	5121-up	34.5 k	1/2 w	Prec.	1%	309-038
R363	101-5120	349 k	1/2 w	Prec.	1%	309-152
	5121-up	69.5 k	1/2 w	Prec.	1%	309-264
R364	101-5120	700 k	1/2 w	Prec.	1%	309-008
	5121-up	139.5 k	1/2 w	Prec.	1%	309-265
R365	101-5120	1.75 meg	1/2 w	Prec.	1%	309-019
	5121-up	349 k	1/2 w	Prec.	1%	309-152
R366	101-5120	3.5 meg	1/2 w	Prec.	1%	309-086
	5121-up	700 k	1/2 w	Prec.	1%	309-008
R414	101-217	68 k	1/2 w	Prec.	1%	use 309-041
	218-up	60 k	1/2 w	Prec.	1%	309-041
R474	X336-up	150 k	2 w			306-154
R505	X365-up	330 k	1 w			304-334
R541	101-267	22 k	2 w			use 304-123
	268-up	12 k	1 w			304-123
R640	101-375X	27 k	1/2 w			302-273
R652	X312-up	27 k	1/2 w			302-273

SWITCHES

SW350	101-5120	Polarity Indicator	260-125	262-100
	5121-up	Polarity Indicator	260-125	262-219
SW360	101-5120	Range D C Volts	260-124	262-099
	5121-up	Range D C Volts	260-124	262-218

ELECTRON TUBES

V540A,B	101-5083	12BZ7	154-048
	5084-up	12AT7	154-039

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
EMT	electrolytic, metal tubular	Prec.	precision
f	farad	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

GMV guaranteed minimum value

STEP GENERATOR

							Order Parts by Number
Bulbs							
B80		Type NE-2 Neon Bulb					150002
Capacitors							
C6	.047 μf	PT	Fixed	400 v	20%		285519
C8	.047 μf	PT	Fixed	400 v	20%		285519
C10	.047 μf	PT	Fixed	400 v	20%		285519
C35	.047 μf	PT	Fixed	400 v	20%		285519
C38	.047 μf	PT	Fixed	400 v	20%		285519
C40	.047 μf	PT	Fixed	400 v	20%		285519
C67	12 μμf	Cer.	Fixed	500 v	10%		281506
C73	470 μμf	Cer.	Fixed	500 v	20%		281525
C85	.01 μf		Special				291019
C88	.015 μf	PT	Fixed	400 v	−2%+20%		285512
C90	.047 μf	PT	Fixed	400 v	20%		285519
C95	.0015 μf	Mica	Fixed	500 v	10%		283535
Resistors							
R4	3.3 k	½ w	Fixed	Comp.	10%		302332
R5	3.3 k	½ w	Fixed	Comp.	10%		302332
R6	20 k	2 w	Var.	Comp.	20%	Phase Adj. A	311018
R7	1 k	½ w	Fixed	Comp.	10%		302102
R8	10 k	1 w	Fixed	Comp.	10%		304103
R9	12 k	½ w	Fixed	Comp.	10%		302123
R10	47 k	1 w	Fixed	Comp.	10%		304473
R15	150 k	½ w	Fixed	Comp.	10%		302154
R16	150 k	½ w	Fixed	Comp.	10%		302154
R17	10 meg	½ w	Fixed	Comp.	10%		302106
R18	10 meg	½ w	Fixed	Comp.	10%		302106
R25	100 k	2 w	Var.	Comp.	20%	Volts/Step Adj.	311026
R26	1 meg	½ w	Fixed	Comp.	10%		302105
R27	1 meg	½ w	Fixed	Comp.	10%		302105
R28	100 k	2 w	Fixed	Comp.	10%		306104
R29	10 k	½ w	Fixed	Comp.	10%		302103
R35	250 k	2 w	Var.	Comp.	20%	Phase Adj. B	311032
R36	1 k	½ w	Fixed	Comp.	10%		302102
R38	10 k	1 w	Fixed	Comp.	10%		304103
R39	12 k	½ w	Fixed	Comp.	10%		302123

Resistors (Continued)

							Order Parts by Number
R40	47 k	1 w	Fixed	Comp.	10%		304473
R45	150 k	½ w	Fixed	Comp.	10%		302154
R46	150 k	½ w	Fixed	Comp.	10%		302154
R47	10 meg	½ w	Fixed	Comp.	10%		302106
R48	10 meg	½ w	Fixed	Comp.	10%		302106
R52	1 k	½ w	Fixed	Comp.	10%		302102
R55	47 k	2 w	Fixed	Comp.	10%		306473
R56	47 k	½ w	Fixed	Comp.	10%		302473
R64	1 k	½ w	Fixed	Comp.	10%		302102
R65	18 k	½ w	Fixed	Comp.	10%		302183
R66	180 k	½ w	Fixed	Comp.	10%		302184
R67	120 k	½ w	Fixed	Comp.	10%		302124
R68	100 k	½ w	Fixed	Comp.	10%		302104
R69	27 k	1 w	Fixed	Comp.			304273
R70	10 k	½ w	Fixed	Comp.	10%		302103
R71	1 k	½ w	Fixed	Comp.	10%		302102
R72	47 k	½ w	Fixed	Comp.	10%		302473
R73	100 k	½ w	Fixed	Comp.	10%		302104
R76	100 k	½ w	Fixed	Comp.	10%		302104
R80	1 k	½ w	Fixed	Comp.	10%		302102
R81	1.5 meg	½ w	Fixed	Comp.	10%		302155
R82	100 k	1 w	Fixed	Comp.	10%		304104
R85	50 k	2 w	Var.	Comp.	20%	Min. No. Curves	311023
R86	1 k	½ w	Fixed	Comp.	10%		302102
R88	4.7 meg	½ w	Fixed	Comp.	10%		302475
R90	390 k	½ w	Fixed	Comp.	10%		302394
R91	20 k	2 w	Var.	Comp.	20%	STEPS/FAMILY	311018
R92	10 k	1 w	Fixed	Comp.	10%		304103
R94	1 k	½ w	Fixed	Comp.	10%		302102

Switches

					not wired	wired
SW50	1 wafer	3 position	rotary	STEPS/SEC	260128	262104
SW90	single pole	single throw	pushbutton	SINGLE FAMILY	260138	—

Vacuum Tubes

V8A	½ 6AN8	Split-Load Phase Inverter	154078
V8B	½ 6AN8	Shaper Amplifier	
V15	6AL5	Rectifier	154016
V38A	½ 6AN8	Split-Load Phase Inverter	154078
V38B	½ 6AN8	Shaper Amplifier	
V45	6AL5	Rectifier	154016
V55A	½ 12AT7	Shaper Cathode Follower	154039
V55B	½ 12AT7	Step Control Cathode Follower	
V65	6AN8	Multivibrator	154078
V75A	½ 12AT7	Step Generator Cathode Follower	154039
V75B	½ 12AT7	Multivibrator Cathode Follower	
V76	6AL5	Disconnect Diode	154016
V86	6AU6	Step Generator	154022
V95	6AL5	Clamp & Coupling Diode	154016

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
f	farad	Prec.	precision
GMV	guaranteed minimum value	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

STEP AMPLIFIER

							Order Parts by Number
Bulbs							
B170		1/25 w		55-70 v			150009
Capacitors							
C112	4.7 μμf	Cer.	Fixed	500 v	20%		281501
C125	.0047 μf	PT	Fixed	400 v	20%		285506
C126	.0047 μf	PT	Fixed	400 v	20%		285506
C145	22 μμf	Cer.	Fixed	500 v	20%		281510
C165	12 μμf	Cer.	Fixed	500 v	10%		281506
C170	.001 μf	Cer.	Fixed	500 v	GMV		283000
C185	2x15 μf	EMC	Fixed	450 v	−20%+50%		290054
Resistors							
R101	100 k	½ w	Fixed	Comp.	10%		302104
R102	220 k	½ w	Fixed	Comp.	10%		302224
R105	500 k	2 w	Var.	Comp.	20%	Volts/Step Zero Adj.	311034
R106	1.5 meg	½ w	Fixed	Comp.	10%		302155
R108	1 k	½ w	Fixed	Comp.	10%		302102
R109	15 k	½ w	Fixed	Comp.	10%		302153
R110	220 k	1 w	Fixed	Comp.	10%		304224
R111	22 meg	½ w	Fixed	Comp.	10%		302226
R112	1.5 meg	½ w	Fixed	Comp.	10%		302155
R115	1.5 meg	½ w	Fixed	Comp.	10%		302155
R116	1 k	½ w	Fixed	Comp.	10%		302102
R117	470 k	1 w	Fixed	Comp.	10%		304474
R120	100 k	2 w	Var.	Comp.	20%	START ADJUST	311026
R125	100 k	½ w	Fixed	Comp.	10%		302104
R130	750 k	½ w	Fixed	Prec.	1%		309010
R131A	10 k	½ w	Fixed	Prec.	1%		309100
R131B	20 k	½ w	Fixed	Prec.	1%		309153
R131C	50 k	½ w	Fixed	Prec.	1%		309090
R131D	100 k	½ w	Fixed	Prec.	1%		309045
R131E	200 k	½ w	Fixed	Prec.	1%		309051
R131F	500 k	½ w	Fixed	Prec.	1%		309003
R131G	1 meg	½ w	Fixed	Prec.	1%		309014
R132	1 k	½ w	Fixed	Comp.	10%		302102
R135	220 k	1 w	Fixed	Comp.	10%		304224
R145	2.7 meg	½ w	Fixed	Comp.	10%		302275

Resistors (Continued)

