TEKTRONIX®

608 MONITOR

WITH OPTIONS

INSTRUCTION MANUAL

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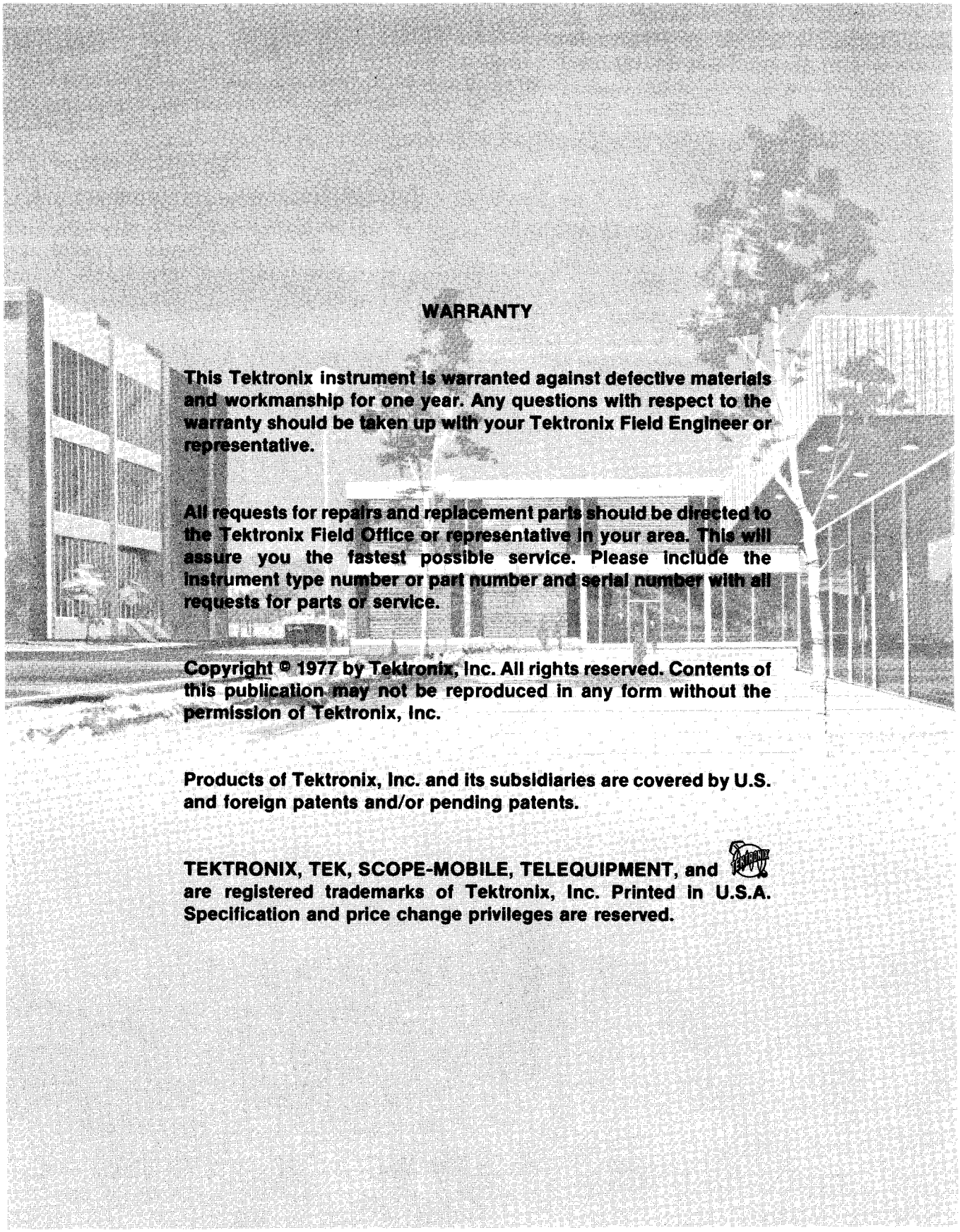

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This Tektronix instrument is warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your Tektronix Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the Tektronix Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument type number or part number and serial number with all requests for parts or service.

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OPERATORS SAFETY INFORMATION

The following general safety information applies to all operators and service personnel. Specific warnings will be found throughout the manual where they apply and should be followed in each instance.

WARNING statements identify conditions or practices which could result in personal injury or loss of life.

CAUTION statements identify conditions or practices which could result in damage to the equipment or other property.

The word **DANGER** on the equipment identifies areas of immediate hazard which could result in personal injury or loss of life.

The following safety symbols may appear on the equipment:


CAUTION—Refer to manual


DANGER—High voltage


Protective ground (earth) terminal

Other warning symbols where they apply.

WARNING

AC POWER SOURCE AND CONNECTION

This instrument operates from a single-phase power source and has a three-wire power cord with a two-pole, three-terminal grounding-type connector. The voltage to ground (earth) from either pole of the power source must not exceed the maximum rated operating voltage, 250 volts.

Before making connection to the power source, a qualified service person should verify that the instrument is set to match the voltage of the power source and has a suitable two-pole, three-terminal grounding-type connector.

GROUNDING THE INSTRUMENT

This instrument is safety class I *equipment (IEC* designation). All accessible conductive parts are directly connected through the grounding conductor of the power cord to the grounding contact of the power connector. Before making external connections to this instrument, always ground the instrument first.*

For electric-shock protection, the power-input plug must be inserted only into a mating receptacle with a grounding contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Qualified service personnel should verify proper grounding of this instrument. For medical-dental applications (to assure grounding integrity) the hospital-grade input plug must be inserted only into a mating hospital-grade receptacle with a grounding contact.

***IEC: International Electrotechnical Commission**

MEDICAL-DENTAL APPLICATIONS

Do not use the amplifier INPUTs for direct patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct patient connection.

Although this instrument is not to be used for direct patient connection, interconnecting this Monitor with other equipment can result in application of excess current to the patient. It is extremely important that the equipment be interconnected in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Areas of Health Care Facilities, section 3038, "Signal Transmission Between Appliances".

Do not operate this instrument in the presence of flammable gases or anesthetics. Explosion can result from operation in such an environment.

USE THE PROPER FUSE

Refer fuse replacement to qualified service personnel only. To avoid electric shock and fire hazard, use only the fuse specified in the parts list for your instrument and which is identical in the following respects:

A. Type—Slow blow, fast blow, etc.

B. Voltage rating—250 V, etc.

C. Current rating.

DO NOT REMOVE INSTRUMENT COVERS

High-voltage is present inside the instrument. To avoid electric shock, operating personnel must not remove protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

LIMIT INPUT SIGNAL VOLTAGE

To avoid electric-shock hazard, do not apply input signals of more than 25 volts (dc + peak ac). Should fault conditions occur however, the instrument is protected for application of input signals up to 100 volts (dc + peak ac).

CAUTION

EXERCISE CARE WITH INTENSITY LEVEL

Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor. Therefore, set the INTENSITY control for just enough display intensity for good visibility.

SERVICE SAFETY INFORMATION

The following are safety precautions which appear in the servicing information sections of this manual. This Service Safety Information is in addition to the Operators Safety Information given previously.

WARNING

DO NOT SERVICE ALONE

Do not attempt internal service or adjustment of this instrument unless another person, capable of rendering first aid and resuscitation, is present.

AC POWER SOURCE AND CONNECTION

This instrument is intended to be operated from a single-phase earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line conductor has over-current (fuse) protection within the instrument.

EXERCISE CARE WHEN OPERATING INSTRUMENT WITHOUT COVERS

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated without protective covers, do not touch exposed connections or components.

DISCONNECT INSTRUMENT POWER

To avoid electric shock, disconnect the Monitor from the power source before removing protective panels, soldering, or replacing components.

CRT HANDLING

Use care when handling a crt. Breakage of the crt causes a high-velocity scattering of glass fragments (implosion). Protective clothing and safety glasses should be worn. Avoid striking the crt on any object which might cause it to crack or implode. When storing a crt, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate.

SILICONE GREASE HANDLING

Handle silicone grease with care. Avoid getting the silicone grease in your eyes. Wash hands thoroughly after use.

CAUTION

APPLY PROPER LINE VOLTAGE

To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument. Incorrect placement of the line-voltage selector plug may damage the instrument. Verify correct placement of the line-voltage selector plug.

AVOID EXCESSIVE MOISTURE

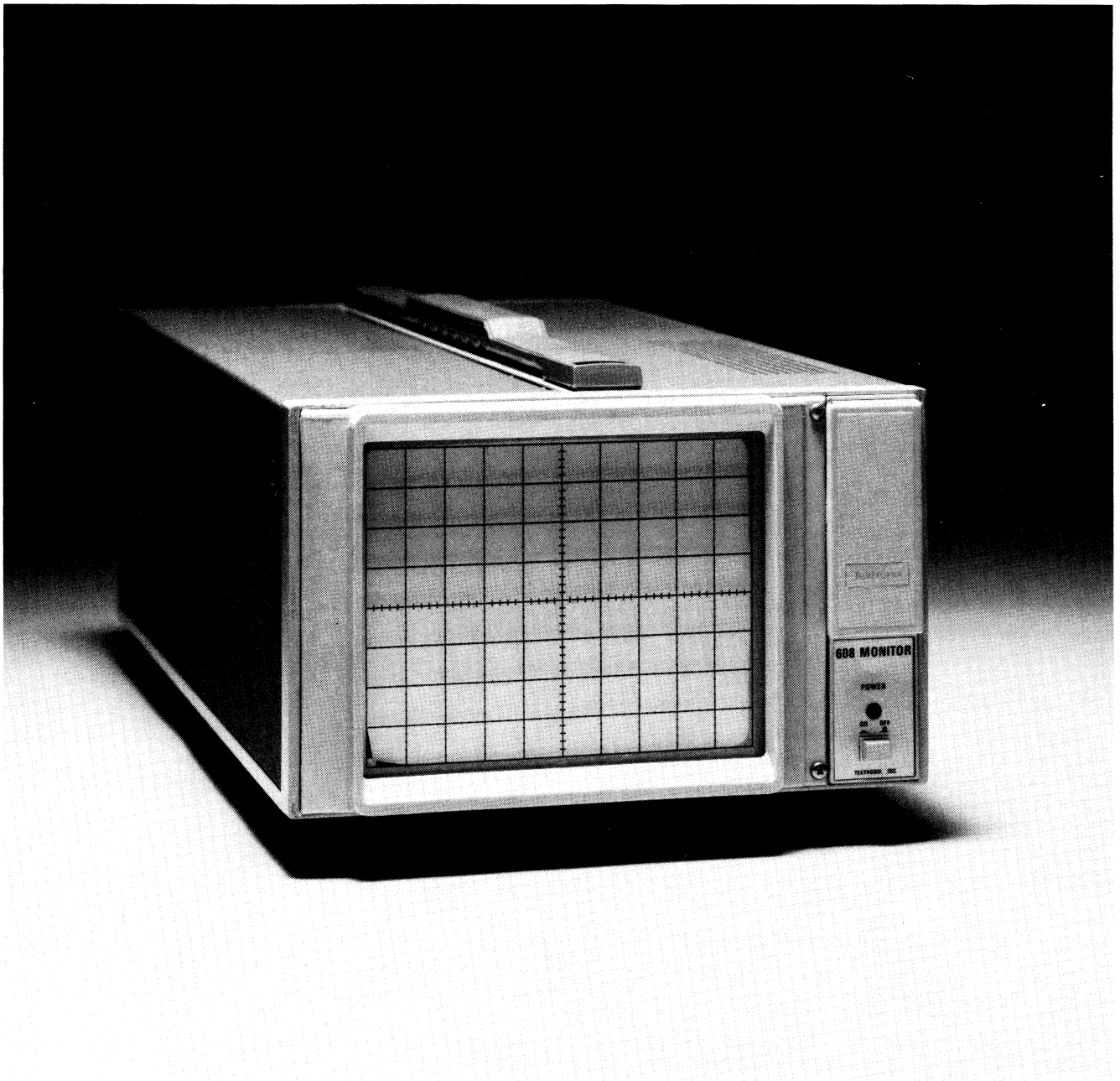
Circuit boards and components must be dry before applying power to prevent damage from electrical arcing.

EXERCISE CARE WHEN CHECKING DIODES

When checking diodes, do not use an ohmmeter scale that has a high internal current, since high currents may damage the diodes under test.

USE PROPER CLEANING AGENTS

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use a non-residue type of cleaner, preferably isopropyl alcohol, totally denatured ethyl alcohol, or TP35. Before using any other type of cleaner, consult your Tektronix Service Center or representative.



608 FEATURES

The 608 Monitor is a general purpose, high-brightness, high-resolution, X-Y display monitor providing a clear, bright, display of analog data on a large screen area. This instrument is designed for display applications as in ultrasonic detection systems, electron microscope systems, volume and vibration analysis, auger probes, and medical biophysical systems. The 608 Monitor may also be used to provide displays of alphanumeric and graphic information from computers and other data transmission systems. Resolution of the large screen crt (cathode-ray tube) in this instrument is excellent. (Monitor is shown with Option 23.)

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GENERAL INFORMATION

INTRODUCTION

OPERATORS MANUAL

The Operators Manual contains information necessary to effectively operate the 608 Monitor and is divided into three sections: Section 1 provides a basic description of the 608 with instrument specifications and accessories. Section 2 contains operating information for the instrument. Information on the options available for the 608 Monitor is located in section 3 of the manual.

INSTRUCTION MANUAL

The Instruction Manual provides both operating and servicing information for the 608 Monitor. The Instruction Manual is divided into ten sections. Operating information is covered in the first two sections; servicing information for use by qualified service personnel is contained in the remaining eight sections of the manual. Schematic diagrams are located at the rear of the manual and can be unfolded for reference while reading other parts of the manual. The reference designators and symbols used on the schematics are defined on the first page of the Diagrams and Circuit Board Illustrations section. All abbreviations used in this manual, with the exception of the parts lists and schematic diagrams, comply with the American National Institute Y1.1-1972 publication. The parts lists are computer printouts and use computer-supplied abbreviations. Information on the options available for the 608 Monitor is located in section 9 of the Instruction Manual.

INSTRUMENT DESCRIPTION

The 608 Monitor is a compact, solid-state instrument with excellent resolution, providing accurate displays of information from the X, Y, and Z signal inputs.

