INSTRUCTION MANUAL

Serial Number _____

WARNING

When the POWER-TEST switch is ON, LETHAL voltages appear on the front (test panel) of the Type 570.

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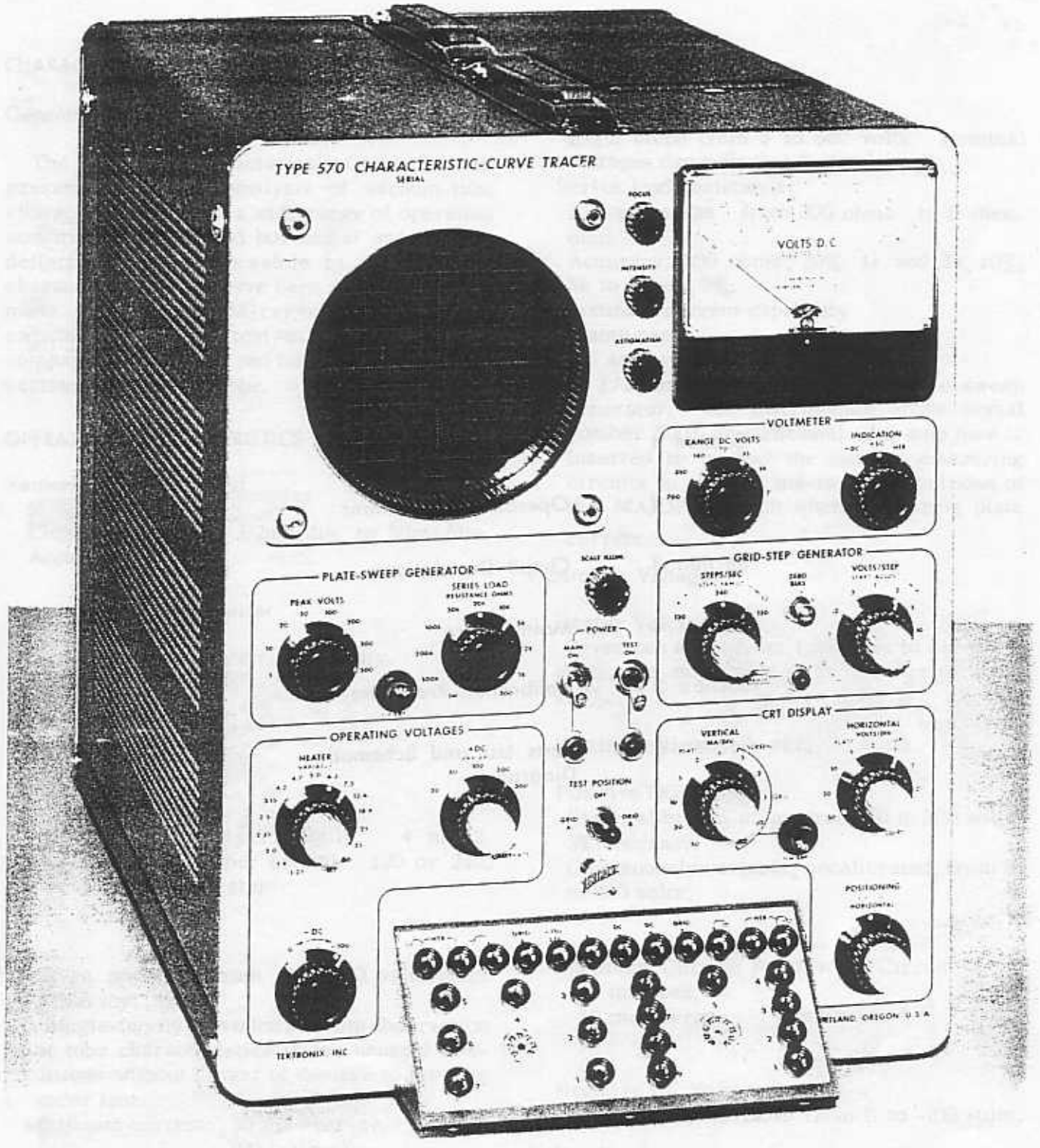

TYPE 570 CHARACTERISTIC-CURVE TRACER
SERIAL
FOCUS
INTENSITY
ASTIGMATISM
VOLTS D.C
VOLTMETER
RANGE DC VOLTS
INDICATION
PLATE-SWEEP GENERATOR
PEAK VOLTS
SERIES LOAD
RESISTANCE OHMS
SCALE ILLUM
POWER
MAIN
TEST
GRID-STEP GENERATOR
STEPS/SEC
ZERO BIAS
VOLTS/STEP
CRT DISPLAY
VERTICAL
HORIZONTAL
OPERATING VOLTAGES
HEATER
+DC
-DC
TEST POSITION
OFF
GRID
DRID
POSITIONING
HORIZONTAL
TEKTRONIX INC
PORTLAND, OREGON, U.S.A.

CONTENTS

SECTION 1
CHARACTERISTICS

CHARACTERISTICS

General Description

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 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.

OPERATING CHARACTERISTICS

Vertical Deflection Factor

Eleven steps from .02ma/div. to 50ma/div.
Accuracy: 3%

Horizontal Deflection Factor

Nine steps from .1v/div. to 50v/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 MA/DIV. switch on instruments above serial number 5001.

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%; 1k and 2k, 10%; 5k to 1 meg, 5%.

Maximum current capability
1 amp peak.
.25 amp average.
A 1/2 amp fuse protects the plate-sweep generator. In instruments above serial number 5001 an additional 1/16 amp fuse is inserted to protect the current measuring circuits in the .02 ma to 1 ma positions of the 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 Circuit
150 ma peak.
50 ma average.

Negative DC Voltage:
Continuously variable from 0 to -100 volts.

Voltmeter

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

SECTION 2
OPERATING INSTRUCTIONS

General

The Type 570 Oscilloscope is an extremely versatile instrument which is adaptable to a great number of applications. However, to make full use of the instrument, it is important that you understand the operation and function of the various controls. This section of the manual is designed to give you this information.

NOTE

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 POWER-TEST switch when making or changing connections. Practice safety by connecting each lead first to the adapter plate and then to the patch panel.

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.