						Order Parts by Number
R146	1 meg	½ w	Fixed	Comp.	5%	301105
R147	1 k	½ w	Fixed	Comp.	10%	302102
R150	220 k	2 w	Fixed	Comp.	10%	306224
R151	27 k	1 w	Fixed	Comp.	10%	304273
R165	2.7 meg	½ w	Fixed	Comp.	10%	302275
R166	1 meg	½ w	Fixed	Comp.	5%	301105
R167	1 k	½ w	Fixed	Comp.	10%	302102
R170	100 k	½ w	Fixed	Comp.	10%	302104
R171	1.5 meg	½ w	Fixed	Comp.	10%	302155
R180	1 k	½ w	Fixed	Comp.	10%	302102
R182	120 k	2 w	Fixed	Comp.	10%	306124
R185	10 meg	½ w	Fixed	Comp.	10%	302106
R186	33 k	2 w	Fixed	Comp.	10%	306333

Switches

					not wired	wired
SW130	2 wafer	7 position	rotary	VOLTS/STEP	260129	262106
SW180	double pole	double throw	pushbutton	ZERO BIAS	260136	—
SW190		three position	lever	TEST POSITION	260137	—

Vacuum Tubes

V110	6AU6	Input Amplifier	154022
V115	12AX7	Input Cathode Folower	154043
V135	6AU6	Input Amplifier	154022
V150	12AT7	Output Amplifier	154039
V180	6CL6	Output Cathode Follower	154031

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
f	farad	Prec.	precision
GMV	guaranteed minimum value	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

HORIZONTAL AMPLIFIER

Capacitors

							Order Parts by Number
C205	4.5–25 μμf	Cer.	Var.	500 v			281010
C207	8 μμf	Cer.	Fixed	500 v	±½ μμf		281503
C242	470 μμf	Cer.	Fixed	500 v	20%		281525

Resistors

R205	5 meg	½ w	Fixed	Prec.	1%		309087
R206	3 meg	½ w	Fixed	Prec.	1%		309026
R207	2 meg	½ w	Fixed	Prec.	1%		309023
R210	47 k	2 w	Fixed	Comp.	10%		306473
R211	47 k	1 w	Fixed	Comp.	10%		304473
R214	500 k	2 w	Var.	Comp.	20%	Volts/Div. Bal.	311034
R215	1 meg	½ w	Fixed	Comp.	10%		302105
R216	15 k	½ w	Fixed	Comp.	10%		302153
R220	50 k	½ w	Fixed	Prec.	1%		309090
R221	150 k	½ w	Fixed	Prec.	1%		309049
R222	250 k	½ w	Fixed	Prec.	1%		309109
R223	500 k	½ w	Fixed	Prec.	1%		309003
R224	1.5 meg	½ w	Fixed	Prec.	1%		309017
R225	2.5 meg	½ w	Fixed	Prec.	1%		309025
R227	5 k	⅓ w	Var.	Comp.	20%	Volts/Div. Cal.	311074
R228	47 k	½ w	Fixed	Comp.	10%		302473
R229	20 k	½ w	Var.	Comp.	20%	Horiz. Gain Adj.	311018
R230	33 k	½ w	Fixed	Comp.	10%		302333
R232	8.2 meg	½ w	Fixed	Comp.	5%		301825
R233	2.2 meg	½ w	Fixed	Comp.	10%		302225
R234	½2x500 k	½ w	Var.	Comp.	20%	HORIZONTAL POSITIONING	311048*
R237	1 k	½ w	Fixed	Comp.	10%		302102
R238	3.5 meg	½ w	Fixed	Prec.	1%		309086
R239	1 k	½ w	Fixed	Comp.	10%		302102
R240	68 k	½ w	Fixed	Comp.	5%		301683

* One half of R270.

Resistors (Continued)

						Order Parts by Number
R241	68 k	½ w	Fixed	Comp.	5%	301683
R242	47 k	2 w	Fixed	Comp.	5%	305473
R244	1 k	½ w	Fixed	Comp.	10%	302102
R245	1 k	½ w	Fixed	Comp.	10%	302102
R246	100 k	2 w	Fixed	Comp.	5%	305104
R247	100 k	2 w	Fixed	Comp.	5%	305104
R248	82 k	2 w	Fixed	Comp.	5%	305823

Switches

					not wired	wired
SW205	1 wafer	2 position	rotary	HORIZONTAL	260133*	262105*
SW210	2 wafer	9 position	rotary	VOLTS/DIV		

Vacuum Tubes

V210	6AU6	Horizontal Input Cathode Follower	154022
V215	6AU6	Horizontal Pos. Adj. Cathode Follower	154022
V240	6AU6	Horizontal Amplifier	154022
V241	6AU6	Horizontal Amplifier	154022
V245	6BQ7A	Horizontal Output Amplifier	154028

* SW205 and SW210 are concentric. Furnished as a unit.

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
f	farad	Prec.	precision
GMV	guaranteed minimum value	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

CRT-DISPLAY SWITCHING

Switches

					Order Parts by Number	
					not wired	wired
SW510*	3 wafer	3 position	rotary	VERTICAL	260132	262102

* SW510 concentric with SW255. Furnished as a unit.

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
EMT	electrolytic, metal tubular	Prec.	precision
f	farad	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^{3} ohms	v	working volts dc
meg	megohm or 10^{6} ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

GMV guaranteed minimum value

VERTICAL AMPLIFIER

							Order Parts by Number
Capacitors							
C280	470 μμf	Cer.	Fixed	500 v	20%		281525
Fuse							
F255	1/16 amp	3AG	Fast-Blo		for 117 v operation		159024
F255	1/16 amp	3AG	Fast-Blo		for 234 v operation		159024
Resistors							
R254	100 k	½ w	Fixed	Comp.	10%		302104
R255	3 k	10 w	Fixed	WW	1%		308073
R256	1 k	5 w	Fixed	WW	1%		308072
R257	500 Ω	5 w	Fixed	WW	1%		308071
R258	300 Ω	5 w	Fixed	WW	1%		308070
R259	100 Ω	½ w	Fixed	Prec.	1%		309112
R260	50 Ω	8 w	Fixed	Prec.	1%		310542
R261	30 Ω	½ w	Fixed	Prec.	1%		310540
R262	10 Ω	3 w	Fixed	Prec.	1%	Special	310547
R263	5 Ω	3 w	Fixed	Prec.			
R264	3 Ω	3 w	Fixed	Prec.	1%	Special	310546
R265	2 Ω	3 w	Fixed	Prec.			
R270	½2x500 k	½ w	Var.	Comp.	20%	VERTICAL POSITIONING	311048*
R271	2.7 meg	½ w	Fixed	Comp.	10%		302275
R272	910 k	½ w	Fixed	Comp.	5%		301914
R275	1 meg	½ w	Fixed	Prec.	1%		309014
R277	22 k	½ w	Fixed	Comp.	10%		302223
R278	20 k	2 w	Var.	Comp.	20%	Vert. Gain Adj.	311018
R279	1 k	½ w	Fixed	Comp.	10%		302102
R280	47 k	2 w	Fixed	Comp.	5%		305473

* One half of R234.

Resistors (Continued)

						Order Parts by Number
R281	1 k	½ w	Fixed	Comp.	10%	302102
R282	68 k	½ w	Fixed	Comp.	5%	301683
R283	68 k	½ w	Fixed	Comp.	5%	301683
R288	1 k	½ w	Fixed	Comp.	10%	302102
R289	1 k	½ w	Fixed	Comp.	10%	302102
R290	100 k	2 w	Fixed	Comp.	5%	305104
R291	100 k	2 w	Fixed	Comp.	5%	305104
R292	82 k	2 w	Fixed	Comp.	5%	305823

Switches

					not wired	wired
SW255*	2 wafer	11 position	rotary	VERTICAL MA/DIV	260132	262102

Vacuum Tubes

V280	6AU6	Input Amplifier	154022
V281	6AU6	Input Amplifier	154022
V290	6BQ7A	Output Amplifier	154028

* Concentric with SW510. Furnished as a unit.

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
f	farad	Prec.	precision
GMV	guaranteed minimum value	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

PLATE-SWEEP & METER CIRCUIT

Bulbs

			Order Parts by Number
B350	#328		150004

Capacitors

C310	330 μμf	Mica	Fixed	500 v	10%	283518
C311	20–125 μμf	Cer.	Var.	500 v		281028
C315	4.5–25 μμf	Cer.	Var.	500 v		281010
C316	10 μμf	Cer.	Fixed	500 v	10%	281504

Fuse

F310	½ amp	3AG	Fast-Blo	for 117 v operation	159025
F310	½ amp	3AG	Fast-Blo	for 234 v operation	159025

Meter

Meter	200 μa		149004

Resistors

R310	150 k	1 w	Fixed	Comp.	10%		304154
R316	33 k	2 w	Fixed	Comp.	10%		306333
R317	22 k	2 w	Fixed	Comp.	10%		306223
R319	1.5 k	25 w	Fixed	WW	5%		308040
R320	1.5 k	25 w	Fixed	WW	5%		308040
R321	2 k	25 w	Fixed	WW	5%		308065
R322	2 k	25 w	Fixed	WW	5%		308065
R323	3 k	25 w	Fixed	WW	5%		308042
R324	10 k	10 w	Fixed	WW	5%		308023
R325	10 k	10 w	Fixed	WW	5%		308023
R326	30 k	10 w	Fixed	WW	5%		308027
R327	100 k	2 w	Fixed	Comp.	5%		305104
R328	100 k	2 w	Fixed	Comp.	5%		305104
R329	333 k	½ w	Fixed	Prec.	1%		309053
R330	1.11 meg	½ w	Fixed	Prec.	1%		309015
R340	250 Ω	25 w	Var.	WW	10%	VARIABLE	311073
R350	5 k	⅕ w	Var.	WW	20%	AC Volts Adj.	311074
R351	15 k	½ w	Fixed	Comp.	10%		302153
R355	250 k	2 w	Var.	Comp.	20%	—DC	311061
R356	82 k	½ w	Fixed	Comp.	10%		302823

Resistors (Continued)