WARNING

High voltage is present inside the instrument. To avoid electric shock, operating personnel must not remove protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

Vertical and horizontal signals to be displayed on the crt are supplied to the Deflection Amplifiers through the appropriate X and Y INPUT connectors. The Deflection Amplifiers process the input signals and provide push-pull outputs to drive the deflection plates of the crt. Both Deflection Amplifiers contain position and gain controls.

The Z-Axis Amplifier controls the display intensity by providing a voltage to drive the crt control grid. Input signals are applied to the Z INPUT connector.

The Dynamic Focus circuit provides focus correction for the display when the crt beam is deflected from the crt center. Thus, by varying the voltage to the crt focus element, the Dynamic Focus circuit compensates for geometric defocusing.

The High-Voltage and Low-Voltage Power Supplies provide all the voltages necessary for operation of this instrument.

SPECIFICATION

The electrical specifications listed in Table 1-1 apply when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C (+59° and +77° F), (2) the instrument must be operating in an ambient temperature between 0° and +50° C (+32° and +122° F) and (3) the instrument must have been operating for at least 20 minutes.

NOTE

Electrical specifications for the available options are located in the Instrument Options section of this manual.

TABLE 1-1

Electrical Characteristics

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor	
Vertical (Y)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.
Horizontal (X)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.
Polarity	
+Y INPUT	Positive signal applied deflects beam up; negative signal deflects beam down.
+X INPUT	Positive signal applied deflects beam to the right; negative signal deflects beam to the left.
Settling Time	Spot must reach new writing position, within 0.05 cm (0.02 in), within 300 ns of deflection from any on-screen position.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 5 MHz at -3 dB point.
Rise Time	70 ns or less.
Phase Difference (DC to 1.5 MHz)	1° or less between X and Y amplifiers. X and Y amplifier gain (V/div) must be set for the same deflection factor.
Position Stability	0.5 mm or less of drift per hour (after 20 minute warm-up).
Gain Stability	1% or less of drift (after 20 minute warm-up).
Displayed Noise (Tangentially Measured)	0.05 mm, or less, with all inputs terminated into 1 kΩ or less.
Input RC (Both Inputs)	1 MΩ, within 1%, paralleled by 60 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	+100 V or -100 V (dc + peak ac).
Position Range (With No Input Signals Applied)	Front panel controls allow spot to be set anywhere within the viewing area.
Dynamic Range	At least 1.5 screen diameters from center screen.

TABLE 1-1 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Crosstalk Between X and Y Amplifiers	
At 500 kHz	0.25 mm, or less, of deflection on the grounded channel (X or Y) with a 1 V signal applied on the other channel (Y or X).
At 5 MHz	0.38 mm, or less, of deflection on the grounded channel (X or Y) with a 1 V signal applied on the other channel (Y or X).
Z-AXIS AMPLIFIER	
Useful Input Voltage Range (+Z INPUT)	Adjustable. With Z Gain at maximum, no more than +1 V will provide full intensity. With Z Gain at minimum, at least +5 V is required to produce full intensity. (-1 V input signal cuts off visible intensity.)
Useful Frequency Range	Dc to at least 10 MHz at -3 dB point.
Rise Time	35 ns or less.
Noise	No visible intensity modulation with Z INPUT terminated into 1 kΩ or less.
Input RC	1 MΩ, within 1%, paralleled by 60 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	+100 V or -100 V (dc + peak ac) with crt beam positioned off the viewing area.
Crosstalk Between Z-Axis Amplifier and X or Y Amplifier	
0 to 500 kHz	0.25 mm or less, with X and Y INPUTS grounded and a 1 V signal applied to the Z-Axis Amplifier. (Z-Axis Gain set for maximum.)
500 kHz to 5 MHz	0.38 mm or less, with X and Y INPUTS grounded and a 1 V signal applied to the Z-Axis Amplifier. (Z-Axis Gain set at minimum.)
CATHODE-RAY TUBE DISPLAY	
Usable Screen Area	9.8 X 12.2 centimeters.
Quality Area	9 X 11 centimeters.
Geometry (Within Graticule Area)	Bowing or tilt is 0.1 division or less.
Orthogonality (Within Graticule Area)	90° within 0.7°.
Accelerating Potential	22.5 kV.
Phosphor	P31 standard.
Deflection	Electrostatic.
Brightness	Light output is at least 240 cd/m^2 (70 fL) with a 0.33 mm, or less, centered spot size. Measured with the crt screen area flooded by a raster, 60 Hz refresh rate, 308 horizontal lines.

TABLE 1-1 (CONT.)

Electrical Characteristics

Characteristic	Performance Requirement
Uniformity	Light output does not vary more than 20% in the crt quality area, at moderate intensity 34 cd/m^2 (10 fL). Measured with the quality area flooded by a raster, 60 Hz refresh rate, 320 horizontal lines.
Spot Size	
#1	0.031 cm (0.012 in) or less, anywhere inside the quality area, with the intensity set to produce 170 cd/m^2 (50 fL) brightness, with a full screen raster refreshed at a 60 Hz rate. Measured with the shrinking raster method.
#2	0.026 cm (0.010 in) or less, at 0.5 μA beam current. Measured with the shrinking raster method.
Resolution	Spot size does not vary more than 10% in the quality area at a constant intensity.
POWER SOURCE	
Line Voltage (ac, rms)	
Low Range, P951	
Low (100 V ac)	90 to 110 V ac.
Medium (110 V ac)	99 to 121 V ac.
High (120 V ac)	108 to 132 V ac.
High Range, P952	
Low (200 V ac)	180 to 220 V ac.
Medium (220 V ac)	198 to 242 V ac.
High (240 V ac)	216 to 250 V ac.
Line Frequency	48 to 440 Hz.
Maximum Power Consumption (120 V ac, 60 Hz)	61 watts; 0.7 ampere.

TABLE 1-2

Environmental Characteristics

Characteristic	Information
NOTE *This instrument will meet the electrical characteristics given in the Performance Requirement column of Table 1-1 over the following environmental limits.*	
Temperature	
Operating	0° to +50° C (+32° to +122° F).
Nonoperating	-40° to +70° C (-40° to +158° F).
Altitude	
Operating	To 4.6 km (15,000 ft.).
Nonoperating	To 12.6 km (50,000 ft.).
Humidity	To 95% at 40° C.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

TABLE 1-3

Physical Characteristics

Characteristic	Information
Net Weight	About 8.2 kg (18 pounds).
Overall Dimensions	See Figure 1-1.

STANDARD ACCESSORIES

1 ea ..... Operators Manual

1 ea ..... Instruction Manual

1 ea ..... Lined Crt Implosion Shield (8 X 10 division graticule)

For more detailed information, refer to tabbed Accessories page in the 608 Instruction Manual.

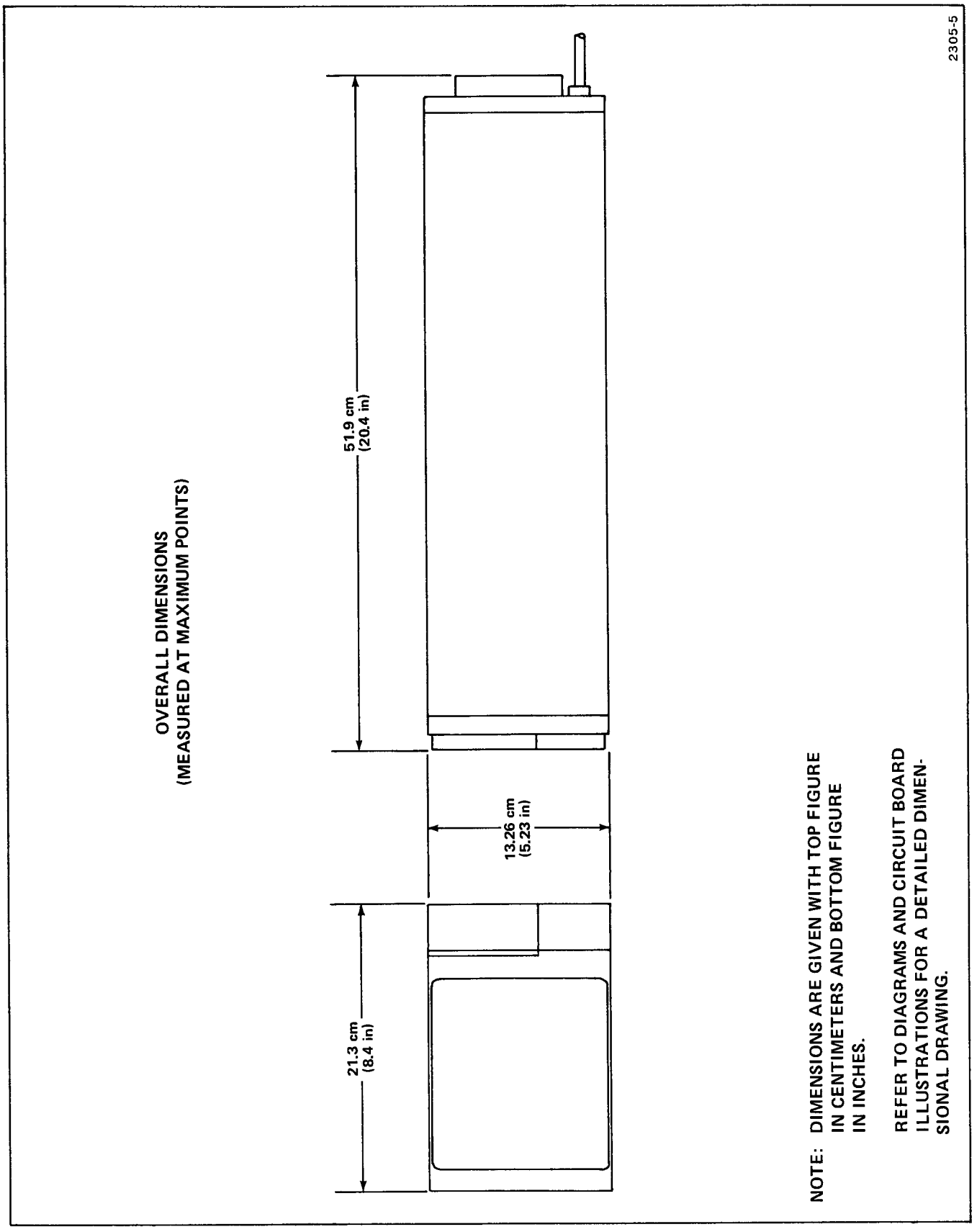

Figure 1-1. 608 Overall dimensional drawing.

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INSTRUMENT PACKAGING

If the instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing the following: Owner (with address) and the name of an individual at your firm who can be contacted, complete instrument type and serial number, and a description of the service required.

Save and re-use the package in which your 608 Monitor was shipped to you. If the original packaging is unfit for use or is not available, repackage the instrument as follows:

1. Obtain a carton of corrugated cardboard with a 275 pound test strength, and having inside dimensions of no less than six inches more than the instrument dimensions; this allows for cushioning.

2. Surround the instrument with polyethylene sheeting to protect the finish.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on all sides.

4. Seal the carton with shipping tape or with an industrial stapler.

OPERATING INSTRUCTIONS

AMBIENT TEMPERATURE CONSIDERATIONS

This instrument can be operated where the ambient air temperature is between 0° and +50° C (+32° and +122° F), and can be stored in ambient temperatures between -40° and +70° C (-40° and +158° F). After being stored in temperatures beyond the above operating limits, allow the chassis temperature to return to within the operating limits before applying power. Allowing the Monitor to operate at an ambient temperature substantially higher than that specified may result in poor reliability as well as inaccurate performance.

When the 608 is mounted in a rack with other equipment, it is important that the ambient temperature surrounding the Monitor does not exceed +50° C (+122° F). Additional clearance or forced ventilation methods (fan) may be needed to maintain ambient temperatures below +50° C (+122° F). Reliability and performance of the 608 will be affected if the ventilation holes in the protective panels are obstructed, or if the 608 is operated at an ambient temperature higher than +50° C (+122° F). Other environments and mounting configurations may require additional cooling measures.

CONTROLS AND CONNECTORS

Controls and connectors necessary for operation of the 608 Monitor are located on the front and rear panels of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each external control and connector. The front-panel controls are shown and described in Figure 2-1. Brief descriptions of the rear-panel controls and connectors are given in Figure 2-2.

NOTE

Information on controls and connectors for the available options is located in the Instrument Options section of this manual.

DETAILED OPERATING INFORMATION

INPUT SIGNAL REQUIREMENTS

The horizontal (X) and vertical (Y) deflection factors are set at the factory to one volt for eight divisions of deflection on each axis. Thus, as shipped, the input signal required for each division of deflection is 0.125 volt.

NOTE

The Functional Check procedure may be used to determine if the horizontal and vertical deflection factors of your particular instrument meet those set at the factory, as stated above.

The best transient response from the 608 Monitor is achieved when the input signal amplitude to the vertical or horizontal INPUT is no greater than that sufficient to provide full-screen deflection.

WARNING

To avoid electric shock, do not apply input signals of more than 25 volts (dc plus peak ac). Should fault conditions occur however, the instrument is protected for application of input signals up to 100 volts (dc plus peak ac).

With no signals applied to the +Z INPUT connector, the intensity of the display is controlled only by the front-panel INTENSITY control. To control the display intensity with an externally applied signal, set the INTENSITY control to about midrange, and apply the input signal to the +Z INPUT connector.