PRELIMINARY INSTRUCTIONS

Cooling

A fan maintains safe operating temperature in the Type 570 by circulating filtered air over

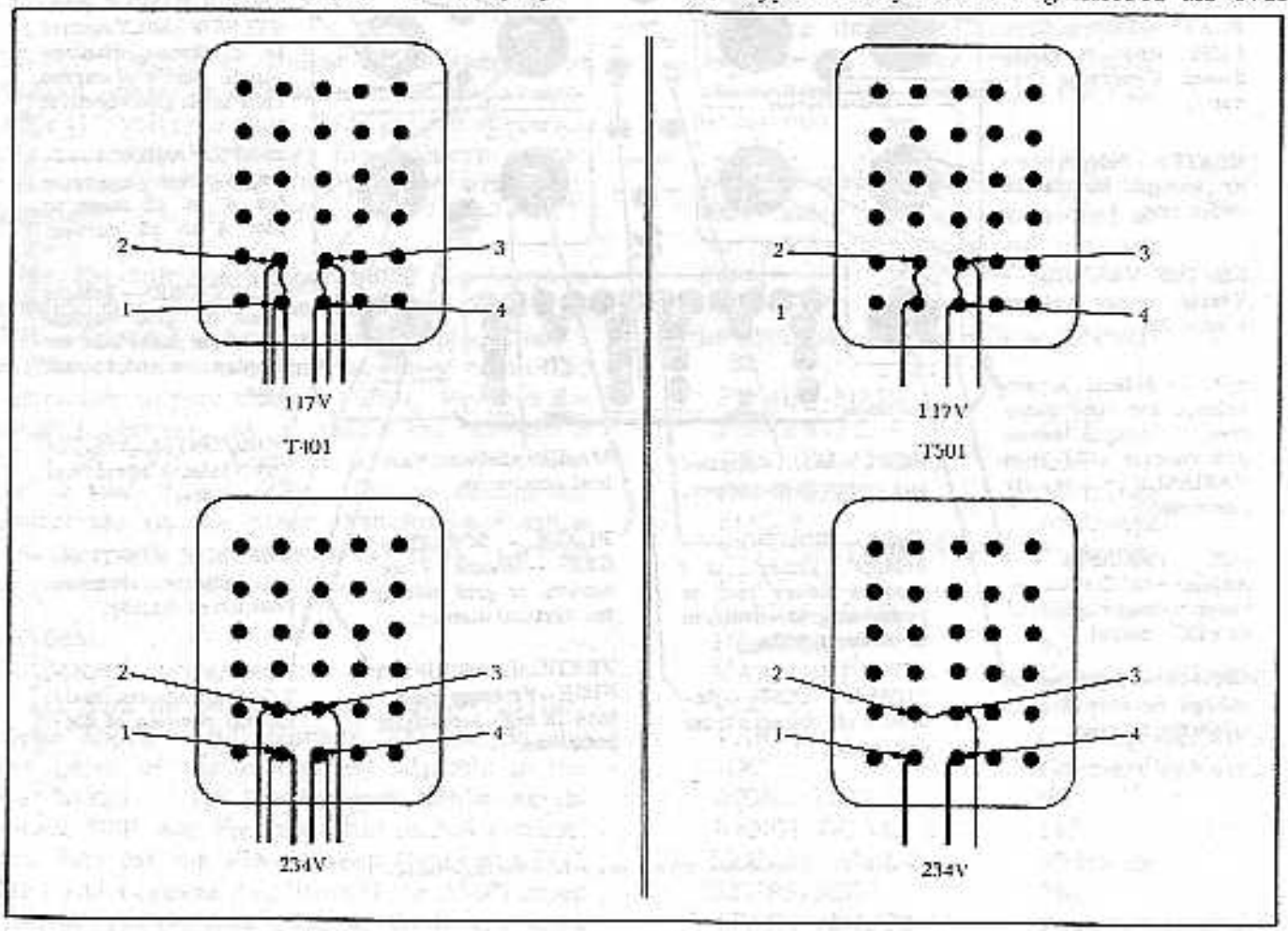
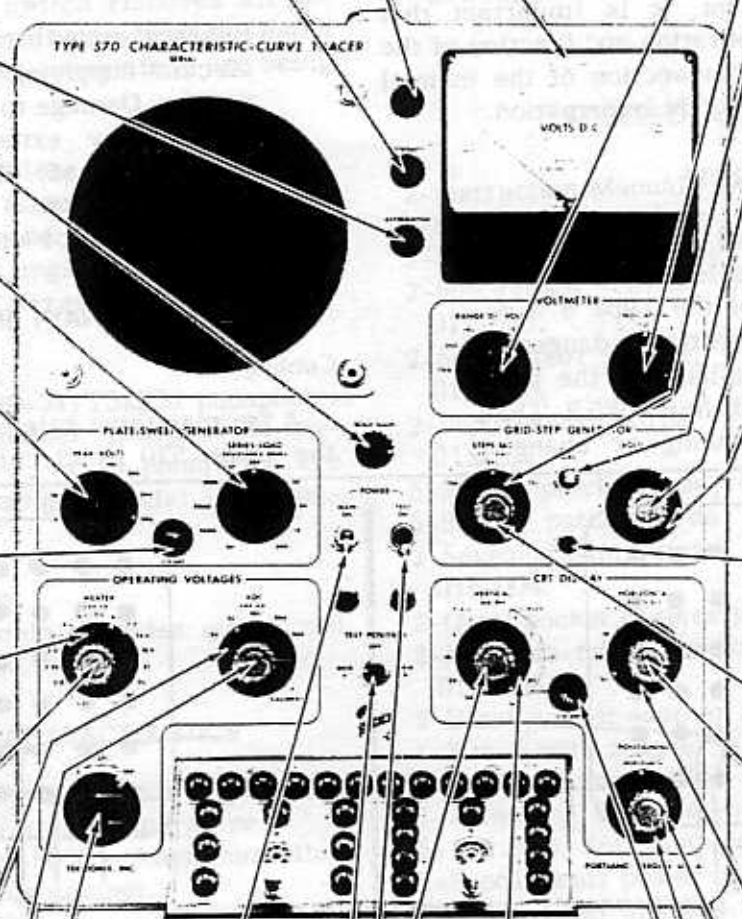


Fig. 2-1. Connections to be made when the Type 570 is connected for 234 (117) volt operation.



FOCUS--Adjusts focus of CRT Beam.

INTENSITY---- Varies brightness of CRT Display.

VOLTMETER---Measures voltages connected to it by INDICATION control.

RANGE DC VOLTS-Selects voltmeter multiplier.

INDICATION--connects voltmeter to -DC, +DC or HTR supplies for device under test.