						Order Parts by Number
R357	27 k	2 w	Fixed	Comp.	10%	306273
R360	34 k	½ w	Fixed	Prec.	1%	309129
R361	69 k	½ w	Fixed	Prec.	1%	309130
R362	174 k	½ w	Fixed	Prec.	1%	309151
R363	349 k	½ w	Fixed	Prec.	1%	309152
R364	700 k	½ w	Fixed	Prec.	1%	309008
R365	1.75 meg	½ w	Fixed	Prec.	1%	309019
R366	3.5 meg	½ w	Fixed	Prec.	1%	309086

Switches

					not wired	wired
SW310	triple pole	double throw	toggle	POWER TEST ON	260143	—
SW330	2 wafer	11 position	rotary	SERIES LOAD RESISTANCE OHMS	260127	262101
SW340	1 wafer	17 position	rotary	HEATER	260130	262107
SW350	2 wafer	3 position	rotary	INDICATION	260125	262100
SW360	2 wafer	7 position	rotary	RANGE DC VOLTS	260124	262099

Transformers

T310	Plate Sweep Supply	120070
T340	Heater Supply	120068

Vacuum Tubes

V310	6AU6	Current-Bal. Cathode Follower	154022
V315	6AX4	Plate Sweep Rectifier	154113
V316	6AX4	Plate Sweep Rectifier	154113
V350	Germanium Diode	Transitron T12G (preferred) or 1N34A	158001
V351	Germanium Diode	Transitron T12G (preferred) or 1N34A	158001

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
f	farad	Prec.	precision
GMV	guaranteed minimum value	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^{3} ohms	v	working volts dc
meg	megohm or 10^{6} ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

MAIN POWER SUPPLY

Bulbs

		Order Parts by Number
B402	#47	150001
B403	#47	150001
B404	#328	150004

Capacitors

C403	2x20 μf	EMC	Fixed	450 v	—20%+50%	290036
C405	2x20 μf	EMC	Fixed	450 v	—20%+50%	290036
C407	.01 μf	PT	Fixed	400 v	20%	285510
C412	.047 μf	PT	Fixed	400 v	20%	285519
C420	2x20 μf	EMC	Fixed	450 v	—20%+50%	290036
C478	.01 μf	PT	Fixed	400 v	20%	285510
C484	80 μf	EMC	Fixed	500 v	—20%+50%	290058
C492	.01 μf	PT	Fixed	400 v	20%	285510
C495	2x20 μf	EMC	Fixed	450 v	—20%+50%	290037

Fuse

F402	5 amp	3AG	Slo-Blo	for 117 v operation	159006
F402	3 amp	3AG	Slo-Blo	for 234 v operation	159005

Resistors

R402	50 Ω	2 w	Var.	WW	20%	SCALE ILLUM.	311055
R407	33 k	½ w	Fixed	Comp.	10%		302333
R408	100 Ω	½ w	Fixed	Comp.	10%		302101
R410	2.2 meg	½ w	Fixed	Comp.	10%		302225
R411	4 k	5 w	Fixed	WW	5%		308051
R412	50 k	½ w	Fixed	Prec.	1%		309090
R413	10 k	2 w	Var.	WW	20%	—150 v Adj.	311015
R414	60 k	½ w	Fixed	Prec.	1%		309041
R465	27 k	½ w	Fixed	Comp.	10%		302273
R466	39 k	½ w	Fixed	Comp.	10%		302393
R470	2.2 meg	½ w	Fixed	Comp.	10%		302225
R472	100 Ω	½ w	Fixed	Comp.	10%		302101
R474	150 k	2 w	Fixed	Comp.	10%		306154
R478	333 k	½ w	Fixed	Prec.	1%		309053
R479	490 k	½ w	Fixed	Prec.	1%		309002

Resistors (Continued)

						Order Parts by Number
R488	180 k	1 w	Fixed	Comp.	10%	304184
R489	39 k	½ w	Fixed	Comp.	10%	302393
R490	100 Ω	½ w	Fixed	Comp.	10%	302101
R492	1 meg	½ w	Fixed	Prec.	1%	309014
R493	490 k	½ w	Fixed	Prec.	1%	309002
R495	1 meg	½ w	Fixed	Comp.	10%	302105
R496	4.5 k	10 w	Fixed	WW	5%	308021

Switches

SW401	1 wafer	8 position	rotary	PEAK VOLTS	260126
SW402	single pole	single throw	toggle	POWER MAIN ON	260134

Transformers

T401	Main Power Supply	120067

Vacuum Tubes

V403	6X4	Rectifier	154035
V405	6X4	Rectifier	154035
V407	5651	Voltage Reference Tube	154052
V410	6AU6	Comparator	154022
V412	12B4	Series Regulator	154044
V470A	½ 6AN8	Series Regulator	154078
V470B	½ 6AN8	Comparator	
V483	6AX4	Rectifier	154113
V484	6AX4	Rectifier	154113
V489	6AU6	Comparator	154022
V495	12B4	Series Regulator	154044

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
EMT	electrolytic, metal tubular	Prec.	precision
f	farad	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

GMV guaranteed minimum value

FLOATING POWER SUPPLY

Bulbs

		Order Parts by Number
B515	Type NE-2 Neon Bulb	150002
B516	Type NE-2 Neon Bulb	150002

Capacitors

C502	7–45 μμf	Cer.	Var.	500 v		281012
C505	80 μf	EMC	Fixed	500 v	—20%+50%	290057
C506	80 μf	EMC	Fixed	500 v	—20%+50%	290057
C509	7–45 μμf	Cer.	Var.	500 v		281012
C510	2x20 μf	EMC	Fixed	450 v	—20%+50%	290036
C515	.001 μf	Cer.	Fixed	500 v	GMV	283000
C525	.01 μf	PT	Fixed	400 v	20%	285510

Resistors

R505	330 k	1 w	Fixed	Comp.	10%	304334
R510	47 k	2 w	Fixed	Comp.	10%	306473
R511	470 k	½ w	Fixed	Comp.	10%	302474
R515	220 k	½ w	Fixed	Comp.	10%	302224
R516	4.7 meg	½ w	Fixed	Comp.	10%	302475
R517	1 k	½ w	Fixed	Comp.	10%	302102
R525	100 Ω	½ w	Fixed	Comp.	10%	302101
R526	100 k	2 w	Fixed	Comp.	10%	306104
R527	100 Ω	½ w	Fixed	Comp.	10%	302101
R528	1 meg	½ w	Fixed	Comp.	10%	302105
R530	330 k	2 w	Fixed	Comp.	10%	306334
R531	40 k	½ w	Fixed	Prec.	1%	309155
R532	60 k	½ w	Fixed	Prec.	1%	309041
R533	100 k	½ w	Fixed	Prec.	1%	309045
R534	200 k	½ w	Fixed	Prec.	1%	309051

Resistors (Continued)

							Order Parts by Number
R535	200 k	½ w	Fixed	Prec.	1%		309051
R536	300 k	½ w	Fixed	Prec.	1%		309125
R540	20 k	2 w	Var.	Comp.	20%	VARIABLE	311018
R541	12 k	1 w	Fixed	Comp.	10%		304123
R542	220 k	½ w	Fixed	Comp.	10%		302224
R543	100 k	2 w	Fixed	Comp.	10%		306104
R544	220 k	½ w	Fixed	Comp.	10%		302224
R545	220 k	½ w	Fixed	Comp.	10%		302224

Switches

					not wired	wired
SW525	2 wafer	5 position	rotary	+DC	260131	262103

Transformers

T501	Floating Power Supply	120069

Vacuum Tubes

V505	6AX5	Floating-Supply Rectifiers	154023
V506	6X4	Floating-Supply Rectifiers	154035
V510	6X4	Screen-Supply Rectifier	154035
V515	6CD6GA	Series Regulator	154112
V525	6AN8	Comparator	154078
V540A	½ 12BZ7	+50 v Regulator	154048
V540B	½ 12BZ7	Voltage Setting Cathode Follower	

ABBREVIATIONS

Cer.	ceramic	m	milli or 10^{-3}
Comp.	composition	Ω	ohm
EMC	electrolytic, metal cased	Poly.	polystyrene
EMT	electrolytic, metal tubular	Prec.	precision
f	farad	PT	paper tubular
h	henry	Tub.	tubular
k	kilohm or 10^3 ohms	v	working volts dc
meg	megohm or 10^6 ohms	Var.	variable
μ	micro or 10^{-6}	w	watt
μμ	micromicro or 10^{-12}	WW	wire wound

GMV guaranteed minimum value

CRT CIRCUIT

Bulbs

		Order Parts by Number
B644	Type NE-2 Neon Bulb	150002
B645	Type NE-2 Neon Bulb	150002

Capacitors

C610	.047 μf	PT	Fixed	400 v	20%		285519
C611	.001 μf	PT	Fixed	600 v	20%		285501
C616	.001 μf	PT	Fixed	1000 v	20%		285502
C620	.001 μf	PT	Fixed	600 v	20%		285501
C628	.0068 μf	PT	Fixed	3000 v	20%		285508
C630	.0068 μf	PT	Fixed	3000 v	20%		285508
C640	.0068 μf	PT	Fixed	3000 v	20%		285508
C641	.015 μf	PT	Fixed	3000 v	20%		285513

Resistors

R605	470 k	½ w	Fixed	Comp.	10%		302474
R610	1 k	1 w	Fixed	Comp.	10%		304102
R611	100 k	2 w	Fixed	Comp.	10%		306104
R615	47 k	½ w	Fixed	Comp.	10%		302473
R616	1.5 k	½ w	Fixed	Comp.	10%		302152
R625	1.8 meg	½ w	Fixed	Comp.	10%		302185
R626	2 meg	2 w	Var.	Comp.	20%	—1700 v Adj.	311042
R627	4.7 meg	2 w	Fixed	Comp.	10%		306475
R628	4.7 meg	2 w	Fixed	Comp.	10%		306475
R641	1 k	½ w	Fixed	Comp.	10%		302102
R644	2 meg	½ w	Var.	Comp.	20%	INTENSITY	311043
R645	1.5 meg	2 w	Fixed	Comp.	10%		306155
R646	2 meg	½ w	Var.	Comp.	20%	FOCUS	311043
R647	4.7 meg	2 w	Fixed	Comp.	10%		306475
R648	4.7 meg	2 w	Fixed	Comp.	10%		306475