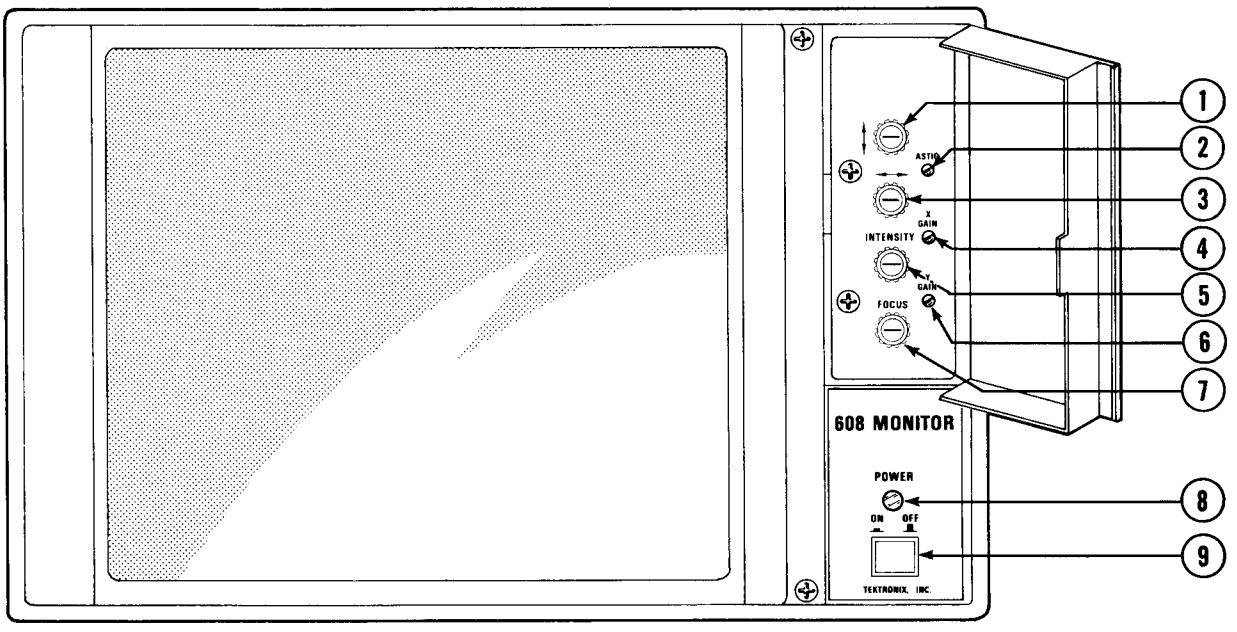
CAUTION

Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

The input signal required for maximum display intensity, through the +Z INPUT connector, is set at the factory for +1 volt, or less. The input signal required to visually cut off the display intensity is set at the factory for -1 volt, or less. The best transient response of the Z-Axis Amplifier is achieved when the input signal is the minimum required to provide the desired intensity change.

NOTE

Detailed Operating Information for the available options is located in the Instrument Options section of this manual.



(1) **Vertical (Y) Position**—Positions the crt beam in the Y axis.

(2) **ASTIG**—Screwdriver adjustment to be used in conjunction with the FOCUS control to provide a well-defined display.

(3) **Horizontal (X) Position**—Positions the crt beam in the X axis.

(4) **X GAIN**—Provides an adjustable amplification factor for crt full-screen deflection of at least 0.5 volt to 2.5 volts.

(5) **INTENSITY**—Controls brightness of the crt display and is the offset control for the Z-Axis INPUTS.

(6) **Y GAIN**—Provides an adjustable amplification factor for crt full-screen deflection of at least 0.5 volt to 2.5 volts.

(7) **FOCUS**—Provides adjustment to obtain a well-defined display.

(8) **POWER (Indicator)**—Illuminates when instrument is on.

(9) **ON/OFF**—Controls power to the Monitor. Instrument is on when pushbutton is in.

2305-1

Figure 2-1. Front-panel controls and indicators.

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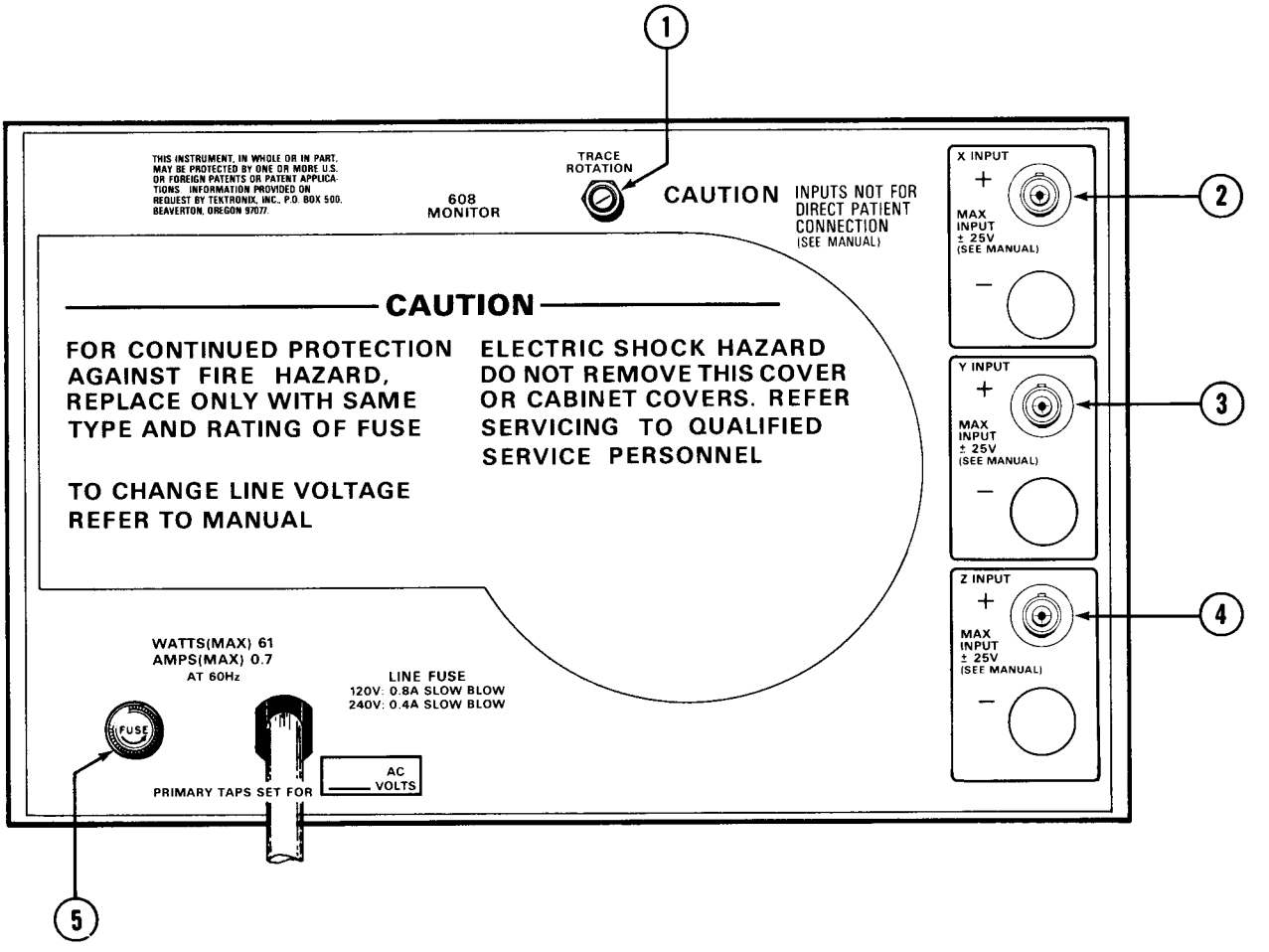

(1) **TRACE ROTATION**—Adjustment to align the trace with the horizontal axis.

(2) **+X INPUT**—BNC input connector to allow application of input signals. A positive signal applied deflects beam to the right; a negative signal deflects beam to the left.

(3) **+Y INPUT**—BNC input connector. A positive signal applied deflects beam up; a negative signal deflects beam down.

(4) **+Z INPUT**—BNC input connector. A positive signal applied provides a linear function to increase crt brightness; a negative signal decreases crt brightness.

(5) **LINE FUSE**—120 V: 0.8 A SLOW; 220 V: 0.4 A SLOW. (Line fuse is internal for Option 6 instruments.)*

* **Refer qualified service personnel to the servicing information sections of the 608 Instruction Manual for further information.**

2305-2

Figure 2-2. Rear-panel controls and connectors.

FUNCTIONAL CHECK

The following procedure is provided to aid in obtaining a display on the 608 Monitor and may be used as a check of basic instrument operation. The procedure may be used for incoming inspection to verify proper operation, and may also be used by the operator for instrument familiarization. Only instrument functions, and not measurement quantities or specifications, are checked in these procedures. Therefore, a minimum amount of test equipment is required. If performing the Functional Check procedure reveals improper performance or instrument malfunction, first check the operation of associated equipment; then refer to qualified service personnel for repair or adjustment of the instrument.

NOTE

Functional Check Procedures for the available options are located in the Instrument Options section of this manual.

TEST EQUIPMENT REQUIRED

The following test equipment was used as a basis to write the Functional Check procedure. Other test equipment, which meets these requirements, may be substituted. When other equipment is substituted, the control settings or set up may need to be altered.

1. Power Module

   Description: Tektronix TM 500-series power module with one or more plug-in compartments.

   Type Used: TEKTRONIX TM 501 (used with the FG 503 Function Generator).

2. Function Generator

   Description: Frequency range, one hertz to 50 kilohertz; output amplitude, one volt peak-to-peak into 50 ohms, waveform output, sine wave.

   Type Used: TEKTRONIX FG 503 (used with TM 501 Power Module).

3. Cables (2 Required)

   Description: Length, 42 inches (1 required), 18 inches (1 required); connectors, BNC.

   Type Used: Type RG-58/U, 50-ohm coaxial, Tektronix Part 012-0057-01 (42 inch), Tektronix Part 012-0076-00 (18 inch).

4. T Connector

   Description: Connectors, BNC-to-BNC.

   Type Used: BNC-to-BNC T connector, Tektronix Part 103-0030-00.

5. 50-Ohm Termination

   Description: Impedance, 50 ohm; connectors, BNC.

   Type Used: Tektronix Part 011-0049-01.

PRELIMINARY SET UP

1. Install the function generator in the power module and turn on the power module.

2. Connect the 608 power cord to a suitable power source.

NOTE

Check the line voltage information recorded on the rear panel. If the source voltage is not within this range, refer qualified service personnel to the servicing information sections of the 608 Instruction Manual.

3. Open the access door on the front panel and set the controls as follows:

   Vertical and Horizontal Position .....Midrange

   INTENSITY .....Fully counterclockwise

   FOCUS .....Midrange

   ON/OFF .....ON (pushbutton in)

4. Allow at least one minute for the instrument to warm up.

DISPLAY FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Notice that a spot will appear on the crt, increasing in brightness as you slowly turn the INTENSITY control clockwise.

CAUTION

A high intensity level combined with a stationary spot will damage the crt phosphor. Therefore, set the INTENSITY control to the minimum necessary for good visibility.

3. Adjust the FOCUS and ASTIG controls for a sharp, well-defined display.

4. Turn the Vertical and Horizontal Position controls and notice that the spot position can be controlled by both controls.

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5. Set the function generator for a 1-volt (peak-to-peak), 50-kilohertz sine-wave output.

6. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

7. Center the display with the Horizontal Position control, and position the trace on the center horizontal graticule line.

8. Check that the rear-panel TRACE ROTATION control will align the trace with the center horizontal graticule line.

DEFLECTION AND Z-AXIS FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Set the function generator for a 2-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

4. Center the display with the Horizontal Position control and check that the X GAIN control will adjust for 8 divisions of horizontal deflection.

5. Disconnect the signal from the +X INPUT connector and apply it to the +Y INPUT connector.

6. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

7. Adjust the INTENSITY control for a barely-visible display.

8. Disconnect the signal from the +Y INPUT connector and apply it to the +X INPUT and +Z INPUT connectors via the 50-ohm termination, 42-inch cable, BNC T connector, and the 18-inch cable.

9. Notice that the right end of the crt display becomes bright, and that the left end disappears.

10. Disconnect the function generator.

This completes the Functional Check procedure for the 608 Monitor.

INSTALLATION

OPERATING POWER INFORMATION

This instrument can be operated from either a 120-volt or 220-volt nominal line-voltage source, 48 to 440 hertz. In addition, three regulating ranges are provided for each nominal line-voltage source.

CAUTION

To prevent damage to the instrument, always check the line-voltage information recorded on the rear panel before applying power to the instrument.

POWER CORD INFORMATION

WARNING

This instrument is intended to be operated from a single-phase earth-referenced power source having one current-carrying conductor (the Neutral Conductor) near earth potential. Operation from power sources where both current-carrying conductors are live with respect to earth (such as phase-to-phase on a three-wire system) is not recommended, since only the Line conductor has over-current (fuse) protection within the instrument.

This instrument has a three-wire power cord with a polarized two-pole, three-terminal plug for connection to the power source and safety-earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only in a mating outlet with a safety-earth contact.

Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections to this instrument, always ground the instrument first by connecting the power cord to a properly mated power outlet.

TABLE 3-1
Power-Cord Conductor Identification

Conductor	Color	Alternate Color
Line	Brown	Black
Neutral	Light Blue*	White
Safety Earth	Green/Yellow	Green/Yellow

*Tinned copper conductor.

The power-cord plug required depends upon the ac input voltage and the country in which the instrument is to be used. Should you require a power-cord plug other than that supplied with your instrument, refer to the standards listed in Table 3-2.

TABLE 3-2
Location of Power-Cord Configuration Information

Nominal Line Voltage	Reference Standards
120 V ac	[1]ANSI C73.11
	[2]NEMA 5-15P (Hospital Grade)
220 V ac	ANSI C73.20
	[3]AS C112
	[4]BS 1363
	[5]CEE 7, sheets IV, VI and VII
	NEMA 6-15-P

[1]ANSI—American National Standard Institute

[2]NEMA—National Electrical Manufacturer's Association

[3]AS—Standards Association of Australia

[4]BS—British Standards Institution

[5]CEE—International Commission on Rules for the Approval of Equipment

For medical-dental applications, use NEMA 5-15-P (Hospital Grade) plug for 120-volt operation, or NEMA 6-15-P plug for 220-volt operation.

LINE-VOLTAGE AND REGULATING-RANGE SELECTION

CAUTION

Damage to the instrument may result from incorrect placement of the line-voltage selector plug.

To select the correct nominal line voltage and regulating range, proceed as follows:

1. Disconnect the instrument from the power source.

2. Insert the proper line-voltage selector plug (the brown plug for 120-volt operation or the red plug for 220-volt operation) on the line-voltage selector pins (located on the Low-Voltage Power Supply board) labeled for the desired nominal line-voltage range. Refer to Figure 3-1 for location and additional information.

3. Remove the line fuse from the fuse holder and check for the correct rating. Replace it with one having the correct rating, if necessary. Refer to Figure 3-1 for fuse information and location.