STEPS/SEC--- Selects stepping rate of 120 or 240 STEPS/second.

ZERO BIAS--plots zero bias curve.

START ADJUST--Adjusts dc level of stair-step waveform so 1st step is positive, negative, or zero bias.

VOLTS/STEP-- adjusts amplitude of steps from Step Generator.

SINGLE FAMILY-When STEPS/FAMILY control is clockwise, displays single family of curves then holds grid negative.

STEPS/FAMILY ----- Adjusts Step Generator for 4 to 12 steps to plot 4 to 12 curves.

PLATE-GRID--Selects plate or grid voltage of device under test for display on horizontal axis.

HORIZONTAL VOLTS/DIV.-Selects horizontal sensitivity.

VERTICAL POSITIONing--Adjusts vertical position of display.

HORIZONTAL POSITIONING-Adjusts Horizontal position of display.

ASTIGMATISM- Adjusts trace width in conjunction with FOCUS control.

SCALE ILLUM.--- controls brightness of graticule lights.

SERIES LOAD--Selects series load resistors for Plate-Sweep Generator.

PEAK VOLTS--Selects Peak voltage from Plate-Sweep Generator.

PLATE--SWP GEN. FUSE--Protects Plate-Sweep Generator Circuits.

HEATER - Selects heater voltage for device under test.

HEATER VARIABLE--Varies heater voltage + or - 20%.

+DC -- Selects Screen voltage for tube under test. Voltages shown are correct only when VARIABLE knob is fully clockwise.

+DC VARIABLE --- Adjusts +DC Circuit between voltages indicated on +DC Control.

-DC--Selects portion of voltage between 0 and -150v for biasing.

POWER-MAIN - Applies and removes line power.

TEST POSITION---- Selects either of 2 devices under test or removes grid wavefrom in center position.

POWER - TEST---Removes all voltages from test panel.

MA/DIV.-Selects Vertical sensitivity.

PLATE - SCREEN--GRID---Selects Plate, screen or grid voltage for vertical display.

VERTICAL AMPLIFIER FUSE--Protects resistors in high sensitivity positions.

Fig. 2-2. Front-panel controls of the Type 570 Oscilloscope.

the rectifiers and other components. When in operation, the instrument must be placed so that the air intake at the back is clear of any obstruction that might impede the flow of air. Side panels should also be in place for proper air circulation. The air filter should be kept clean, in accordance with cleaning instructions found in the Maintenance Section of the manual.

Under no circumstances should your Type 570 oscilloscope be operated without the fan running. Without the fan, inside temperature of the oscilloscope will rise to a dangerous level in five to ten minutes.

Power Requirements

50-Cycle Operation--This instrument is normally calibrated for a 60-cycle line frequency at the factory. If the instrument is to be used for a 50-cycle operation it will be necessary to readjust the step-generator phase controls. See Step 7 in the Calibration 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.

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 electrically to pins 1 and 3 of T501. Remove the jumpers between pin 1 and 2 and between 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 power line fuse.

Fuse Data

Fuse data for the power line fuse on oscilloscopes above serial number 5001 is on the rear panel of the instrument adjacent to the fuse holder. On instruments below serial number 5001 see the parts list in this manual. Fuse data for the Plate Sweep Generator (1/2 AMP) and Vertical Amplifier (1/16 AMP) fuses is found near the fuse holders. On instruments with serial numbers of 5000 or below the fuse(s) will be found under the access door located on top of the cabinet. On instruments with serial numbers above 5000 the fuses are located on the front panel. Use only the recommended fuses for maximum over-current protection.

OSCILLOSCOPE OPERATION INFORMATION

Initial Control Settings

This section describes 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 parch-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.

NOTE

Be sure the HEATER Control is set to the proper range before connecting the heaters of the tube under test.

Also be sure that the heaters of the tube under test are connected to the HTR connectors on the test panel.

Set the oscilloscope controls as follows:

POWER-MAIN	ON
POWER-TEST	OFF
TEST POSITION	OFF
INTENSITY	Midrange
FOCUS	Midrange
ASTIGMATISM	Midrange
PEAK VOLTS	200
SERIES LOAD	10 K
HEATER	6.3
VARIABLE	Counterclockwise
+DC	100
VARIABLE	Counterclockwise
-DC	Counterclockwise
INDICATION	HTR
RANGE DC VOLTS	140
STEPS/FAMILY	Midrange
STEPS/SEC	240
START ADJUST	Counterclockwise
VOLTS/STEP	.5
VERTICAL MA/DIV	1

PLATE-SCREEN-GRID	PLATE
HORIZONTAL/ VOLTS	20
PLATE-GRID	PLATE
POSITIONING (VERTICAL and HORIZONTAL)	Midrange

Now insert the nine-pin-miniature socket adapter into the test panel and connect the patch cords as follows:

Pin No.	Connect to	Tube element
1	P	Triode plate
2	GRID B	Pentode grid
3	+ DC	Pentode screen
4	HTR	Heater
5	HTR	Heater
6	P	Pentode plate
7	K	Pentode cathode and suppressor
8	K	Triode cathode
9	GRID A	Triode grid

Install a type 6U8 tube in the socket adapter and turn the POWER-TEST switch ON. The HEATER VARIABLE should now be adjusted for a reading of 100%. The 100% marking will be found on the 0-140 meter scale. Switch the INDICATION Control to +DC and adjust the +DC VARIABLE Control for a meter reading of 100 volts.

Position the TEST POSITION switch to the GRID A position. Adjust the POSITIONING Controls so that the displayed curves start in the lower left hand corner of the graticule.

Using the display of curves adjust the FOCUS, ASTIGMATISM and INTENSITY Controls for a sharp trace of comfortable brightness.

The ZERO BIAS button should now be depressed and the position of the zero bias curve noted. With the ZERO BIAS button released adjust the START ADJUST until the uppermost curve is superimposed upon the position that the zero bias curve occupied with the button depressed.

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 and display the plate-characteristic curves of the 6U8 pentode section. Move the PLATE-SCREEN-GRID Control to SCREEN. This will result in a display which shows the screen current plotted against plate voltage. Now return the control to the PLATE position.