Resistors (Continued)

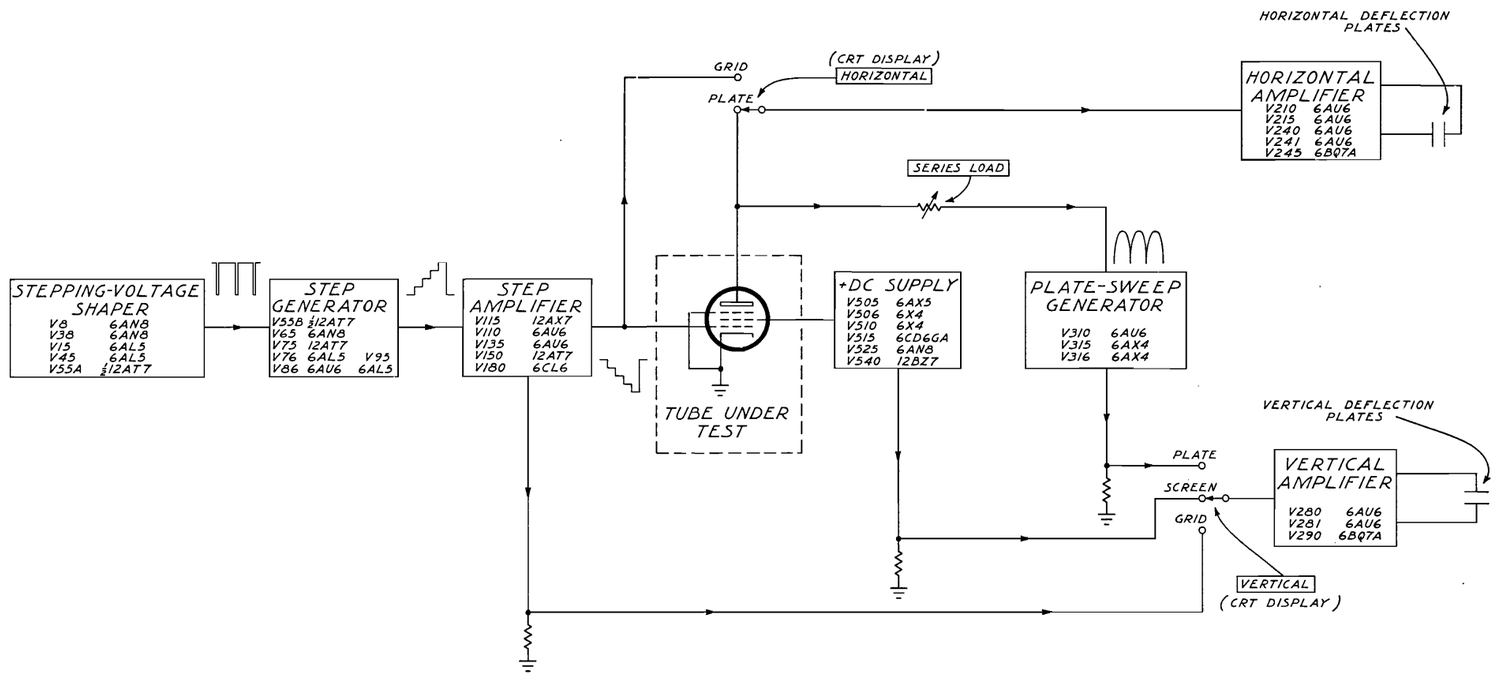
							Order Parts by Number
R650	100 k	2 w	Var.	Comp.	20%	Geom. Adj.	311026
R651	50 k	2 w	Var.	Comp.	20%	ASTIGMATISM	311023
R652	27 k	½ w	Fixed	Comp.	10%		302273

Transformers

T620	CRT Supply		120071

Vacuum Tubes

V605A	½ 12AU7	Comparator	154041
V605B	½ 12AU7	Shunt Regulator	
V610	6AQ5	Oscillator	154017
V630	5642	High Voltage Rectifier	154051
V631	5642	High Voltage Rectifier	154051



TYPE 570 CHARACTERISTIC-CURVE TRACER A BLOCK DIAGRAM 10-24-55 KF

V8A
V38A
SPLIT-LOAD
PHASE INVERTER

V15
V45
RECTIFIERS

V8B
V38B
SHAPER AMPLIFIERS

V55A
SHAPER C.F.

V65A
V65B
MULTIVIBRATOR

V75B
MULTIVIBRATOR C.F.