NOTE

An alternate line fuse, intended for the line-voltage source for which the Monitor was not set when shipped from the factory, is clipped to the Low-Voltage Power Supply board (see Fig. 3-1).

4. Change the nominal line-voltage information recorded on the 608 rear panel. Use a non-abrasive eraser to remove previous data, and mark on the new data with a pencil.

5. Apply power to the Monitor.

INSTALLATION IN PATIENT-CARE FACILITIES

WARNING

Do not use the amplifier INPUTS for direct-patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct-patient connection.

WARNING

Although this Monitor is not to be connected directly to a patient, interconnecting this Monitor to other equipment can result in the application of excessive current to a patient. It is extremely important that the interconnection is made in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Areas of Health Care Facilities, section 3038, "Signal Transmission Between Appliances".

Among the situations involving the above-mentioned patient hazard is one in which two or more pieces of interconnected equipment are grounded at locations remote from one another. The standard mentioned in the preceding warning describes both this hazard and the appropriate corrective measures.

Z-AXIS INPUT ATTENUATION SELECTION

CAUTION

Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

The Z-Axis Amplifier is shipped from the factory with 1X input attenuation and 1 megohm input impedance. However, the attenuation and input impedance can be modified to suit a specific application. Posts, on the Z-Axis Amplifier board, allow components to be changed without damage to the circuit board. Figure 3-2 illustrates the method used to modify input attenuation and input impedance of the +Z INPUT. Refer to the Test Point and Adjustment Locations foldout page in section 8, Diagrams and Circuit Board Illustrations, for location of the Z-Axis attenuation components. Refer to your Tektronix Field Office or representative for additional information.

RACKMOUNTING INFORMATION

The 608 can be operated in a standard 19-inch instrument rack with front and rear holes that conform to universal hole spacing. Kits are available to convert the 608 from the cabinet to a rackmounted configuration, and vice versa. Complete instructions are included in the kits. A brief description of each available conversion kit is given here. Consult your Tektronix Field Office or representative for additional information.

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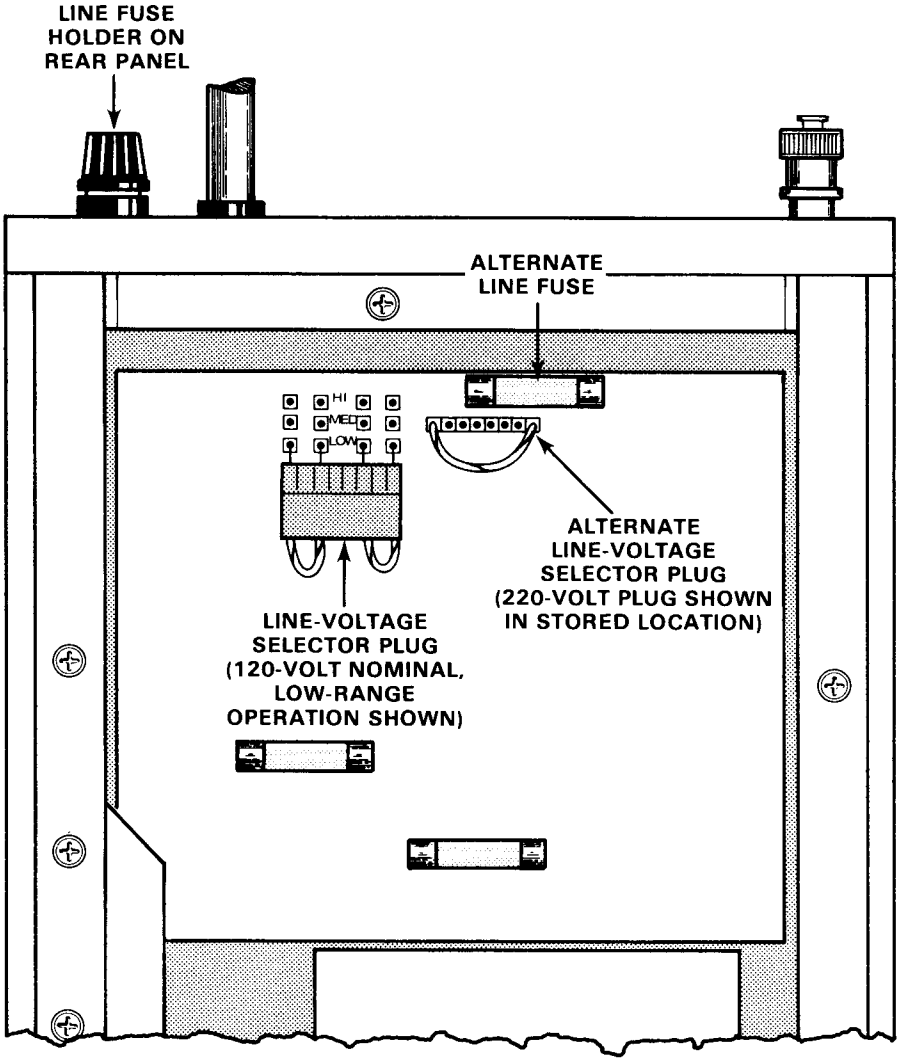

Regulating Ranges

Line-Voltage Selector Position	Regulating Range and Fuse Data	
	120 Volts (Nominal)	220 Volts (Nominal)
LO	90 V ac to 110 V ac	180 V ac to 220 V ac
MED	99 V ac to 121 V ac	198 V ac to 242 V ac
HI	108 V ac to 132 V ac	216 V ac to 250 V ac
Line Fuse Data	0.8 A slow-blowing type	0.4 A slow-blowing type

2305-7

Figure 3-1. Location of line-voltage selector plugs, regulating-range pins, and line fuse.

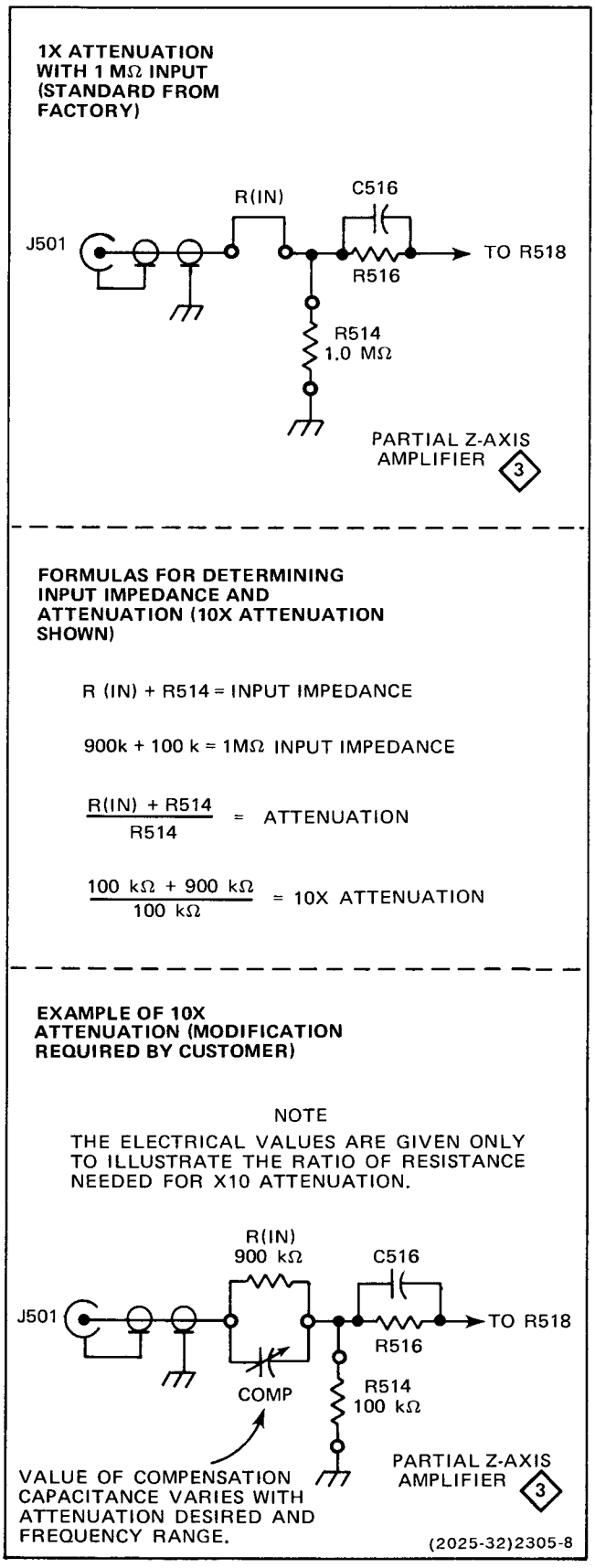

Figure 3-2. Typical method for modifying Z-Axis input impedance and attenuation.

CAUTION

Reliability and performance of the 608 will be affected if the ventilation holes in the protective panels are obstructed, or if the 608 is operated in an ambient temperature higher than +50° C. Forced ventilation methods may be needed.

CABINET-TO-RACKMOUNT CONVERSION

Tektronix Part 040-0600-00. Mounts two 608 Monitors side-by-side in a standard 19-inch wide rack. The kit comes equipped with a slide-out assembly and includes the securing hardware. Complete rackmounting instructions are included in each kit.

Tektronix Part 040-0601-00. Mounts one 608 Monitor in a standard 19-inch wide rack. The kit is equipped with a slide-out assembly, securing hardware, and a blank front panel to cover the second instrument opening in the rack. Complete rackmounting instructions are included in each kit.

Tektronix Part 040-0624-00. Converts one TM 503 Power Module and one 608 Monitor to mount side-by-side in a standard 19-inch wide instrument rack. The kit includes slide-out assembly and securing hardware. Complete rackmounting instructions are included with each kit.

RACKMOUNT-TO-CABINET CONVERSION

Tektronix Part 040-0602-00. Converts one 608 Monitor from a rackmount configuration to a cabinet configuration. Complete instructions are included in each kit.

INSTRUMENT DIMENSIONS

A drawing showing the major dimensions of the 608 is shown in Figure 1-1 (General Information section). Further details and tolerances are shown on the Detailed Dimensional Drawing foldout page in section 8, Diagrams and Circuit Board Illustrations.

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THEORY OF OPERATION

This section of the manual describes the circuitry in the 608 Monitor. The description begins with a discussion of the instrument using the block diagram on Figure 4-1, and then continues in detail, showing the relationships between the stages in each major circuit. Schematics of all major circuits are given in Section 8, Diagrams and Circuit Board Illustrations. Stages are outlined on the schematics with wide shaded lines; the stage names are in shaded boxes. Refer to these schematics throughout the following discussions for specific electrical values and relationships.

NOTE

The Theory of Operation for available electrical options is located in Section 9, Instrument Options, at the rear of this manual.

BLOCK DIAGRAM

The following discussion is provided to aid in understanding the overall concept of the 608 before the individual circuits are discussed in detail. A basic block diagram is shown in Figure 4-1.

Vertical and horizontal signals to be displayed on the crt are supplied to the Deflection Amplifiers through the appropriate Y and X INPUT connectors. The Deflection Amplifiers process the input signals and provide push-pull outputs to drive the deflection plates of the crt. Both Deflection Amplifiers contain position and gain controls.

The Z-Axis Amplifier controls the display intensity by providing a voltage to drive the crt control grid. Input signals are applied to the Z INPUT connector.

The Dynamic Focus circuit provides focus correction for the display when it is deflected from the crt center. Thus, by varying the voltage to the crt focus element, the Dynamic Focus circuit compensates for geometric defocusing.

The High-Voltage and Low-Voltage Power Supplies provide all the voltages necessary for operation of this instrument.

DETAILED CIRCUIT OPERATION

Complete schematic diagrams are provided in Section 8, Diagrams and Circuit Board Illustrations. The numbers inside the diamond after a heading in the following discussions refer to the schematic diagram for that circuit. The schematic diagrams contain wide shaded borders around the major stages of the circuits to conveniently locate the components mentioned in the following discussions. The name of each stage, given in a shaded box on the diagram, matches the subheading in the discussion of that schematic diagram.

VERTICAL (Y) DEFLECTION AMPLIFIER ◇1

The Vertical (Y) Deflection Amplifier processes the Y input signals and provides final amplification to drive the vertical deflection plates of the crt. A schematic diagram of the Vertical (Y) Deflection Amplifier is shown on diagram 1. A detailed block diagram, showing each major stage of the Vertical (Y) Deflection Amplifier, is superimposed on the schematic with wide shaded lines to conveniently locate the components mentioned here. The stage names (given as sub-headings in the following discussion) can be found in the shaded boxes on diagram 1.