To expand the display of the first curve reset the following controls:

PEAK VOLTS	20
VERTICAL MA/DIV	.1
HORIZONTAL VOLTS/ DIV	2

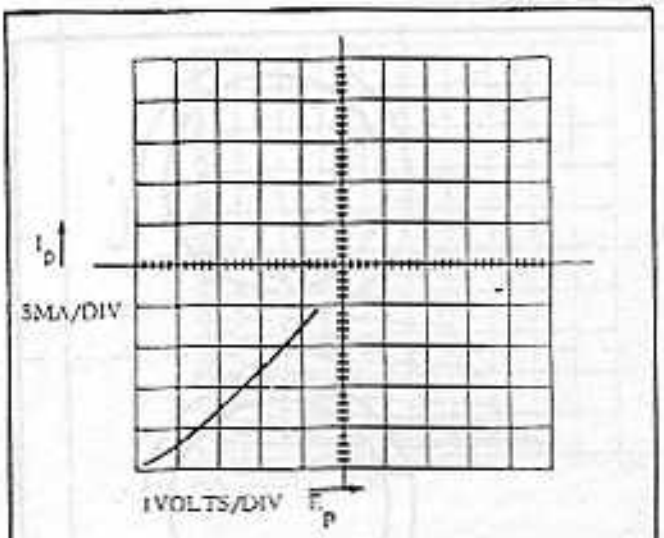
You will notice that the curves are not plotted all the way to the origin and that the curves intersect the current axis above the origin. These are normal effects and do not indicate miscalibration of the instrument. The correct horizontal positioning can be determined by momentarily grounding the plate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

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 PLATE-SCREEN-GRID Control to PLATE and the PLATE-GRID Control to PLATE. Before turning the POWER-TEST switch on, set the PEAK VOLTS Control to a low voltage. After the POWER-TEST switch is turned ON, wait until the cathode of the tube under test has reached operating temperature before raising the PEAK VOLTS. The 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 Control and test panel connector can be used instead of a battery if the peak plate current is to be less than 50 ma. To use the +DC test panel connector, connect the cathode of the tube under test to +DC. Set the +DC Controls to minimum, about ten volts.



Control Settings for a 6AL5 Diode

PEAK VOLTS	100
SERIES LOAD	5K
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	PLATE
MA/DIV	5
VOLTS/DIV	1

Fig. 2-3. Plate Current vs. Plate Voltage curve for a 6AL5 diode.

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 the SERIES LOAD switch has put sufficient series resistance in the circuit 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 PLATE-SCREEN-GRID and PLATE-GRID Controls to the proper positions the following curves can be plotted: plate current versus plate voltage, grid current versus plate voltage, plate current versus grid voltage, and grid current versus 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 waveform is a stair-step waveform starting at zero or some positive voltage. It can be set to have from four to twelve steps going negative from ground or it may have as many as eight positive steps above ground. In the latter case the start of the stair-step waveform is above ground. 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 vs. Plate Voltage

To display plate current versus 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 connectors and the plate to P. Turn the PLATE-SCREEN-GRID and PLATE-GRID 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 START ADJUST Control nearly counterclockwise to avoid a positive grid voltage.
3. Set the PEAK VOLTS Control for a safe 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 POWER-TEST 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.

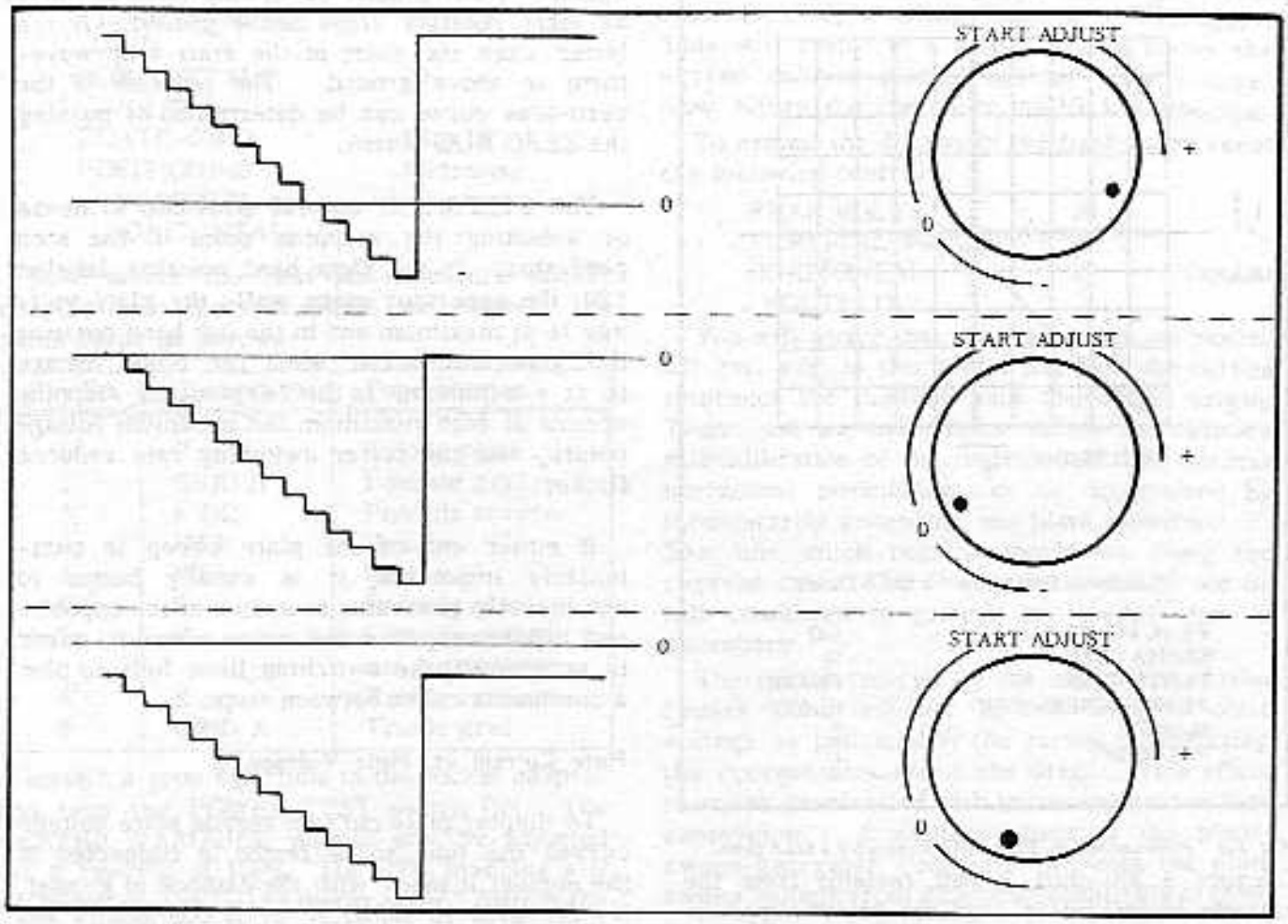


Fig. 2-4. The affect the START ADJUST Control has on the grid-step waveform.