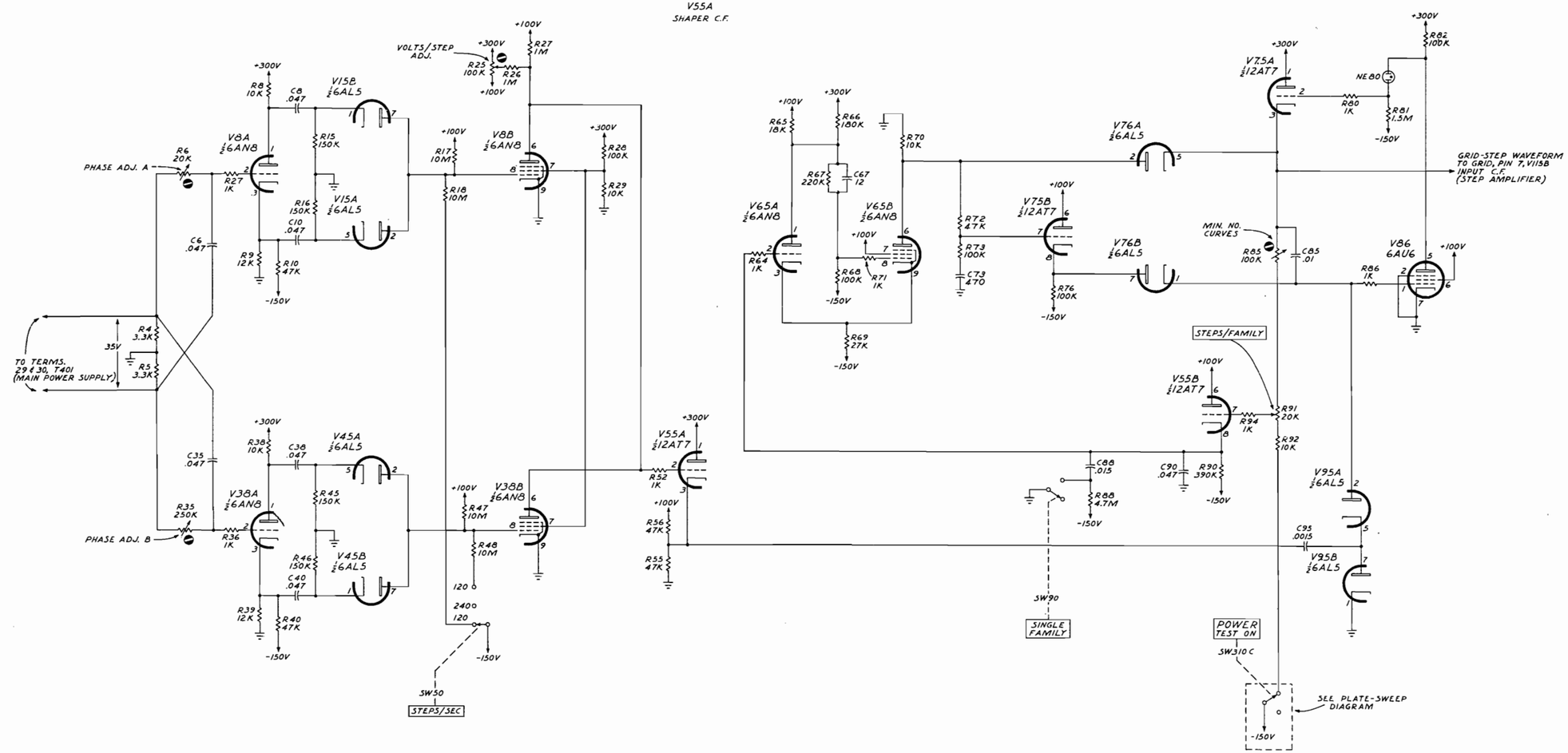
V76A
V76B
DISCONNECT
DIODES

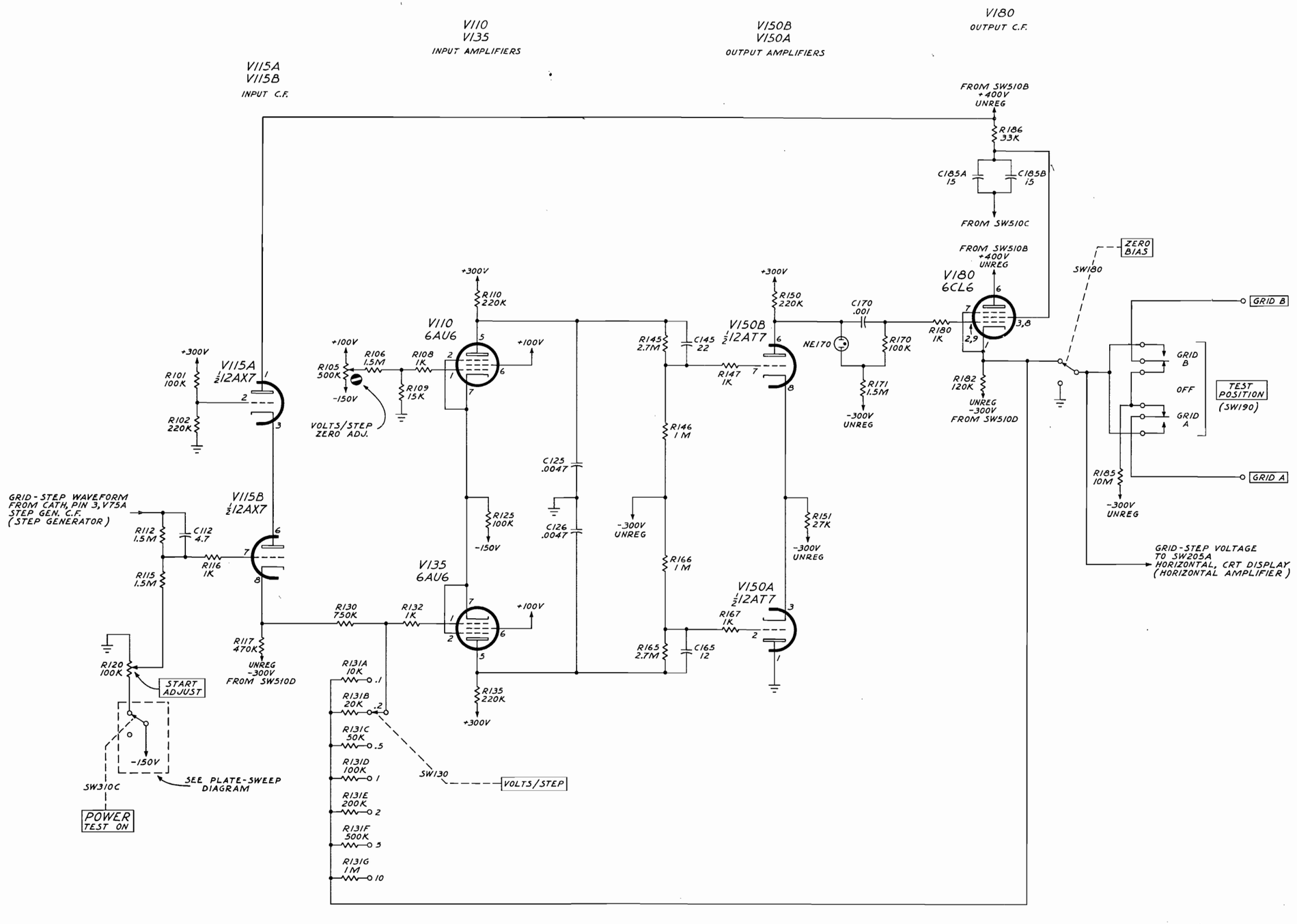
V75A
STEP-GEN. C.F

V55B
STEP-CONTROL C.F.

V95A
V95B
CLAMP &
COUPLING DIODE

V86
STEP GEN.



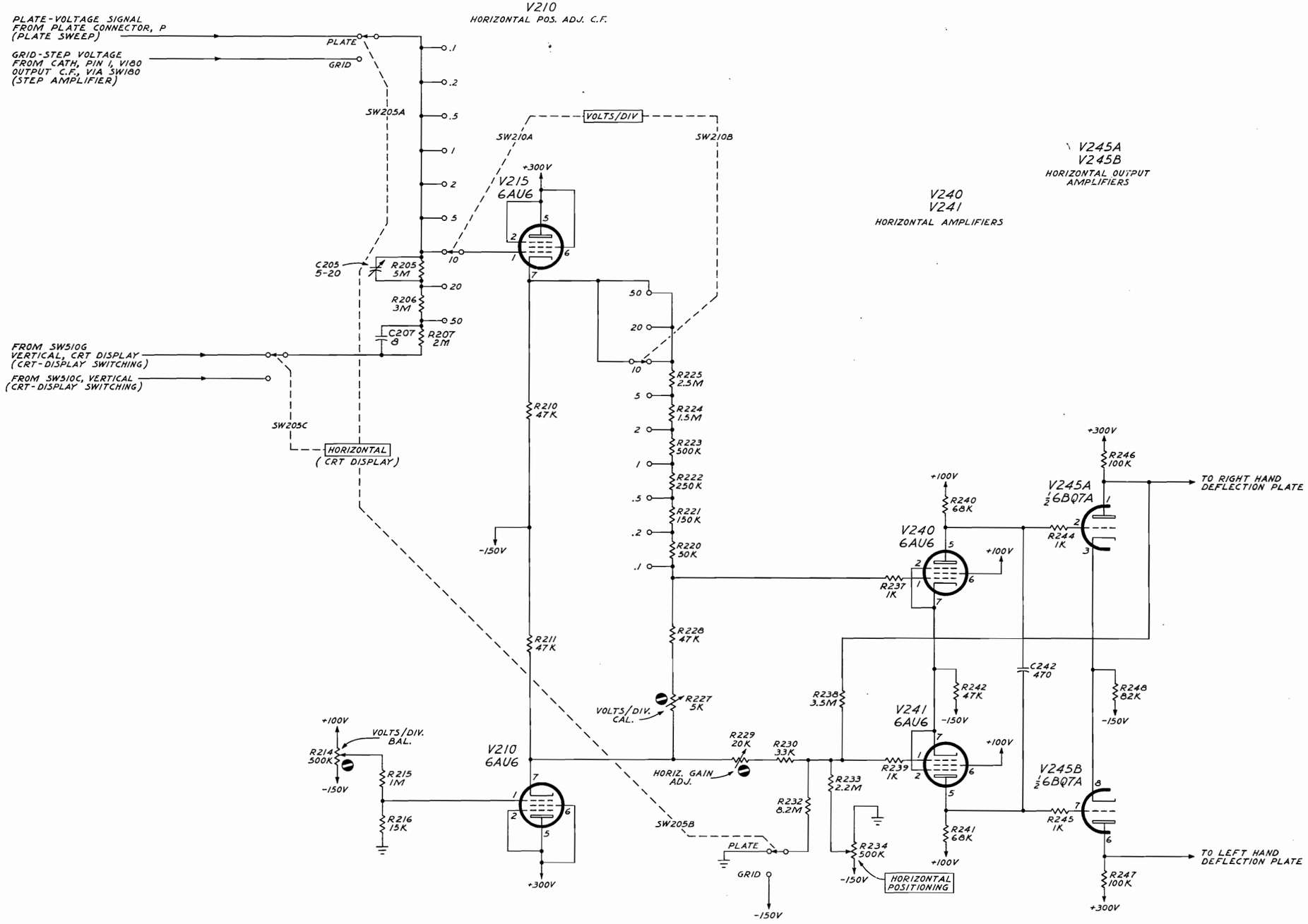

V115A
V115B
INPUT C.F.
V110
V135
INPUT AMPLIFIERS
V150B
V150A
OUTPUT AMPLIFIERS
V180
OUTPUT C.F.
FROM SW510B
+400V
UNREG
R186
33K
C185A
15
C185B
15
FROM SW510C
FROM SW510B
+400V
UNREG
ZERO
BIAS
SW180
V180
6CL6
GRID B
GRID
B
OFF
GRID
A
TEST
POSITION
(SW190)
GRID A
R185
10M
-300V
UNREG
GRID-STEP VOLTAGE
TO SW205A
HORIZONTAL, CRT DISPLAY
(HORIZONTAL AMPLIFIER)
+300V
R101
100K
R102
220K
V115A
½12AX7
+100V
R105
500K
-150V
VOLTS/STEP
ZERO ADJ.
R106
1.5M
R108
1K
R109
15K
V110
6AU6
+300V
R110
220K
+100V
R125
100K
-150V
C125
.0047
C126
.0047
R145
2.7M
C145
22
R147
1K
R146
1 M
+300V
R150
220K
V150B
½12AT7
NE170
C170
.001
R170
100K
R171
1.5M
-300V
UNREG
R180
1K
R182
120K
UNREG
-300V
FROM SW510D
GRID-STEP WAVEFORM
FROM CATH, PIN 3, V75A
STEP GEN. C.F.
(STEP GENERATOR)
V115B
½12AX7
R112
1.5M
C112
4.7
R116
1K
R115
1.5M
R120
100K
START
ADJUST
-150V
SEE PLATE-SWEEP
DIAGRAM
SW310C
POWER
TEST ON
R117
470K
UNREG
-300V
FROM SW510D
V135
6AU6
R130
750K
R132
1K
+100V
R135
220K
+300V
R131A
10K
R131B
20K
R131C
50K
R131D
100K
R131E
200K
R131F
500K
R131G
1 M
SW130
VOLTS/STEP
-300V
UNREG
R166
1 M
R165
2.7M
C165
12
V150A
½12AT7
R167
1K
R151
27K
-300V
UNREG