Y PREAMPLIFIER

Signals to be displayed are applied to J101 (+Y INPUT). The Y Preamplifier employs a matched pair of FETs to provide a high input impedance and temperature stability. This stage consists of two identical and inverting feedback amplifiers, Q120A-Q130-Q134 and Q120B-Q230-Q234, which operate as a paraphase amplifier. A push-pull signal is produced at the collectors of Q134 and Q234. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive

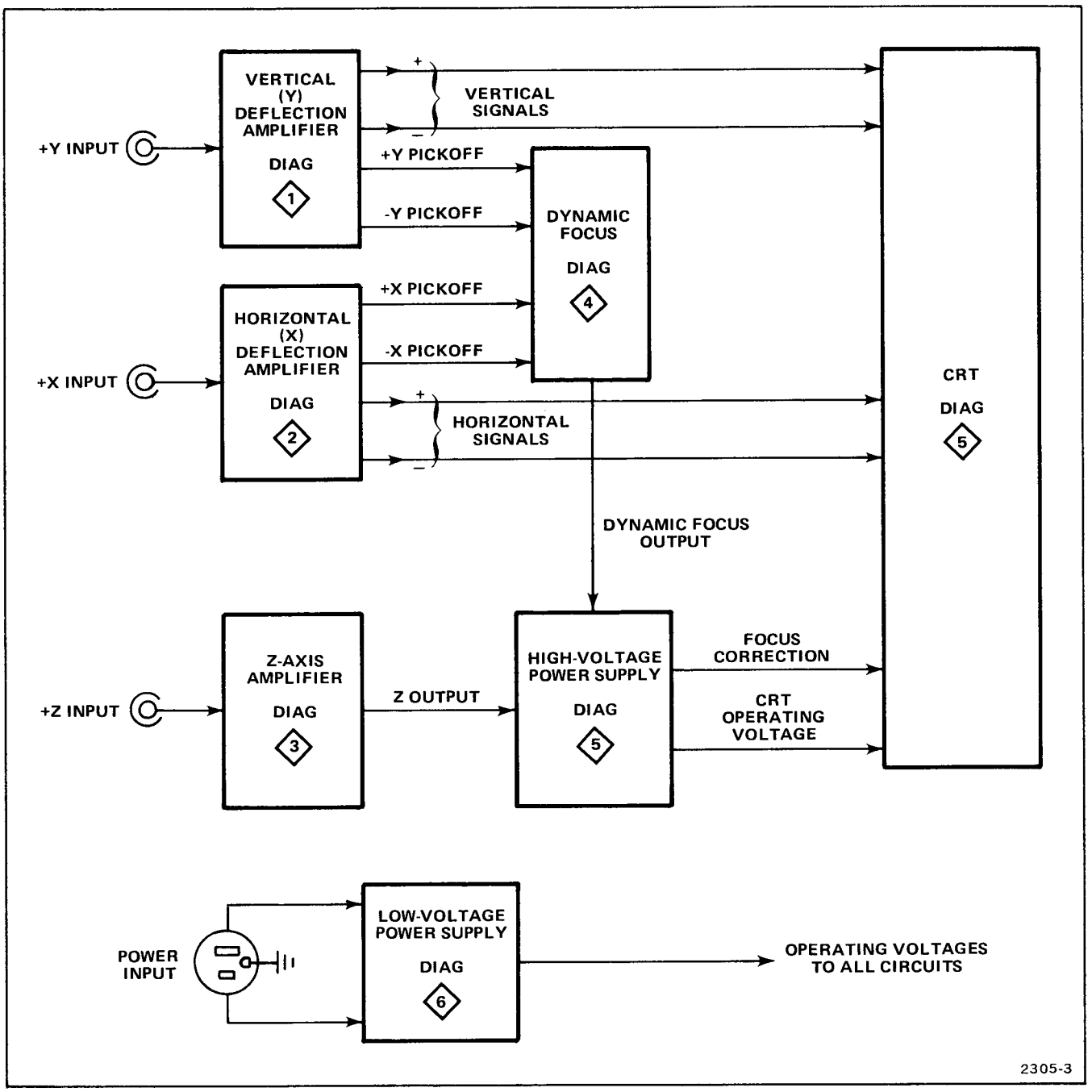

Figure 4-1. 608 Block Diagram.

input voltages. Front-panel screwdriver adjustment Y Gain (R125) provides an adjustable amplification factor to allow crt full-screen deflection range of at least 0.5 to 2.5 volt. This control is normally set to a nominal 1 volt for 8 divisions of deflection.

VERTICAL POSITIONING & LIMITER

Vertical positioning is provided by front-panel control R147, through the current sources of Q142-Q242. The push-pull signals from the Y Preamplifier are applied to the Y Output Amplifier after being offset by this stage. Diodes CR140 and CR240 prevent overdriving the Y Output Amplifier by limiting the Y Preamplifier signals to within about 4 volts of each other.

Y FOCUS-CORRECTION PICKOFF

Samples of the +Y and -Y signals are coupled from the Y Preamplifier to the Dynamic Focus circuit

(diagram 4) for focus correction in the Y axis. A sampling of the +Y voltage signal is converted to a current signal by Q295, and the -Y voltage signal by Q195, before being applied to the Dynamic Focus circuit.

Y OUTPUT AMPLIFIER

The Y Output Amplifier consists of two identical and non-inverting operational amplifiers connected in a differential configuration. For ease of explanation, only the + side will be discussed.

Transistors Q270-Q272-Q276-Q284-Q286-Q290 make up the active components of the +Y Output Amplifier. Transistor Q290 provides bias current for input transistor Q270. The signal from the Y Preamplifier stage is amplified by Q270 and fed to emitter followers Q272-Q276. The emitter followers drive output transistors Q286 and Q284. The output transistors (Q286-Q284) are connected as a collector-coupled complementary amplifier to provide a fast linear output signal while consuming minimum quiescent power.

The output signal at the collectors of Q286 and Q284 causes a change in the current through feedback resistor R288 that, due to the input signal, will just balance the current through R163. Thus the current in Q270 is held nearly constant. Variable capacitor C167 and potentiometer R161 (HF Comp) provide a means of adjusting the amplifier response.

HORIZONTAL (X) DEFLECTION AMPLIFIER ◇2

The Horizontal (X) Deflection Amplifier processes the X input signals and provides final amplification to drive the horizontal deflection plates of the crt. A schematic diagram of the Horizontal (X) Deflection Amplifier is shown in diagram 2. A detailed block diagram, showing each major stage of the Horizontal (X) Deflection Amplifier, is superimposed on the schematic with wide shaded lines to conveniently locate the components mentioned here. The stage names (given as sub-headings in the following discussion) can be found in the shaded boxes on diagram 2.

X PREAMPLIFIER

Signals to be displayed are applied to J301 (+X INPUT). The X Preamplifier employs a matched pair of FETs to provide a high input impedance and temperature stability. This stage consists of two identical and inverting feedback amplifiers, Q320A-Q330-Q334 and Q320B-Q430-Q434, which operate as a paraphase amplifier. A push-pull signal is produced at the collectors of Q334 and Q434. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input voltages. Front-panel screwdriver adjustment R325 (X GAIN) provides an adjustable amplification factor to allow a crt full-screen deflection range of at least 0.5 volt to 2.5 volts. This control is normally set to a nominal 1 volt for 8 divisions of deflection.

HORIZONTAL POSITIONING AND LIMITER

Horizontal positioning is provided by front-panel control R347, through the current sources of Q342-Q442. The push-pull signals from the X Preamplifier are applied to the X Output Amplifier after being offset by this stage. Diodes CR340 and CR440 prevent overdriving the X Output Amplifier by limiting the X Preamplifier signals to within about 4 volts of each other.

X FOCUS-CORRECTION PICKOFF

Samples of the +X and -X signals are coupled from the X Preamplifier to the Dynamic Focus circuit (diagram 4) for focus correction in the X axis. A sampling of the +X voltage signal is converted to a current signal by Q495, and the -X voltage signal by Q395, before being applied to the Dynamic Focus circuit.

X OUTPUT AMPLIFIER

The X Output Amplifier consists of two identical and non-inverting operational amplifiers connected in a differential configuration. For ease of explanation, only the + side will be discussed.

Transistors Q470-Q472-Q476-Q484-Q486-Q490 make up the active components of the +X Output Amplifier. Transistor Q490 provides bias current for input transistor Q470. The signal from the X Preamplifier stage is amplified by Q470 and fed to emitter followers Q472-Q476. The emitter followers drive output transistors Q486 and Q484. The output transistors (Q484-Q486) are connected as a collector-coupled complementary amplifier to provide a fast linear output signal while consuming minimum quiescent power.

The output signal at the collectors of Q486 and Q484 causes a change in the current through feedback resistor R488 that, due to the input signal, will just balance the current through R363. Thus the current in Q470 is held nearly constant. Variable capacitor C367 and potentiometer R361 (HF Comp) provide a means of adjusting the amplifier response.

Z-AXIS AMPLIFIER ◇3

The Z-Axis Amplifier circuit provides the drive signal to control the crt intensity. A schematic diagram of the Z-Axis Amplifier is shown on diagram 3 at the rear of this manual. A detailed block diagram, showing each major stage, is superimposed on the schematic diagram with wide shaded lines. The stage names (given as sub-headings in the following discussion) can be found in the shaded boxes on diagram 3.

Z PREAMPLIFIER

Input signals are applied to J501 (+Z INPUT). Provisions are made on the input line to permit installation of an attenuating resistor and to change the input impedance (see Z-Axis Input Attenuation Selection in Section 3, Installation).

The Z Preamplifier employs a matched pair of FETs to provide a high input impedance and temperature stability. This stage consists of two identical and inverting feedback amplifiers, Q520A-Q530-Q534 and Q520B-Q630-Q634, which operate as a paraphase amplifier. A push-pull signal is produced at the collectors of Q534 and Q634. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input voltages. Potentiometer R525 (Z Gain) allows an adjustable amplification factor to provide maximum crt grid drive when a signal of at least +1 volt to +5 volts is applied to the +Z INPUT connector, and R547 (INTENSITY) is set to about midrange. Under this condition, a zero-volt input cuts off the display intensity to below the visible level.

INTENSITY AND LIMITER

Display intensity is varied by front-panel control R547 (INTENSITY) through the current sources of Q542 and Q642. The push-pull signals from the Z Preamplifier are applied to the Z Output Amplifier after being offset by this stage. Diodes CR565 and CR540 prevent overdriving the Z Output Amplifier by limiting the Z Preamplifier signals to within 3.4 volts of each other.

Z OUTPUT AMPLIFIER

The push-pull signals from the Z Preamplifier stage are applied to the bases of Q570 and Q670. These two transistors are voltage-to-current converters which, with Q576, produce a single-ended current signal.

Transistors Q580-Q680-Q590-Q690-Q596-Q696 are connected as an operational amplifier, with the feedback path provided through R692. High-current, low-impedance drive is provided by the complementary configuration of emitter followers Q580-Q680. The dc and low-frequency signals from Q580-Q680 are coupled through R584 to the base of Q690; the high-frequency signals are capacitively coupled through C585 and C586 to the base of Q590. Complementary amplifiers Q590-Q690 provide the final gain for the Z output signals, with emitter followers Q596-Q696 supplying the high current necessary to drive the capacitive load. High-frequency compensation is provided by C693-R693 (HF Comp).

DYNAMIC FOCUS ④

The Dynamic Focus circuit provides focus correction as the crt beam is deflected to the edges of the display area in both the vertical (Y) and horizontal (X) axis. A schematic diagram of the Dynamic Focus circuit is shown in diagram 4. A detailed block diagram, showing the major stages of this circuit, is superimposed on the schematic diagram with wide shaded lines. The stage names (given as sub-headings in the following discussion) can be found in the shaded boxes on diagram 4.

Geometric defocusing, a contributing factor to overall crt defocusing, occurs when the beam is deflected from the crt center. The electron beam, at center screen, is focused for a particular beam length. When the beam is deflected, either vertically or horizontally, the beam length changes. However, the focusing voltage remains the same. As a result, the display is defocused, appearing larger at the edges of the screen then at crt center (see Fig. 4-2).

The Dynamic Focus circuit varies the voltage to the focus element of the crt depending upon the vertical

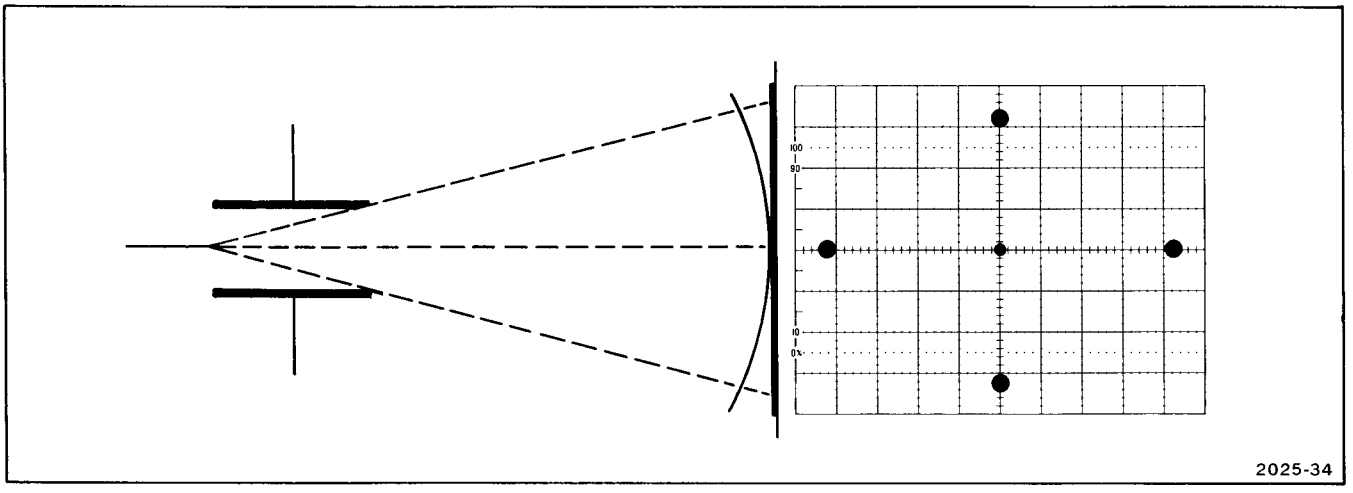

Figure 4-2. Simplified illustration of geometric defocusing.

and horizontal positions of the electron beam. Therefore, overall focus is improved over the crt display area. Figure 4-3 illustrates the typical correction-voltage curve as the beam is deflected over the crt display area. The correction-voltage curves for vertical and horizontal deflection are not identical; however, the theory is the same.

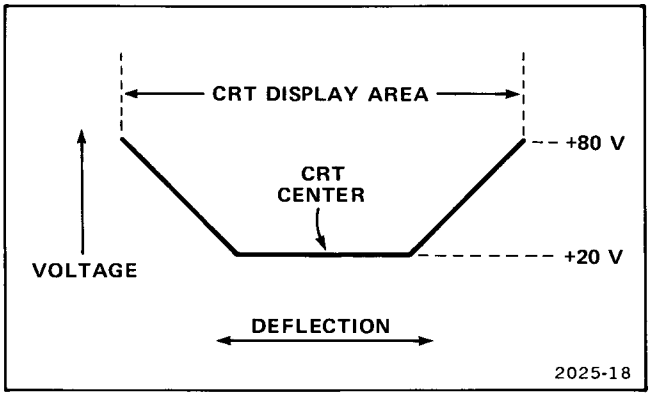

Figure 4-3. Typical correction-voltage curve applied to the crt focus element (correction voltage applied for both vertical and horizontal deflection).