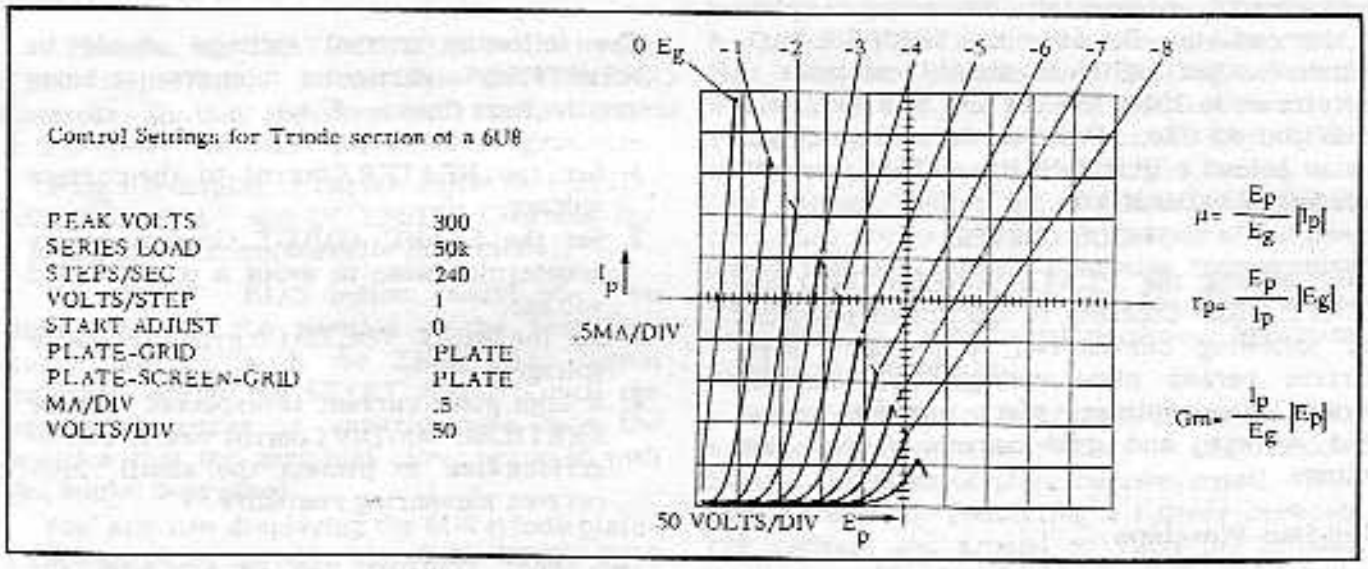
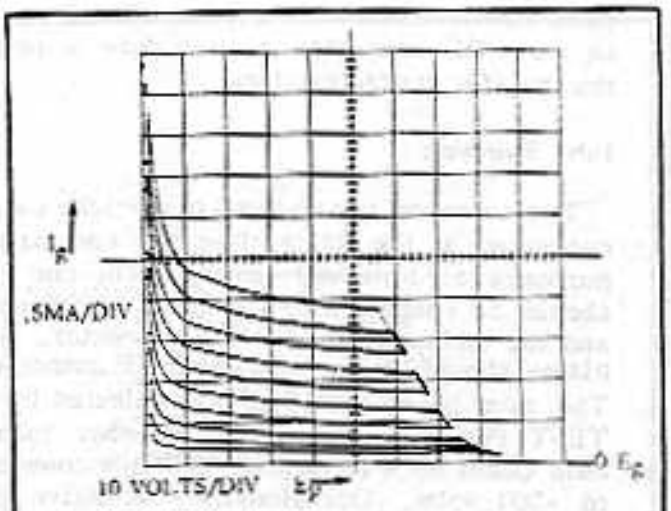


Fig. 2-5. Plate Current vs. Plate Voltage curve for the triode section of a 6U8

Grid Current vs. Plate Voltage

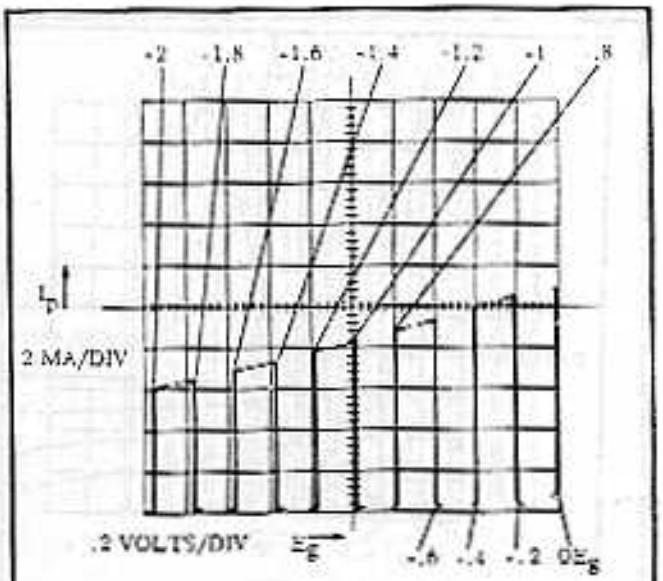
Grid current can be plotted against plate voltage by setting the controls as for the plate current versus plate voltage display and moving the PLATE-SCREEN-GRID Control to GRID. Increase the vertical sensitivity with the VERTICAL MA/DIV switch as required. Normally the grid current will not be measurable until the grid approaches zero bias or goes positive.



Control Settings for Triode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	full clockwise
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	GRID
MA/DIV	.5
VOLTS/DIV	10

Fig. 2-6. Grid Current vs. Plate Voltage curves for the triode section of a 6U8.



Control Settings for Triode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.2
START ADJUST	0
PLATE-GRID	GRID
PLATE-SCREEN-GRID	PLATE
MA/DIV	2
VOLTS/DIV	.2

Fig. 2-7. Plate Current vs. Grid Voltage curves for the triode section of a 6U8.

Plate Current vs. Grid Voltage

To display plate current plotted against grid voltage, set the controls as for the plate current versus plate voltage curves and switch the PLATE-GRID Control to GRID. This automatically positions the display to the right. It will normally be necessary to increase the horizontal sensitivity with the HORIZONTAL VOLTS/DIV switch and reposition the display slightly.