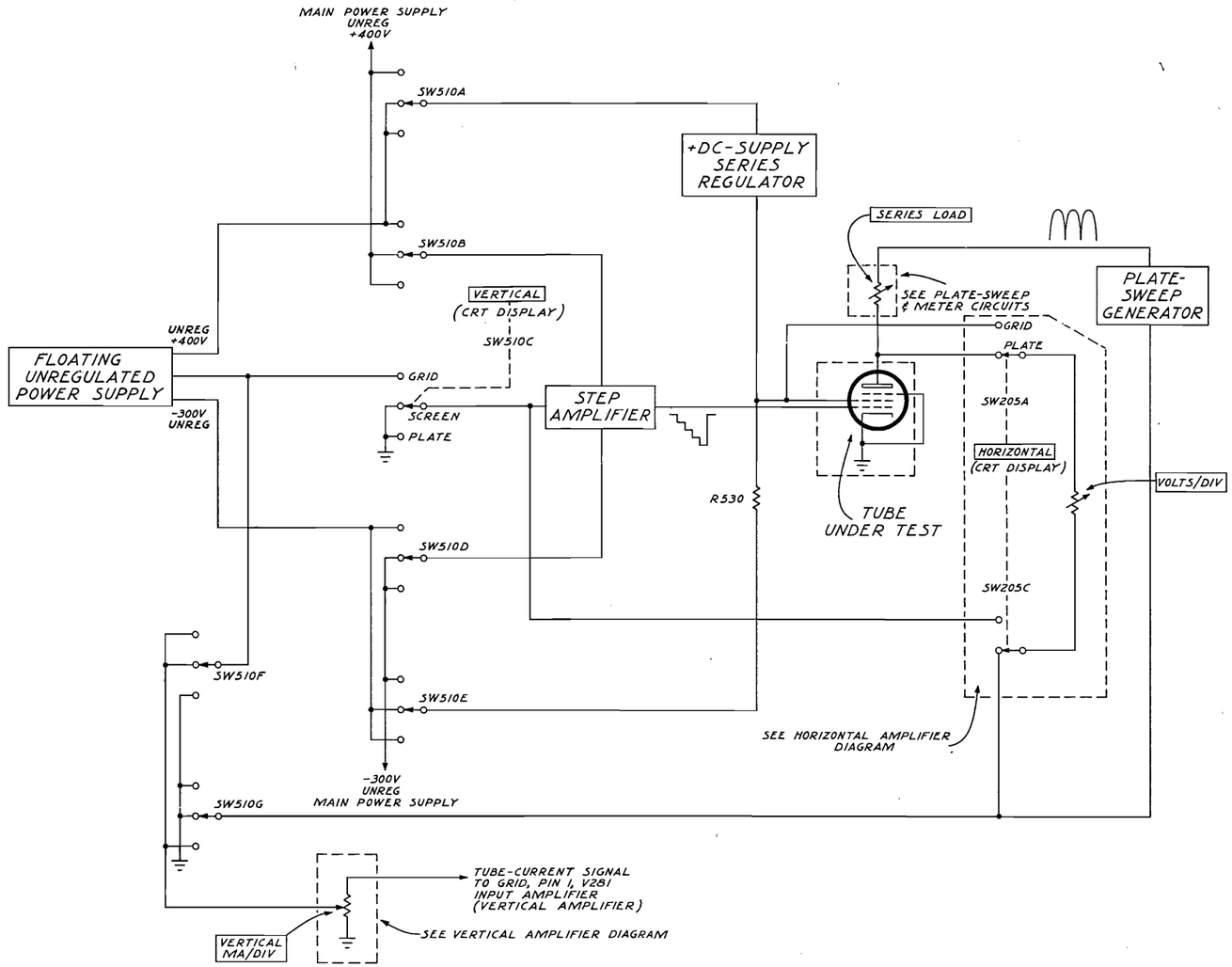
V215
HORIZONTAL INPUT C.F.

V210
HORIZONTAL POS. ADJ. C.F.

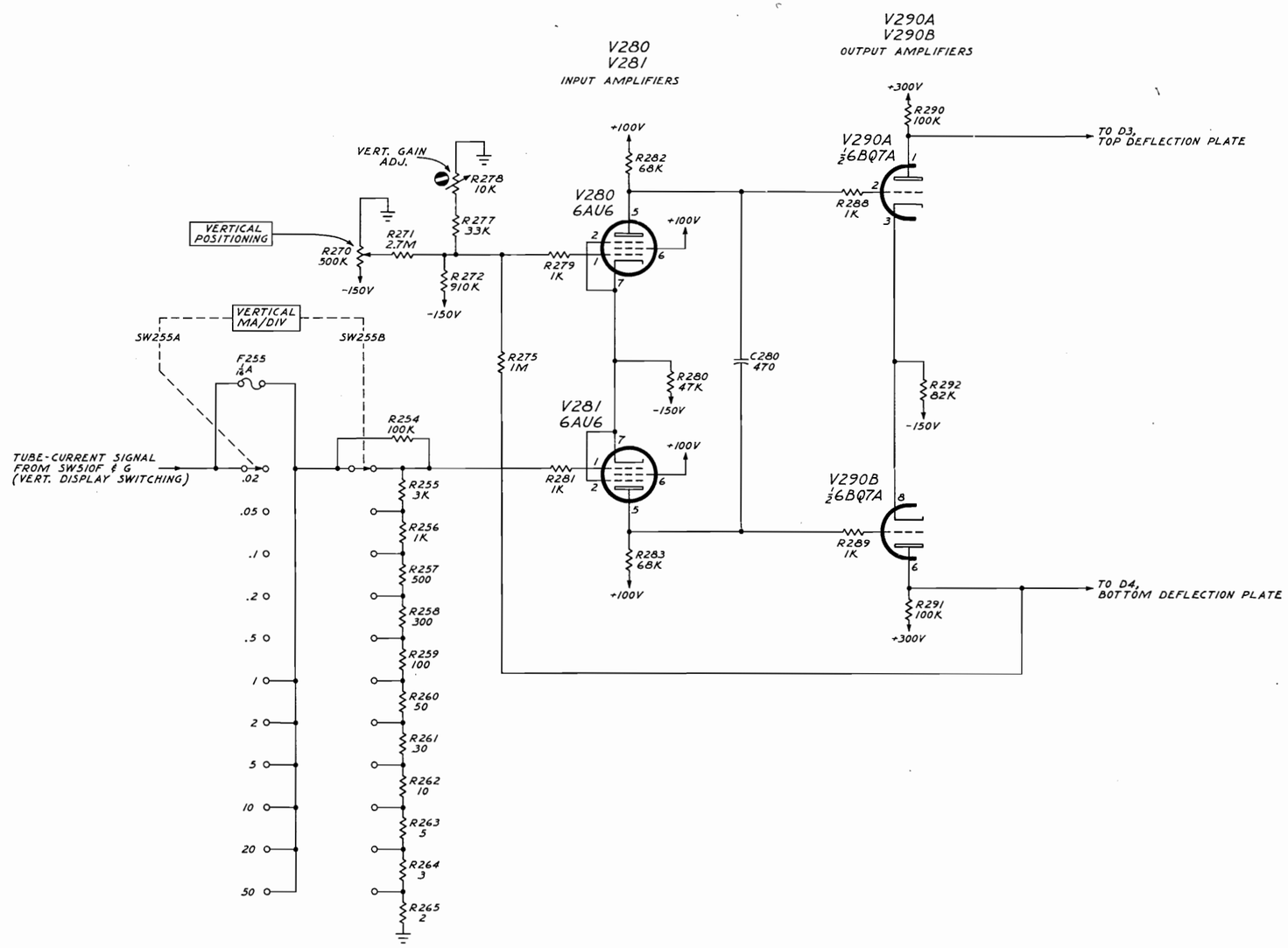
V240
V241
HORIZONTAL AMPLIFIERS

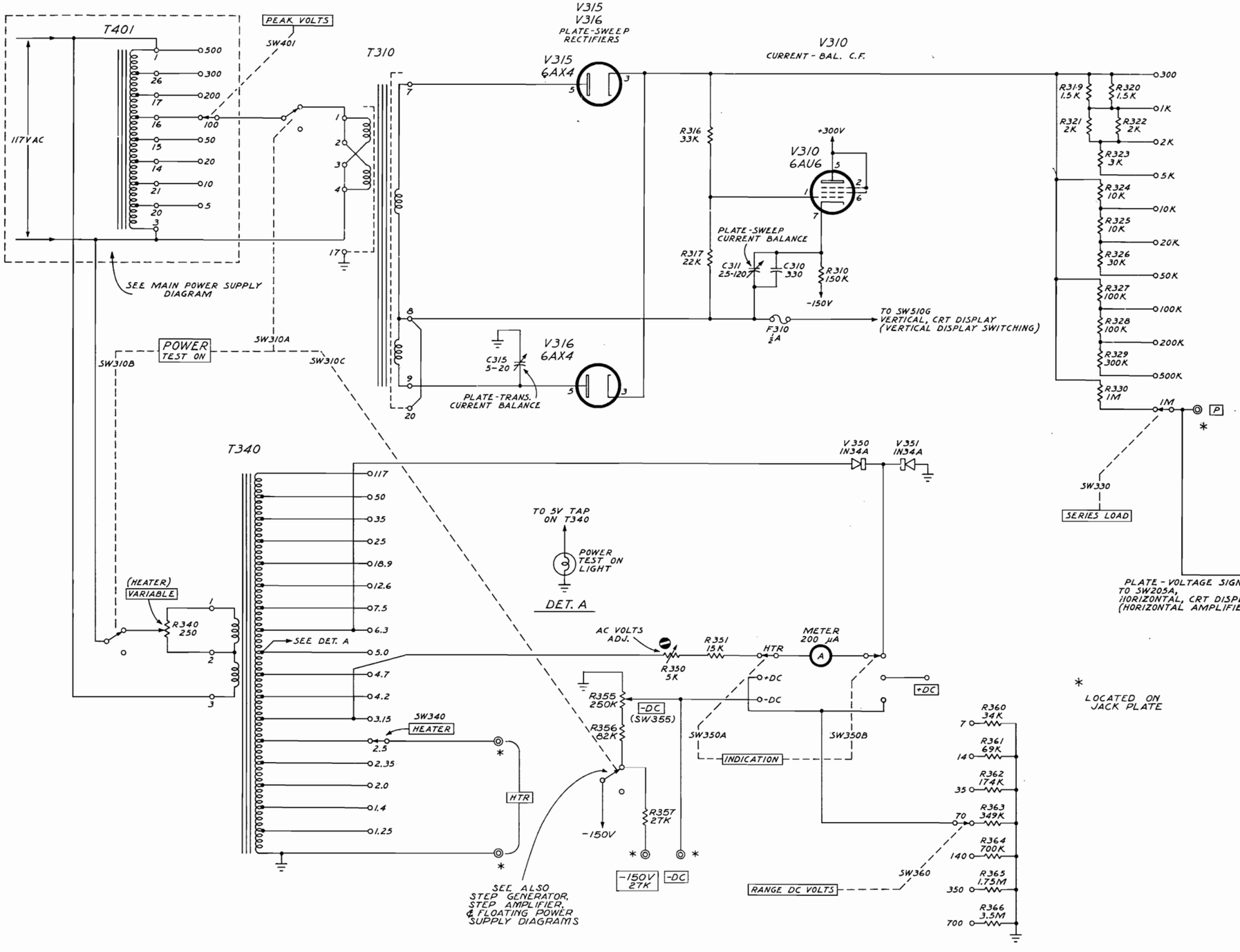
V245A
V245B
HORIZONTAL OUTPUT AMPLIFIERS