X FOCUS-CORRECTION SHAPER

Samples of the +X and -X horizontal signals, from the X Focus-Correction Pickoff stage shown on diagram 2, are coupled to the X Focus-Correction Shaper stage of the Dynamic Focus circuit. Quiescently, with the crt beam horizontally deflected within about 3 divisions of center screen, Q710-Q720 are conducting and CR710-CR720 are reverse biased. The voltage level at the anodes of CR710 and CR720 is approximately +5.1 volts, as determined by zener diode VR750 and transistor Q750.

As the beam is deflected to the right side of the crt display area, the output of Q710 falls below +4.5 volts, forward biasing CR710 (CR720 is reverse biased). The signal is coupled through R715 (Right) and applied to the Summing and Output Amplifier at the emitter of Q750.

As the beam is deflected to the left side of the crt display area, the output of Q720 falls below +4.5 volts, forward biasing CR720 (CR710 is reverse biased). The signal is coupled through R725 (Left) and applied to the Summing and Output Amplifier at the emitter of Q750.

Y FOCUS-CORRECTION SHAPER

Samples of the +Y and -Y vertical signals, from the Y Focus-Correction Pickoff stage shown on diagram 1, are coupled to the Y Focus-Correction Shaper stage of the Dynamic Focus circuit. Quiescently, with the crt beam vertically deflected within about 3 divisions of center screen, Q730-Q740 are conducting and CR730-CR740 are reverse biased. The voltage level at the anodes of CR730 and CR740 is approximately +5.1 volts, as determined by zener diode VR750 and transistor Q750.

As the beam is deflected to the bottom region of the crt display area, the output of Q730 falls below +4.5 volts, forward biasing CR730 (CR740 is reverse biased). The signal is coupled through R735 (Bottom) and applied to the Summing and Output Amplifier at the emitter of Q750.

As the beam is deflected to the top region of the crt display area, the output of Q740 falls below +4.5 volts, forward biasing CR740 (CR730 is reverse biased). The signal is coupled through R745 (Top) and applied to the Summing and Output Amplifier at the emitter of Q750.

SUMMING AND OUTPUT AMPLIFIER

Outputs from both the X and Y Focus-Correction Shapers are added in the Summing and Output Amplifier stage. The focus-correction signals are coupled to common-base transistor Q750. Diode CR753 limits the output of Q750 to prevent overdriving the Output Amplifier. The Output Amplifier of this stage, consisting of transistors Q760-Q765-Q770-Q776, is an inverting operation amplifier. The input signal to this amplifier is developed across R753. The feedback network for the Output Amplifier consists of R789 and C789-C788. Emitter followers Q760 and Q765 provide current amplification for Q770 and Q776, which are connected in a collector-coupled complementary amplifier configuration. The composite correction signal is coupled to the Focus-Element DC Restorer stage of the High-Voltage Power Supply circuit (diagram 5).

HIGH-VOLTAGE POWER SUPPLY ⑤

The High-Voltage Power Supply provides the voltage levels and control circuits necessary for operation of the cathode-ray tube (crt). A schematic diagram of the High-Voltage Power Supply is shown on diagram 5. A detailed block diagram, showing each major stage of this circuit, is superimposed on the schematic diagram with wide shaded lines. The stage names (given as sub-headings in the following discussion) can be found in the shaded boxes on diagram 5.

HIGH-VOLTAGE OSCILLATOR

A repetitive, sinusoidal signal is produced by a regenerative feedback oscillator in the primary of T850 and induced into the secondary. Current drive for the primary winding is furnished by Q816-Q818-Q810-Q814. The conduction of the High-Voltage Oscillator transistors is controlled by the output voltage of the Error Amplifier.

CATHODE SUPPLY

The Cathode Supply voltage, -4500 volts, is produced by voltage doubler C852-CR852-CR853. It is then filtered by C854, R856, and C858, before being applied to the crt cathode (pin 2 of V950). The Cathode Supply is regulated by the Error Amplifier.

ERROR AMPLIFIER

Regulation of the Cathode Supply voltage is accomplished by applying a sample of the -4500 volts, from voltage divider R920A-R920B, to the positive input (pin 3) of U832. If the output level of the Cathode Supply exceeds the normal -4500 volts (becomes more negative), the voltage at pin 3 of U832 goes negative from its quiescent zero-volt level. This results in a reduced output voltage from U832. A lower potential from the Error Amplifier reduces the conduction of the High-Voltage Oscillator, resulting in a smaller peak-to-peak amplitude of the signal in the secondary of T850 and returning the Cathode Supply to -4500 volts.

CURRENT LIMITER

Transistor Q826 protects the High-Voltage Oscillator transistors if excess current is demanded from the secondary of T850, due to a short circuit or abnormal load, by limiting the maximum current drawn by the High-Voltage Oscillator.

CONTROL-GRID DC RESTORER

The Control-Grid DC Restorer couples the dc and low-frequency components of the Z-Axis Amplifier output signal to the crt control grid (pin 3 of V950). This allows the Z-Axis Amplifier to control the crt beam intensity. The potential difference between the Z-Axis Amplifier output level and the crt control grid (about -4500 volts) prohibits direct coupling.

The Control-Grid DC Restorer is actually a cathode-referenced bias supply for the crt control grid. Quiescently, its output voltage is more negative than the crt cathode by an amount determined by the Z-Axis Amplifier output level and the setting of the Crt Bias adjustment, R862. (The cutoff voltage at the crt control grid is typically about 85 volts more negative than the crt cathode level.)

NOTE

A simplified diagram of the Control-Grid DC Restorer is shown in Figure 4-4. The voltages given on this diagram are idealized levels and will not necessarily be the same as those found in the actual instrument.

The Control-Grid DC Restorer is divided into two sections for ease of explanation. The first section can be considered a modulator at low-voltage potentials, and the remaining section as a demodulator at high-voltage potentials (see Fig. 4-4).

Modulator

When the secondary winding output of T850 (pin 10) swings positive, C872 charges through R860 and C860 to a voltage level determined by the setting of the Crt Bias adjustment, R862. At this voltage level (approximately +85 volts), diode CR872 conducts, preventing any additional increase in the positive voltage across C872. When the secondary-winding output swings negative, diode CR872 turns off. Then CR860 conducts and clamps the negative excursion at C872 to the voltage level of the Z-Axis Amplifier output. The result is a square-wave output from the Modulator; the output amplitude is determined by the difference between the Z-Axis Amplifier output level and the Crt Bias adjustment setting. (See waveform 2 on Fig. 4-4.) This square wave is coupled through C872 to the Demodulator.

Demodulator

The Demodulator rectifies the signal from the Modulator and references it to the crt Cathode Supply level. The positive swing of waveform 3, Figure 4-4, is limited by CR874 to the level of the Cathode Supply; the negative excursion is coupled through CR876 to C879. Quiescently, C879 will charge to about -4500 volts through R876. After repetitive cycles from C872, C879 will charge to the negative level of waveform 3. Capacitor C879 filters the output of the Demodulator, and also provides a path for the high-frequency portions of the Z-Axis Amplifier output signal to be coupled to the crt control grid.

The remainder of the components not shown on the simplified diagram in Figure 4-4 provide circuit protection in the event of a high-voltage arc, or other malfunction.

FOCUS-ELEMENT DC RESTORER

The Focus-Element DC Restorer couples the dc and low-frequency components of the Dynamic Focus correction signals (diagram 4) to the crt focus element of V950. This allows the Dynamic Focus circuit to control the focus-element potential. The potential difference between the Dynamic Focus output and the focus element (approximately 3250 volts) prohibits direct coupling.

The Focus-Element DC Restorer is divided into 2 sections for ease of explanation. The first section can be considered a modulator at low-voltage potentials and the remianing section a demodulator at high-voltage potentials (see Fig. 4-5).

Modulator

When the secondary-winding output at T850 pin 10 swings positive, C929 charges through R927 and C927 to a voltage level determined by the output level from the Summing and Output Amplifier stage of the Dynamic Focus circuit (diagram 4). At this voltage level (approximately +15 volts for center-screen deflection) CR925 conducts, preventing any additional

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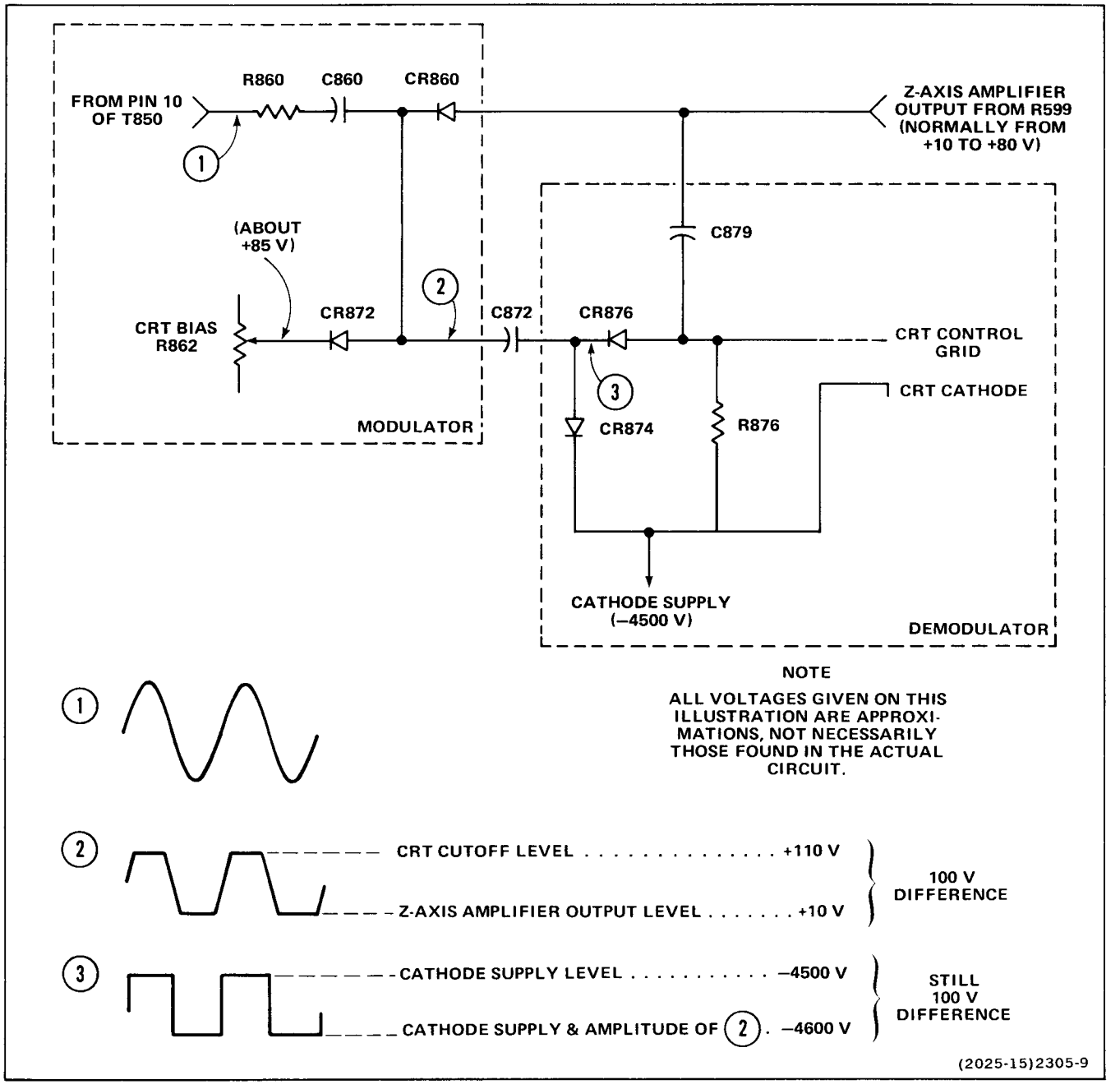

Figure 4-4. Simplified diagram of Control-Grid DC Restorer.

increase in positive voltage across C929. When the secondary-winding output swings negative, CR925 turns off. Then, CR927 conducts and clamps the negative excursion at C929 a diode drop below ground. The result is a square-wave output from the Modulator, with the output amplitude determined by the difference between the level of the Dynamic Focus circuit (diagram 4) and approximately ground (see waveform 2 on Fig. 4-5). The Modulator output is coupled through C929 to the Demodulator.

Demodulator

The Demodulator rectifies the signal from the Modulator and references it to the potential on C934. The potential on C934 is determined by voltage divider R920D, R920C, and FOCUS control R844. The negative swing of waveform 3 in Figure 4-5 is limited by CR929 to the level of C934; the positive excursion is coupled through CR930 to C930. Quiescently, C930 will charge to about -3250 volts through R930. After