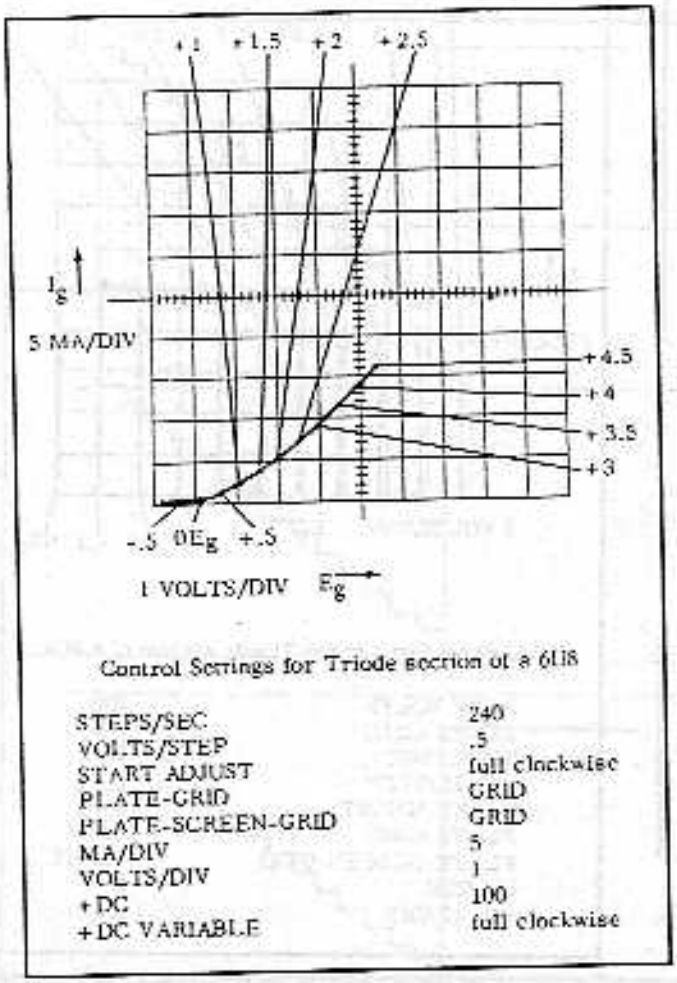
The display obtained consists of vertical lines which show the variation of plate current as the plate is swept from zero to maximum voltage. The part of the curve of primary interest is formed by the tops of these lines. This is a dynamic characteristic for the combined tube and load resistance. However, 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 PLATE-GRID Control to PLATE and read the peak voltage directly from the screen.

A method of plotting a more conventional-looking transfer characteristic is to connect the plate to the +DC connection on the test panel and adjust the +DC Control for the proper voltage. Now if the PLATE-SCREEN-GRID Control 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 connection are less than that of the normal P connection and the continuous voltage applied to the tube under test increases the average plate dissipation in the tube.

Grid Current vs. Grid Voltage

After displaying plate current versus grid voltage curves the grid current vs. grid voltage



Control Settings for Triode section of a 6U8

STEPS/SEC	240
VOLTS/STEP	.5
START ADJUST	full clockwise
PLATE-GRID	GRID
PLATE-SCREEN-GRID	GRID
MA/DIV	5
VOLTS/DIV	1
+DC	100
+DC VARIABLE	full clockwise

Fig. 2-8. Grid Current vs. Grid Voltage curves for the triode section of a 6U8. Note +DC connector supplied the plate voltage.

display can be obtained by switching the PLATE-SCREEN-GRID Control to GRID. Increased vertical sensitivity may be required. This is accomplished by changing the setting of the VERTICAL MA/DIV Control. The vertical lines can be eliminated by connecting the plate to the +DC connector as was done to obtain the transfer characteristics.

Tube Switching

Two tubes or two sections of one tube can be connected at the same time for comparison purposes or to speed testing. The one grid should be connected to the GRID A connector and the other grid to GRID B connector. Both plates should be connected to the P connector. The tube to be tested is now selected by the TEST POSITION switch. The other tube is held cutoff 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. There should now 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 connection used for screen voltage. This prevents the alternate connection mentioned in the triode section under plate current versus grid voltage in which the +DC connection is used as the plate supply.

Control Settings for Pentode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	0
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	PLATE
MA/DIV	.5
VOLTS/DIV	20
+DC	50
+DC VARIABLE	Set for 38 volts

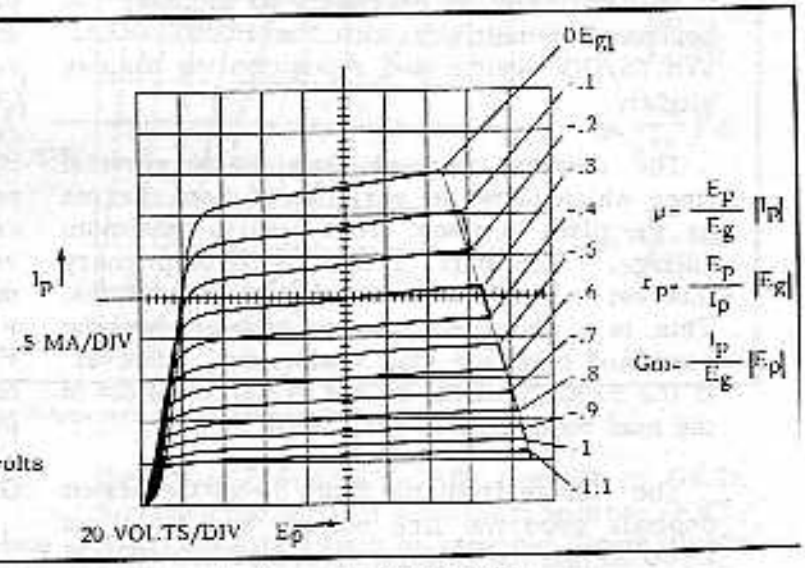
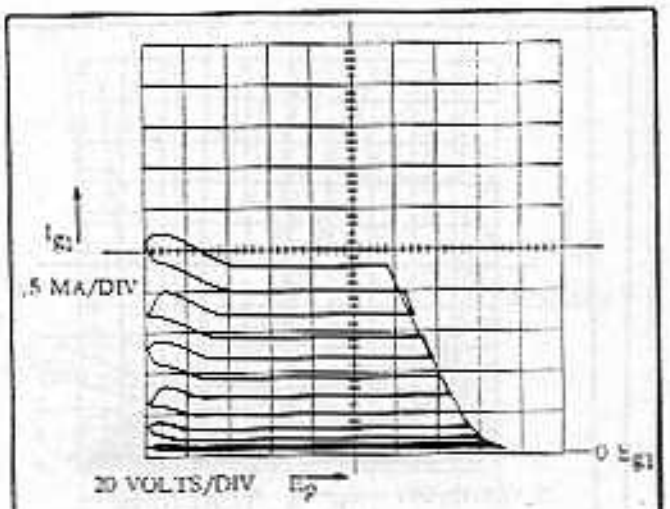