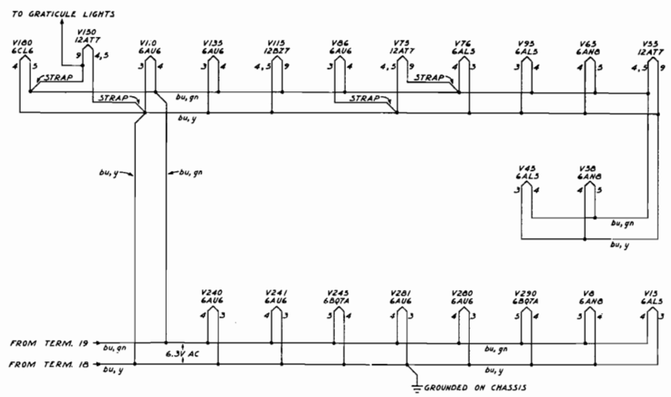




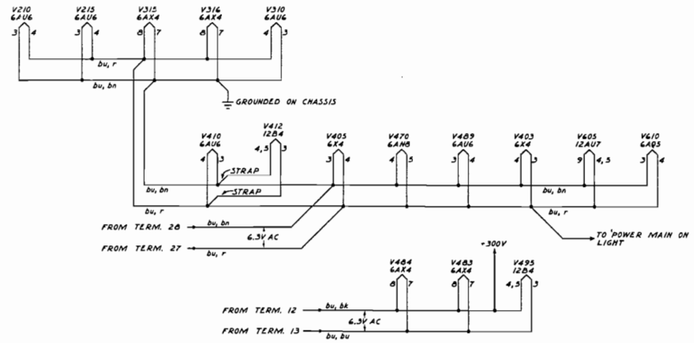
TYPE 570 CHARACTERISTIC-CURVE TRACER A CRT-DISPLAY SWITCHING 8-16-55 KF


V280
V281
INPUT AMPLIFIERS
V290A
V290B
OUTPUT AMPLIFIERS
+300V
R290
100K
TO D3,
TOP DEFLECTION PLATE
V290A
½6BQ7A
R288
1K
+100V
R282
68K
V280
6AU6
VERT. GAIN
ADJ.
R278
10K
VERTICAL
POSITIONING
R271
2.7M
R270
500K
R277
33K
R272
910K
-150V
R279
1K
VERTICAL
MA/DIV
SW255A
SW255B
F255
¼A
R275
1M
C280
470
R280
47K
R292
82K
V281
6AU6
R254
100K
TUBE-CURRENT SIGNAL
FROM SW510F & G
(VERT. DISPLAY SWITCHING)
.02
.05
.1
.2
.5
1
2
5
10
20
50
R255
3K
R256
1K
R257
500
R258
300
R259
100
R260
50
R261
30
R262
10
R263
5
R264
3
R265
2
R281
1K
R283
68K
V290B
½6BQ7A
R289
1K
R291
100K
TO D4,
BOTTOM DEFLECTION PLATE


T401
PEAK VOLTS
SW401
117 VAC
500
300
200
100
50
20
10
5
SEE MAIN POWER SUPPLY DIAGRAM
T310
V315
V316
PLATE-SWEEP RECTIFIERS
V315 6AX4
V316 6AX4
V310
CURRENT-BAL. C.F.
R316 33K
V310 6AU6
+300V
PLATE-SWEEP CURRENT BALANCE
R317 22K
C311 25-120
C310 330
R310 150K
-150V
TO SW510G VERTICAL, CRT DISPLAY (VERTICAL DISPLAY SWITCHING)
F310 ½A
C315 5-20
PLATE-TRANS. CURRENT BALANCE
R319 1.5K
R320 1.5K
R321 2K
R322 2K
R323 3K
R324 10K
R325 10K
R326 30K
R327 100K
R328 100K
R329 300K
R330 1M
300
1K
2K
5K
10K
20K
50K
100K
200K
500K
1M
P
SW330
SERIES LOAD
PLATE-VOLTAGE SIGNAL TO SW205A, HORIZONTAL, CRT DISPLAY (HORIZONTAL AMPLIFIER)
SW310A
SW310B
SW310C
POWER TEST ON
T340
V350 IN34A
V351 IN34A
117
50
35
25
18.9
12.6
7.5
6.3
5.0
4.7
4.2
3.15
2.5
2.35
2.0
1.4
1.25
TO 5V TAP ON T340
POWER TEST ON LIGHT
DET. A
(HEATER) VARIABLE
R340 250
SEE DET. A
AC VOLTS ADJ.
R350 5K
R351 15K
HTR
METER 200 μA
+DC
-DC
R355 250K
(SW355)
R356 62K
SW340 HEATER
SW350A
SW350B
INDICATION
R357 27K
-150V
-150V 27K
-DC
RANGE DC VOLTS
SW360
R360 34K
R361 69K
R362 174K
R363 349K
R364 700K
R365 1.75M
R366 3.5M
7
14
35
70
140
350
700
SEE ALSO STEP GENERATOR, STEP AMPLIFIER, & FLOATING POWER SUPPLY DIAGRAMS
* LOCATED ON JACK PLATE