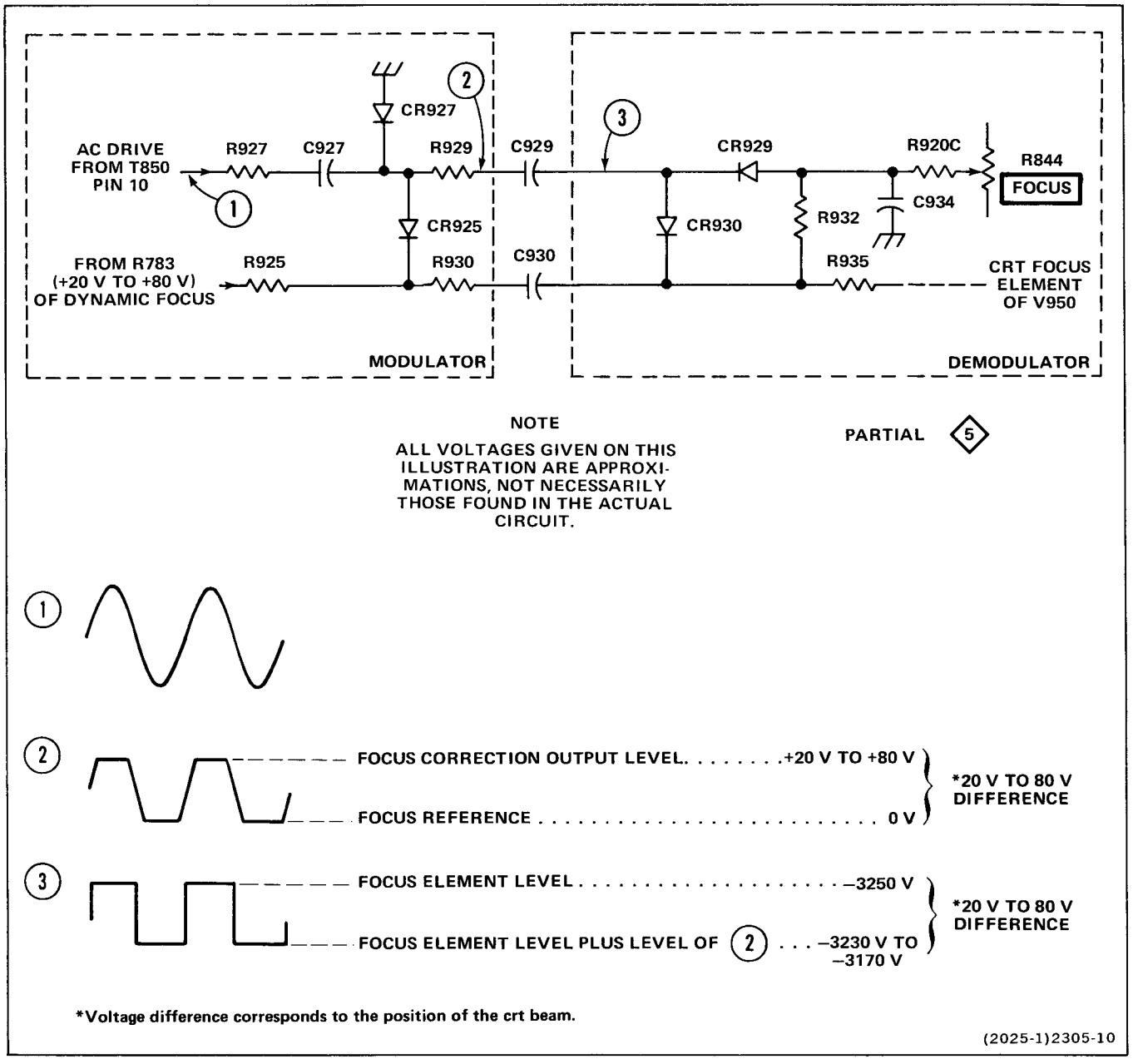

Figure 4-5. Simplified diagram of Focus-Element DC Restorer.

repetitive cycles from C929, C930 will charge to the positive level of waveform 3. Capacitor C930 filters the output of the Demodulator, and also provides a path for the high-frequency portions of the focus-correction signal to be coupled to the crt focus element at V950.

The remainder of the components not shown on the simplified diagram in Figure 4-5 provides circuit protection in the event of a high-voltage arc or other malfunction.

+100-VOLT REGULATED SUPPLY

The ac voltage from pin 2 of T850 is half-wave rectified by CR888 to provide unregulated power for the +100-Volt Regulated Supply. Filtering is provided by C889, L889, and C890.

The regulator for this supply is a feedback amplifier system. Current to the load is delivered by series-pass transistor Q900, which is located in the output side of the supply. The supply voltage is established by the

drop across resistive-divider network R904-R906. The feedback through this network and R907 is compared to the reference level established at the base of Q911. Any variation in output voltage of the supply (due to ripple, change of current through the load, etc.), is immediately transmitted through error amplifier Q907-Q911-Q914 to the base of Q900, changing its conduction and nullifying the original output variation.

Transistor Q895 protects the +100-volt series regulator (Q900) if excess current is demanded from this supply. Essentially, all current from this supply flows through R896. When excess current is demanded from the +100-volt series regulator, due to a short circuit or similar malfunction at the output of this supply, the voltage drop across R896 increases, causing Q895 to increase conduction. The resulting current through Q895 reduces the conduction of Q900 to limit the supply current to a safe level.

CRT INTERCONNECTS

The ASTIG screwdriver adjustment, R841, which is used in conjunction with the front-panel FOCUS control to provide a well-defined display, varies the positive level on the astigmatism element of the crt. Geometry adjustment R943 varies the positive level on the geometry element to control the overall geometry of the display. TRACE ROTATION adjustment R949 controls the current through L980 to provide adjustment of the display alignment.

LOW-VOLTAGE POWER SUPPLY ◈6◈

The Low-Voltage Power Supply provides the operating power for the Monitor. Electronic regulation is used to provide stable, low-ripple output voltages. A schematic diagram of the Low-Voltage Power Supply is shown on diagram 6 at the rear of this manual. A detailed block diagram, showing each major stage of this circuit, is superimposed on the schematic with wide shaded lines. The stage names (given as sub-heading in the following discussion) can be found in the shaded blocks on diagram 6.

POWER INPUT

Power is applied to the primary of transformer T950 through fuse F950, thermal cutout S960, ON/OFF switch S950, and Line-Voltage Selector plug P951 or P952. The Line-Voltage Selector plugs allow changing the primary winding taps of T950 to meet different line-voltage and regulating range requirements. Line fuse F950 should be changed for each nominal line voltage (current rating of fuse for 220-volt operation must be 0.4 A slow-blowing type; for 120-volt operation the current rating of the fuse must be 0.8 A slow-blowing type).

Thermal cutout S960 provides thermal protection for this instrument. If the internal temperature of the instrument exceeds a safe operating level, S960 opens to interrupt the applied power. When the temperature returns to a safe level, S960 automatically closes to re-apply the power.

RECTIFIER AND FILTER

A full-wave bridge circuit, composed of CR951-CR952-CR953-CR954 rectifies the ac voltage from the secondary of T950. Filtering is provided by C951 and C952.

+18-VOLT UNREGULATED SUPPLY

The +18-Volt Unregulated Supply provides unregulated power for the high-voltage transformer (T850) on diagram 5. Fuse F951 provides circuit protection in the event of an overload.

+15-VOLT REGULATED SUPPLY

The +15-Volt Regulated Supply, in addition to providing power to circuitry throughout the instrument, provides a reference-voltage source to establish the operating level for the feedback regulator of the -15-Volt Regulated Supply. The regulator for the +15-Volt Regulated Supply is a feedback amplifier system that operates between ground and the +18-Volt Unregulated Supply. Current to the load is delivered by series-pass transistor Q955, which is located in the output side of the supply. The supply voltage is established by the drop across resistive-divider network R959-R958-R957. The feedback trhough this network is compared to the reference level established at the base of Q965 by the voltage drop across VR968. Any variation in output voltage of the supply (due to ripple, change of current through the load, etc.), is immediately transmitted to the base of Q955 and nullified by a change in Q955 conduction, maintaining a steady output.

The output of the supply is set to exactly +15 volts by adjustment of R958, the +15-V Adjust.

Transistor Q970 protects the +15-volt series regulator (Q955) if excess current is demanded from this supply. Essentially, all current from this supply flows through R954. When excess current is demanded from the +15-volt series regulator, due to a short circuit or similar malfunction at the output of this supply, the voltage drop across R954 increases enough to turn on Q970. The resulting current through Q970 reduces the conduction of Q955 to limit the supply current to a safe level. Fuse F953 provides circuit protection in the event of an overload or regulator malfunction.

-15-VOLT REGULATED SUPPLY

The regulator for the -15-Volt Regulated Supply consists of series-pass transistor Q976 and error amplifier Q987-Q944-Q981. This is a feedback

amplifier system similar to that just described for the +15-Volt Regulated Supply.

The center of resistive-divider network R978-R979 is set by the error amplifier to be zero volts, with respect to ground, during normal operation. Any variation in output from the -15-Volt Regulated Supply is coupled to the error amplifier, which changes the bias of the -15-volt series regulator (Q976). This change in bias, and resulting change in conduction of the regulator, nullifies the output variation to maintain a steady level from the supply.

Diode CR993 protects the -15-volt series regulator (Q976) if excess current is demanded from this supply. Essentially, all current from this supply flows through R975. When excess current is demanded from the -15-volt series regulator, due to a short circuit or similar malfunction at the output of this supply, the voltage drop across R954 increases enough to forward bias CR993. This increases the conduction of Q994, which then reduces the conduction of Q976 to limit the supply current to a safe level. Fuse F955 provides circuit protection in the event of an overload or regulator malfunction.

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MAINTENANCE

This section of the manual contains information for performing preventive maintenance, troubleshooting, and corrective maintenance for the 608 Monitor.

PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the instrument. The severity of the environment to which the instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding electrical adjustment of the instrument.

CLEANING

The 608 Monitor should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket which prevents efficient heat dissipation, and also provides an electrical conduction path which may result in instrument failure. Cabinet panels will provide added protection against dust in the interior of the instrument.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Use a non-residue type of cleaner, preferably isopropyl alcohol, total denatured ethyl alcohol, or TP35. Before using any other type of cleaner, consult your Tektronix Service Center.

EXTERIOR

Loose dust accumulated on the outside of the instrument can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

CRT

Clean the crt faceplate with a soft, lint-free cloth dampened with denatured alcohol.

INTERIOR

Cleaning the interior of the instrument should only be occasionally necessary. The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air (approximately 5 lb/in^2). Remove any dirt which remains with a soft brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces, or for cleaning more delicate circuit components.

CAUTION

Circuit boards and components must be dry before applying power to the instrument to prevent damage from electrical arcing.

The high-voltage circuits should receive special attention. Excessive dirt in this area may cause high-voltage arcing and result in improper instrument operation.

VISUAL INSPECTION

The 608 Monitor should be inspected occasionally for such defects as broken connections, improperly installed circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged parts are found. Overheating usually indicates other trouble in the instrument; therefore, the cause of overheating must be corrected to prevent recurrence of the damage.

SEMICONDUCTOR CHECKS

Periodic checks of semiconductors are not recommended. The best check of semiconductor performance is actual operation in the instrument. More details on semiconductors are given under Troubleshooting later in this section.

PERIODIC ELECTRICAL ADJUSTMENT

To ensure accurate measurements, check the electrical adjustment of this instrument after each 1000 hours of operation, or every six months if used infrequently. In addition, replacement of components may necessitate adjustment of the affected circuits. Complete adjustment instructions are given in Section 6, Performance Check and Adjustment. This procedure can be helpful in localizing certain troubles in the instrument, and in some cases, may correct them.

TROUBLESHOOTING

The following information is provided to facilitate troubleshooting of the 608 Monitor. Information contained in other sections of this manual should be used in conjunction with the following data to aid in locating a defective component. An understanding of the circuit operation is helpful in locating troubles. See Section 4, Theory of Operation, for this information.

TROUBLESHOOTING AIDS

DIAGRAMS

Complete schematic diagrams are given on the foldout pages in Section 8, Diagrams and Circuit Board Illustrations. Schematic diagrams for the various Options available are given in Section 9, Instrument Options. The component number and electrical value of each component in this instrument are shown on these diagrams. (See the first page of the Diagrams and Circuit Board Illustrations section for definitions of the reference designators and symbols used to identify components in this instrument.) Important voltages and numbered waveform test points are also shown on the diagrams. Important waveforms, and the numbered test points where they were obtained, are located adjacent to each diagram. The portions of circuits mounted on circuit boards are enclosed with heavy solid black lines. Each schematic diagram is divided into functional stage blocks, as indicated by the wide shaded lines. These functional blocks are described in detail in Section 4, Theory of Operation.

CIRCUIT BOARD ILLUSTRATIONS

To aid in locating circuit boards, a circuit board location illustration appears on the back of the foldout page facing each schematic diagram. In addition, an illustration of the circuit board is included here, with the physical location of the components and waveform test points that appear on the schematic diagram identified. Each circuit board illustration is arranged in a grid locator with an index to facilitate rapid location of components contained in the schematic diagrams.

TROUBLESHOOTING CHART

A troubleshooting chart is given in Section 8, Diagrams and Circuit Board Illustrations, to aid in locating a defective circuit. The shaded blocks of the Troubleshooting Chart indicate stages which may cause the indicated malfunction. The stage names given in shaded blocks correspond directly to the names given in the functional stage blocks of the schematic diagrams. The circuits are discussed in detail in Section 4, Theory of Operation.

TEST POINT AND ADJUSTMENT LOCATIONS

To aid in locating test points and adjustable components called out in the Performance Check and Adjustment procedure, a "Test Point and Adjustment Locations" foldout page is provided in Section 8, Diagrams and Circuit Board Illustrations.

COMPONENT COLOR CODING

The instrument contains composition resistors, some metal-film resistors and some wire-wound resistors. The resistance values of wire-wound resistors are usually printed on the component body. The resistance values of composition resistors and metal-film resistors are color coded on the components using the EIA color code (some metal-film resistors may have the value printed on the body). The color code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes, which consist of two significant figures, a multiplier, and a tolerance value (see Fig. 5-1). Metal film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

COLOR CODE

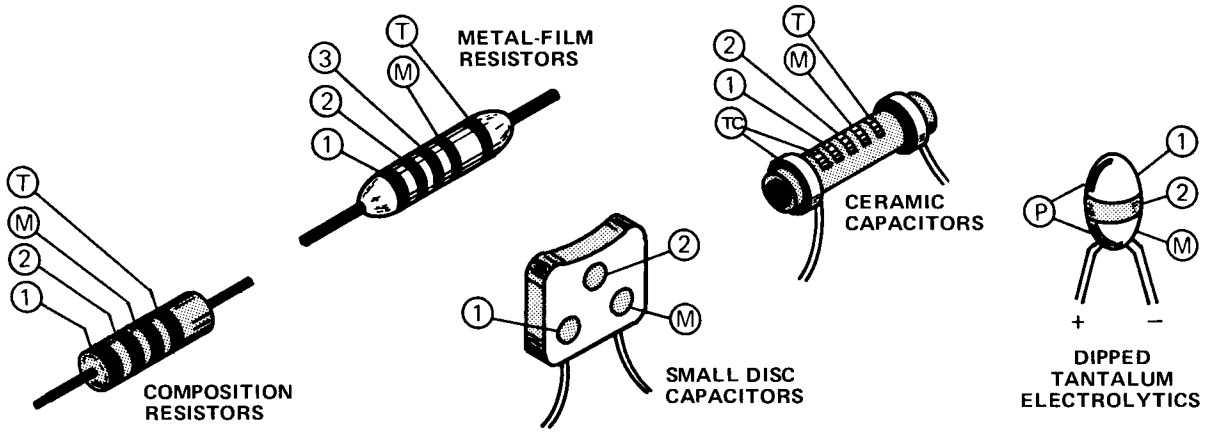
(1) (2) AND (3) - 1st, 2nd, AND 3rd SIGNIFICANT FIGS.