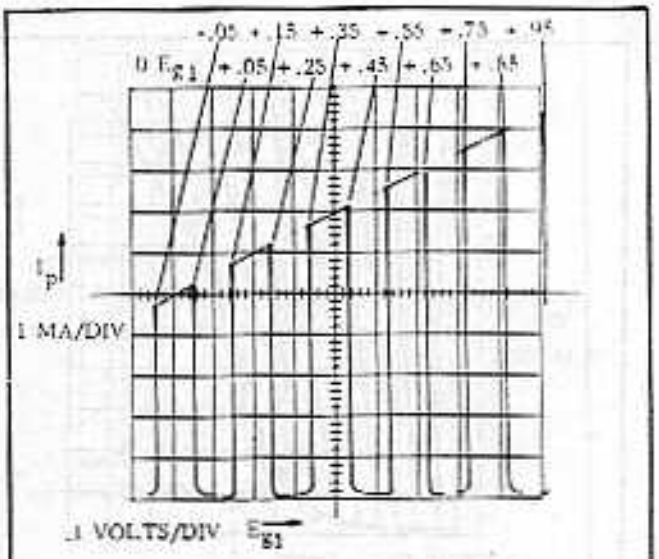
Fig. 2-9. Plate Current vs. Plate Voltage curves for the pentode section of a 6U8.



Control Settings for Pentode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	full clockwise
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	GRID
MA/DIV	.5
VOLTS/DIV	20
+DC	50
+DC VARIABLE	Set for 27 volts

Fig. 2-10. Grid Current vs. Plate Voltage curves for the pentode section of a 6U8.



Control Settings for Pentode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	full clockwise
PLATE-GRID	GRID
PLATE-SCREEN-GRID	PLATE
MA/DIV	1
VOLTS/DIV	.1
+DC	50
+DC VARIABLE	Set for 45 volts

Fig. 2-11. Plate Current vs. Grid Voltage curves for the pentode section of a 6U8.

Screen Current vs. Plate Voltage

This curve can be plotted by setting the controls as for the plate current versus plate voltage display with the exception that the PLATE-SCREEN-GRID Control 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 vs. Grid Voltage

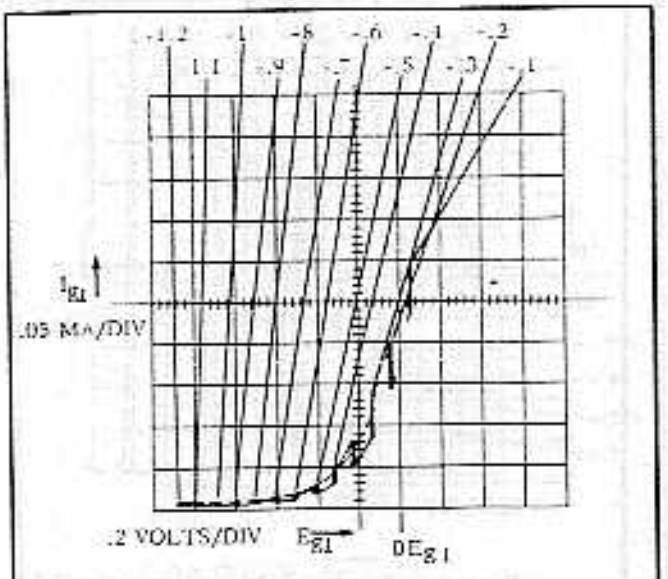
This curve is similar to the plate current versus grid voltage curve. It is obtained by setting the PLATE-SCREEN-GRID Control to SCREEN and the PLATE-GRID Control to GRID. Adjust the HORIZONTAL VOLTS/DIV as required to obtain a full screen display and position the display as desired. If the STEPS/SEC 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.

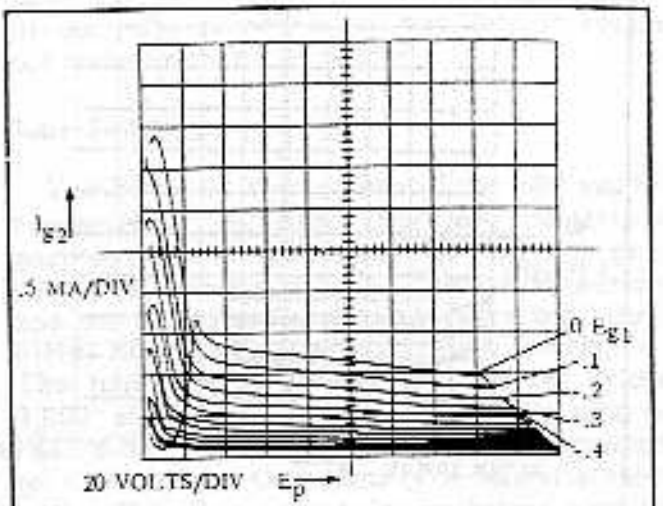
The maximum voltage swing from the Grid-Step Generator as it plots a family of curves



Control Settings for Pentode section of a 6U8

PEAK VOLTS	100
SERIES LOAD	50k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	0
PLATE-GRID	GRID
PLATE-SCREEN-GRID	GRID
MA/DIV	.05
VOLTS/DIV	.2
+DC	50
+DC VARIABLE	Set for 31 volts

Fig. 2-12. Grid Current vs. Grid Voltage curves for the pentode section of a 6U8.



Control Settings for Pentode section of a 6U8

PEAK VOLTS	200
SERIES LOAD	10k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	0
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	SCREEN
MA/DIV	.5
VOLTS/DIV	20
+DC	50
+DC VARIABLE	Set for 35 volts

Fig. 2-13. Screen Current vs. Plate Voltage curves for the pentode section of a 6U8.