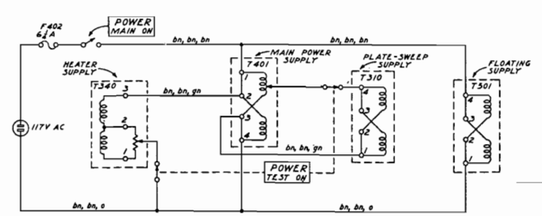


AMPLIFIER CHASSIS

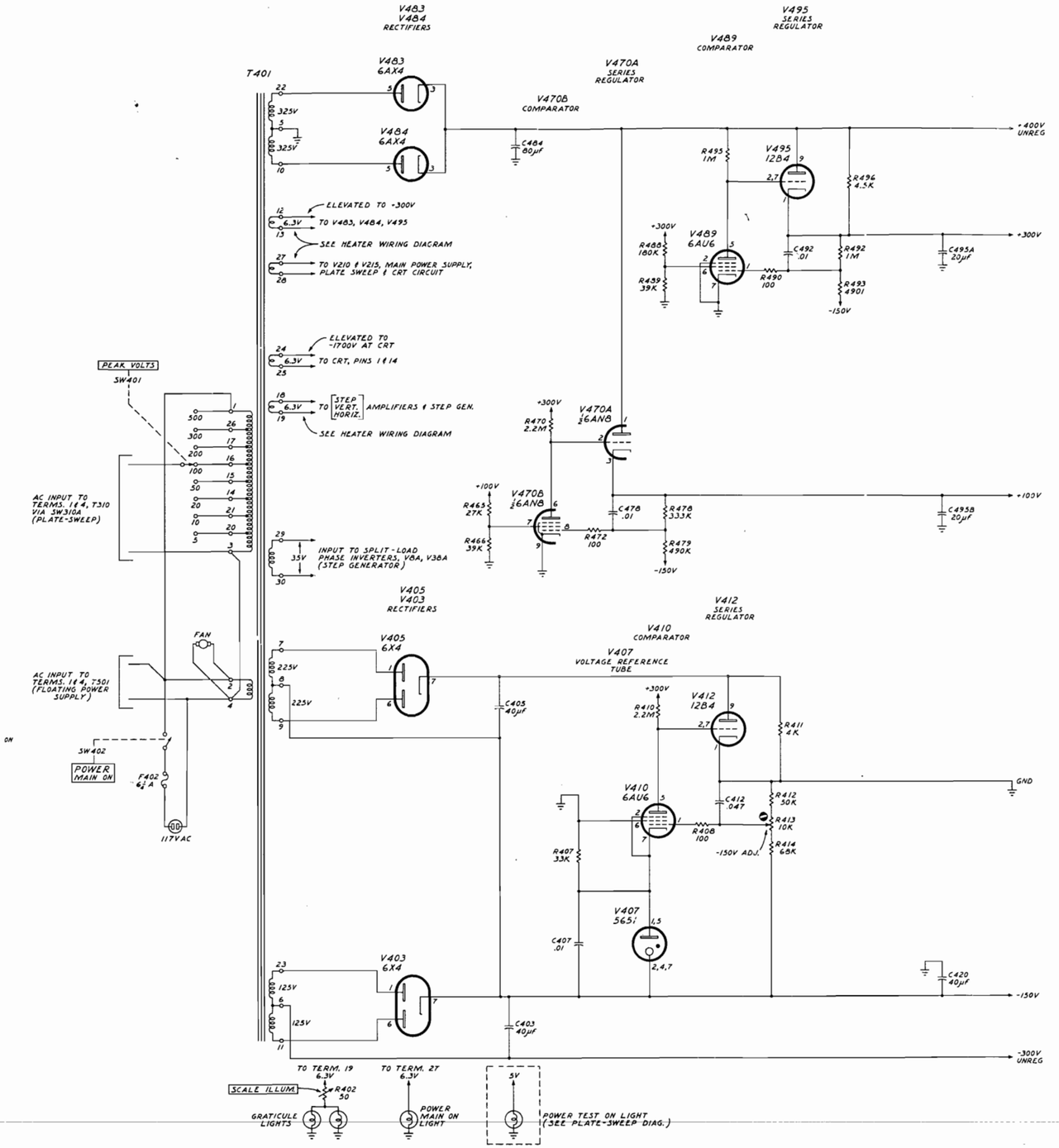


POWER CHASSIS

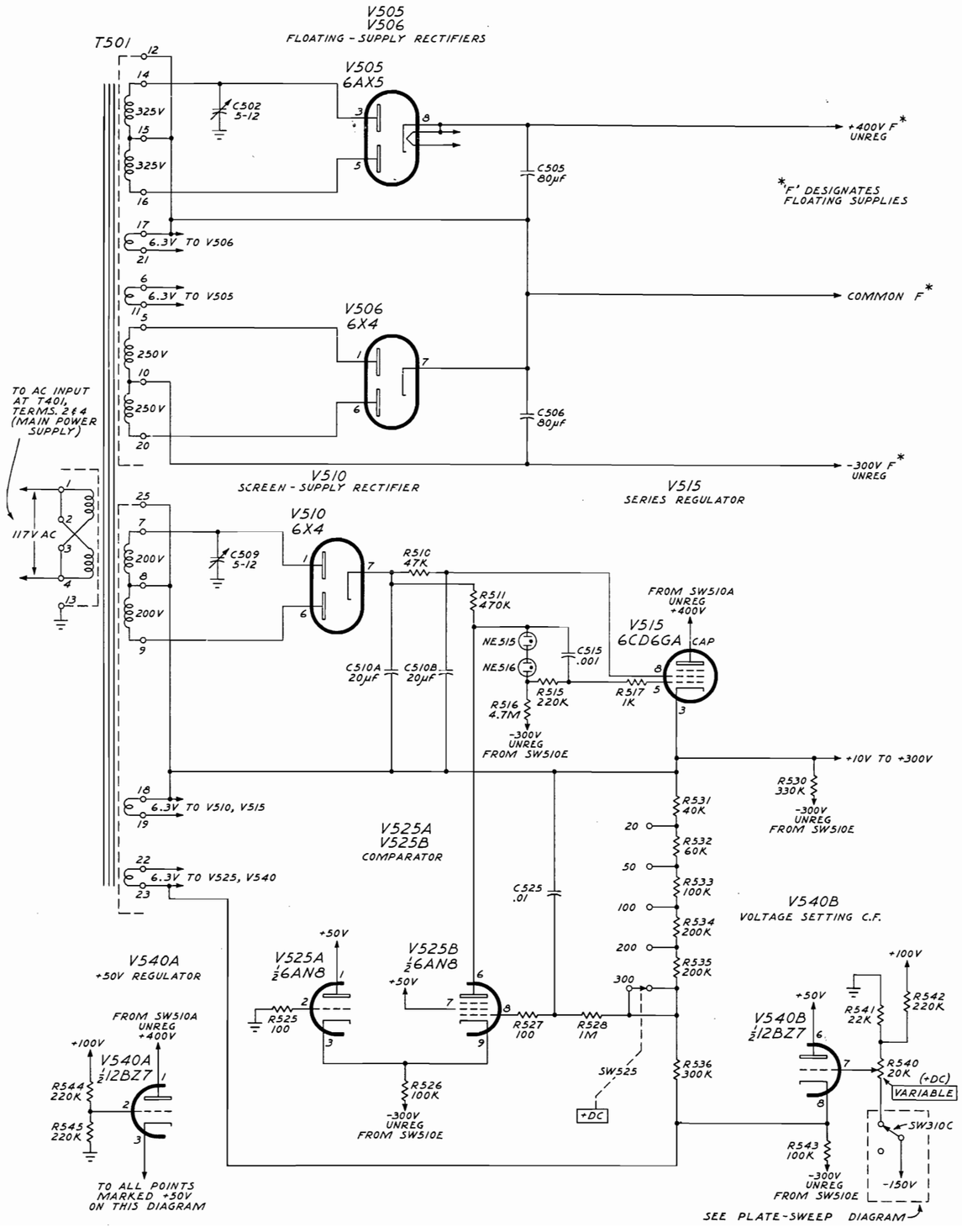
HEATER WIRING DIAGRAM

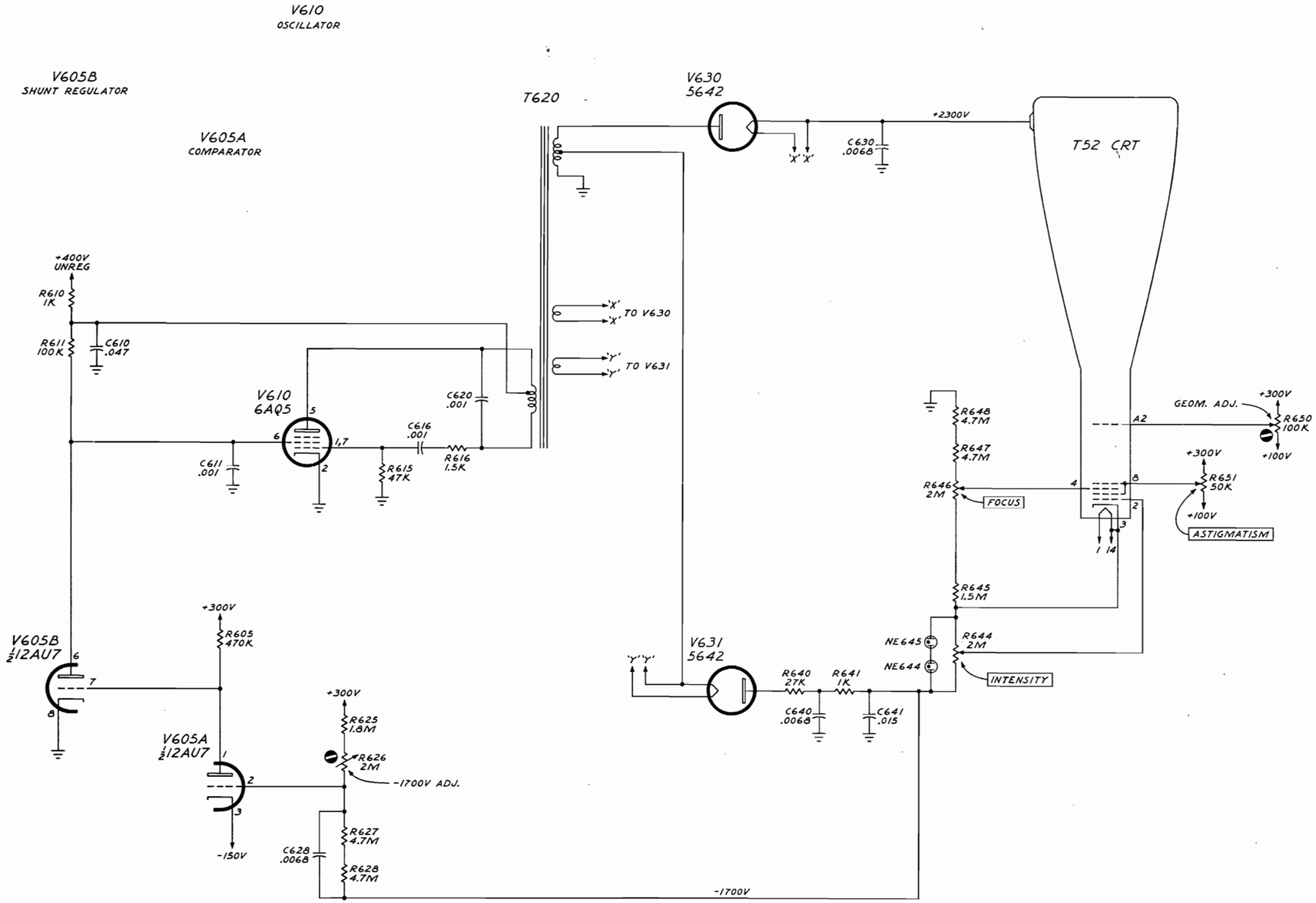


AC WIRING DIAGRAM 10-21-55 KF



MAIN POWER SUPPLY 8-5-55 KF


V505
V506
FLOATING - SUPPLY RECTIFIERS
T501
12
14
325V
15
325V
16
17
6.3V TO V506
21
6
6.3V TO V505
11
5
250V
10
250V
20
25
7
200V
8
200V
9
18
6.3V TO V510, V515
19
22
6.3V TO V525, V540
23
C502 5-12
C509 5-12
V505 6AX5
3
8
5
V506 6X4
1
7
6
V510 6X4
1
7
6
C505 80µf
C506 80µf
+400V F* UNREG
*'F' DESIGNATES FLOATING SUPPLIES
COMMON F*
-300V F* UNREG
V510 SCREEN - SUPPLY RECTIFIER
V515 SERIES REGULATOR
TO AC INPUT AT T401, TERMS. 2 & 4 (MAIN POWER SUPPLY)
117V AC
1
2
3
4
13
R510 47K
R511 470K
C510A 20µf
C510B 20µf
NE515
NE516
C515 .001
R515 220K
R516 4.7M
-300V UNREG FROM SW510E
FROM SW510A UNREG +400V
V515 6CD6GA
CAP
8
5
3
R517 1K
+10V TO +300V
R530 330K
-300V UNREG FROM SW510E
V525A V525B COMPARATOR
C525 .01
R531 40K
20
R532 60K
50
R533 100K
100
R534 200K
200
R535 200K
300
R536 300K
V540B VOLTAGE SETTING C.F.
+100V
R542 220K
R541 22K
+50V
V540B ½12BZ7
6
7
8
R540 20K (+DC) VARIABLE
SW310C
-150V
R543 100K
-300V UNREG FROM SW510E
SEE PLATE-SWEEP DIAGRAM
+50V
V525A ½6AN8
1
2
3
R525 100
V525B ½6AN8
6
7
8
9
R527 100
R528 1M
SW525
+DC
R526 100K
-300V UNREG FROM SW510E
V540A +50V REGULATOR
FROM SW510A UNREG +400V
+100V
V540A ½12BZ7
1
2
3
R544 220K
R545 220K
TO ALL POINTS MARKED +50V ON THIS DIAGRAM



TYPE 570 CHARACTERISTIC-CURVE TRACER

A

CRT CIRCUIT

8-16-55
K F