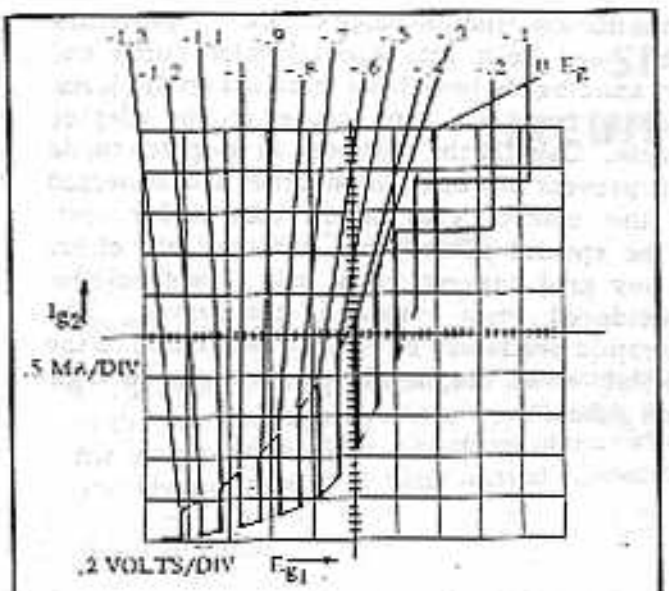
and comes to rest is equivalent to about 14 steps at any setting of the VOLTS/STEP Control. Thus, if the step generator is set for the maximum number of positive steps with the START ADJUST Control, it will rest five steps negative until the SINGLE FAMILY button is pushed. This will be between .5 volts and 50 volts negative depending on the setting of the VOLTS/STEP Control. 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 connection and the 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 connection 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 circuits to recover before a second family can be plotted.

SEMICONDUCTOR DEVICES

The Type 570 was designed 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 as vacuum tubes described under Thermionic Diodes. To protect the diode, maximum resistance, as set by the SERIES LOAD Control, consistent with adequate voltage swing as set by the PEAK VOLTS should be used. If you connect the diode between the test panel, P, connector and the +DC connector, be sure to load the +DC connection with an external resistor. The +DC circuit will lose regulation if current through the diode exceeds the current through the resistor by more than 2 ma. This resistor should be selected to draw 50 ma or less.



Control Settings for Pentode section of a 6U8

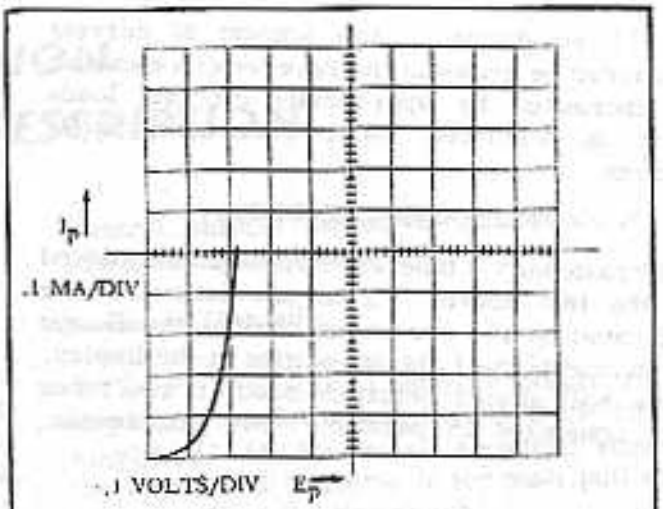
PEAK VOLTS	100
SERIES LOAD	50k
STEPS/SEC	240
VOLTS/STEP	.1
START ADJUST	0
PLATE-GRID	GRID
PLATE-SCREEN-GRID	SCREEN
MA/DIV	.5
VOLTS/DIV	.2
+DC	50
+DC VARIABLE	Set for 38 volts

Fig. 2-14. Screen Current vs. Grid Voltage curves for the pentode section of a 6U8.

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.

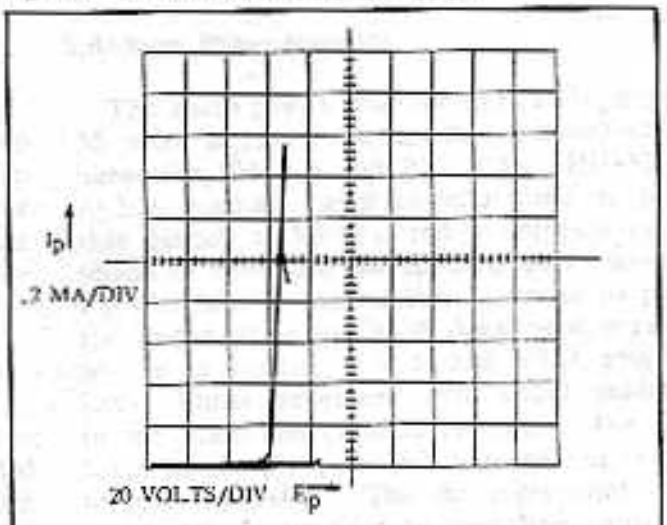
Curves can be plotted of current versus voltage for gas diodes. For instance, in this way you can obtain the firing potential and voltage drop of a voltage reference tube. Other special applications may occur to you from time to time. Be sure to check the current requirements of a special circuit. The Grid-Step Generator, Plate-Sweep Generator and +DC circuit are designed for electron flow from ground into the circuit only. A certain amount of current can be drawn from these circuits in the reverse direction but they quickly drop



Control Settings for a Silicon Diode Type 1N1566

PEAK VOLTS	100
SERIES LOAD	200k
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	PLATE
MA/DIV	.1
VOLTS/DIV	.1

Fig. 2-15. Curve displayed by a type 1N1566 diode.



Control Settings for a Gas Diode Type 5651

PEAK VOLTS	100
SERIES LOAD	20k
PLATE-GRID	PLATE
PLATE-SCREEN-GRID	PLATE
MA/DIV	.2
VOLTS/DIV	20
-DC	Set for -20 volts

Fig. 2-16. Displaying the firing potential and voltage drop of a type 5651 gas diode. Note the cathode is connected to the "-DC" connector.

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 oscillation 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 and ferramic beads have been installed on the leads running from the tube socket on the adapter panels. Usually the resistors in the patch cords will prevent any oscillation if they are connected to the control grid of the tube under test. If the special patch cords are used, the effect of any grid current which may flow should be considered when evaluating the curves. The ferramic beads are to prevent oscillation on the display when displaying tube curves of high-gain tubes.