(M) - MULTIPLIER; (T) - TOLERANCE;

(TC) - TEMPERATURE COEFFICIENT.

(T) AND/OR (TC) COLOR CODE MAY NOT BE PRESENT ON SOME CAPACITORS;

(P) - POSITIVE (+) POLARITY AND VOLTAGE RATING.



COLOR	SIGNIFICANT FIGURES	RESISTORS		CAPACITORS			DIPPED TANTALUM VOLTAGE RATING
		MULTIPLIER (OHMS)	TOLERANCE	MULTIPLIER (pF)	TOLERANCE		
					OVER 10pF	UNDER 10pF	
BLACK	0	1	---	1	±20%	± 2pF	4VDC
BROWN	1	10	±1%	10	±1%	±0.1pF	6VDC
RED	2	10^2 or 100	±2%	10^2or 100	±2%	---	10VDC
ORANGE	3	10^3or 1 K	±3%	10^3 or 1000	±3%	---	15VDC
YELLOW	4	10^4 or 10K	±4%	10^4 or 10,000	+100% −0%	---	20VDC
GREEN	5	10^5 or 100 K	±1/2%	10^5or 100,000	±5%	±0.5pF	25VDC
BLUE	6	10^6 or 1 M	±1/4%	10^6 or 1,000,000	---	---	35VDC
VIOLET	7	---	±1/10%	10^7 or 10,000,000	---	---	50VDC
GRAY	8	---	---	10^{-2} or 0.01	+80% −20%	±0.25pF	---
WHITE	9	---	---	10^{-1} or 0.1	±10%	±1pF	3VDC
GOLD	---	10^{-1} or 0.1	±5%	---	---	---	---
SILVER	---	10^{-2} or 0.01	±10%	---	---	---	---
NONE	---	---	±20%	---	±10%	±1pF	---

(1862-74) 1866-57

Figure 5-1. Color code for resistors and capacitors.

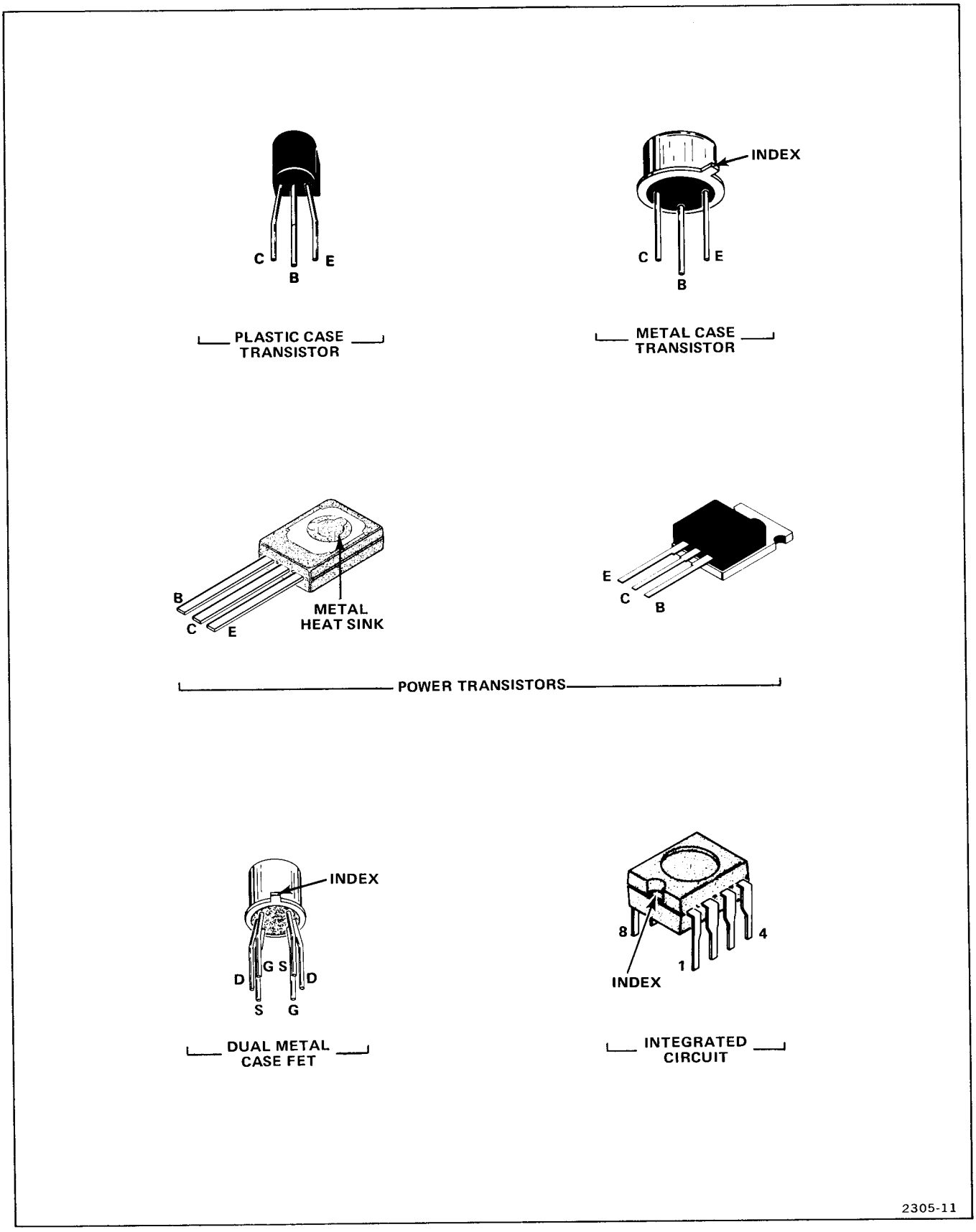


Figure 5-2. Semiconductor lead configurations.

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The values of common disc capacitors and small electrolytics are marked on the side of the component body. The white ceramic and epoxy-coated tantalum capacitors used in the instrument are color coded using a modified EIA code (see Fig. 5-1).

The cathode end of glass-encased diodes is indicated by a stripe, a series of stripes, or a dot. The cathode and anode ends of metal-encased diodes can be identified by the diode symbol marked on the body.

SEMICONDUCTOR LEAD CONFIGURATIONS

Figure 5-2 shows the lead configurations of the semiconductors used in the 608 Monitor.

MULTI-CONNECTOR HOLDERS

The multi-connector holders are keyed with two triangles, one on the holder and one on the circuit board. When a connection is made perpendicular to a circuit board surface, the orientation of the triangle on the end-lead multi-pin connector holder is determined by the placement of the multi-pin connector index (see Fig. 5-3).

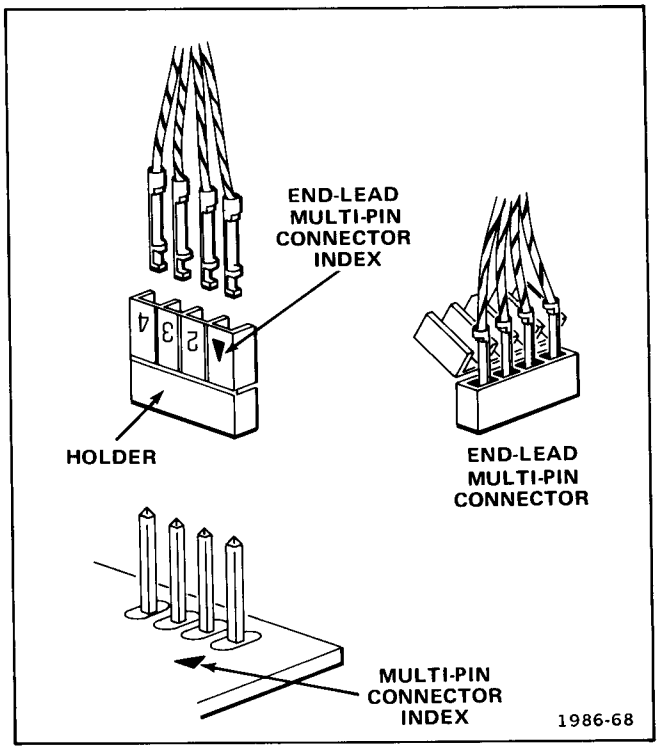


Figure 5-3. Orientation of multi-connector holders.

TROUBLESHOOTING EQUIPMENT

The following equipment, in addition to that listed in the Performance Check and Adjustment section, is useful for troubleshooting the 608 Monitor:

Semiconductor Tester

Description: Dynamic-type tester.

Purpose: To test the semiconductors used in this instrument.

Recommended Type: TEKTRONIX Type 576 Curve Tracer or equivalent.

Test Oscilloscope

Description: Frequency response, dc to twenty-five megahertz minimum (to fifty megahertz for troubleshooting the Z-Axis Amplifier); deflection factor, one millivolt/division to five volts/division. A 10X, ten megohm voltage probe should be used to reduce circuit loading for voltage measurements.

Purpose: To check operating waveforms.

TROUBLESHOOTING TECHNIQUES

This troubleshooting procedure is arranged in an order that checks the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks assure proper connection, operation, and adjustment. If the trouble is located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, replace it using the replacement procedure given under Component Replacement in this section.

1. CHECK CONTROL SETTINGS

Incorrect control settings can simulate a trouble that does not exist. If there is any question about the correct function or operation of any control on the 608, refer to Section 2, Operating Instructions.

2. CHECK ASSOCIATED EQUIPMENT

Before proceeding with troubleshooting, check that the equipment used with this instrument is operating correctly. Also, check that the input signals are properly connected and that the interconnecting cables are not defective. Check the line-voltage source.

WARNING

Although this Monitor is not to be connected to a patient, interconnecting this Monitor to other equipment can result in the application of excessive current to a patient. It is extremely important that the interconnection is made in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Areas of Health Care Facilities, section 3038, "Signal Transmission Between Appliances".

3. VISUAL CHECK

Visually check that portion of the instrument in which the trouble is located. Many troubles can be found by visible indications, such as unsoldered connections, broken wires, damaged circuit boards and damaged components.

4. CHECK INSTRUMENT ADJUSTMENT

Check the electrical adjustment of this instrument, or of the affected circuit if the trouble appears in one circuit. The apparent trouble may only be a result of misadjustment. Complete adjustment instructions are given in Section 6, Performance Check and Adjustment.

5. ISOLATE TROUBLE TO A CIRCUIT

To isolate trouble to a particular circuit, note the trouble symptom. The symptom often identifies the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check the affected circuits by taking voltage and waveform readings.

Incorrect operation of all circuits often indicates trouble in the power supplies. Check first for the correct output voltage of the individual supplies. A defective component elsewhere in the instrument can appear as a power-supply trouble and may also affect the operation of other circuits. Table 5-1 lists the output voltage range and typical ripple of the power supplies in this instrument. These voltages are measured between the power-supply test points and ground (see the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations, for test point locations). If the power-supply voltage and ripple is within the listed range, the supply can be assumed to be working correctly. If outside the range, the supply may be misadjusted or operating incorrectly. Use the procedure given in Section 6, Performance Check and Adjustment, to adjust the power supplies.

Figure 8-9 in Section 8, Diagrams and Circuit Board Illustrations, provides a guide for locating a defective circuit. Start at the top left of the Troubleshooting Chart and perform the checks given across the top of the chart until the indicated results are not found. Then proceed to further checks, or the circuit in which trouble is suspected, as listed beneath the step. The shaded blocks of the Troubleshooting Chart indicate circuit stages that may cause the malfunction, and correspond directly to the functional blocks on the schematic diagrams. The circuits listed are discussed in detail in Section 4, Theory of Operation. After the defective circuit has been located, proceed with steps 6 and 7 of Troubleshooting Techniques to isolate the defective component.

6. CHECK VOLTAGES AND WAVEFORMS

Often the defective component can be located by checking for the correct voltages or waveforms in the circuit. Typical voltages and waveforms are given in Section 8, Diagrams and Circuit Board Illustrations.

TABLE 5-1
Power Supply Output Voltage

Power Supply	Test Point	Output Voltage Range	Typical Ripple (peak-to-peak)
-15 V	-15V TP	-14.7 V to -15.3 V	2 mV or less.
+15 V (Adjustable)	+15V TP	+14.96 V to +15.04 V	2 mV or less.
+100 V	+100V TP	+97 V to +103 V	50 mV or less.

NOTE

Voltages and waveforms given in Section 8, Diagrams and Circuit Board Illustrations, are not absolute and may vary slightly between 608 Monitors. To obtain operating conditions similar to those used to make these readings, see the appropriate schematic.

7. CHECK INDIVIDUAL COMPONENTS

The following procedures describe methods of checking individual components in the 608 Monitor. Components which are soldered in place are best checked by first disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

WARNING

To avoid electric shock, always disconnect the Monitor from the power source before replacing components.

Fuses

Check for open fuses by checking the continuity with an ohmmeter. The location and rating of power-supply fuses is shown in Figure 5-4.

Transistors

A good check of transistor operation is actual performance under operating conditions. A transistor can most effectively be checked by substituting a new component for it (or one which has been checked previously). However, be sure that circuit conditions

are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester. Static-type testers are not recommended, since they do not check operation under simulated operating conditions.

Integrated Circuits

Integrated circuits can be checked with a voltmeter, test oscilloscope, or by direct substitution. A good understanding of the circuit operation is essential when troubleshooting circuits using integrated circuits. In addition, operating waveforms, logic levels, and other operating information for the integrated circuits are given in Section 4, Theory of Operation, and Section 8, Diagrams and Circuit Board Illustrations. Use care when checking voltages and waveforms around the integrated circuits so that adjacent leads are not shorted together. A convenient means of clipping a test probe to the in-line multi-pin integrated circuits is with an integrated-circuit test clip. This device also doubles as an integrated-circuit extraction tool.

Diodes

A diode can be checked for an open or shorted condition by measuring the resistance between terminals with an ohmmeter scale having a low internal source current, such as the R X 1K scale. The resistance should be very high in one direction and very low when the meter leads are reversed.

CAUTION

When checking diodes, do not use an ohmmeter scale that has a high internal current, since high currents may damage the diodes under test.

Resistors

Check the resistors with an ohmmeter. Resistor tolerance is given in Section 7, Replaceable Electrical Parts. Normally, resistors do not need to be replaced unless the measured value varies widely from the specified value.

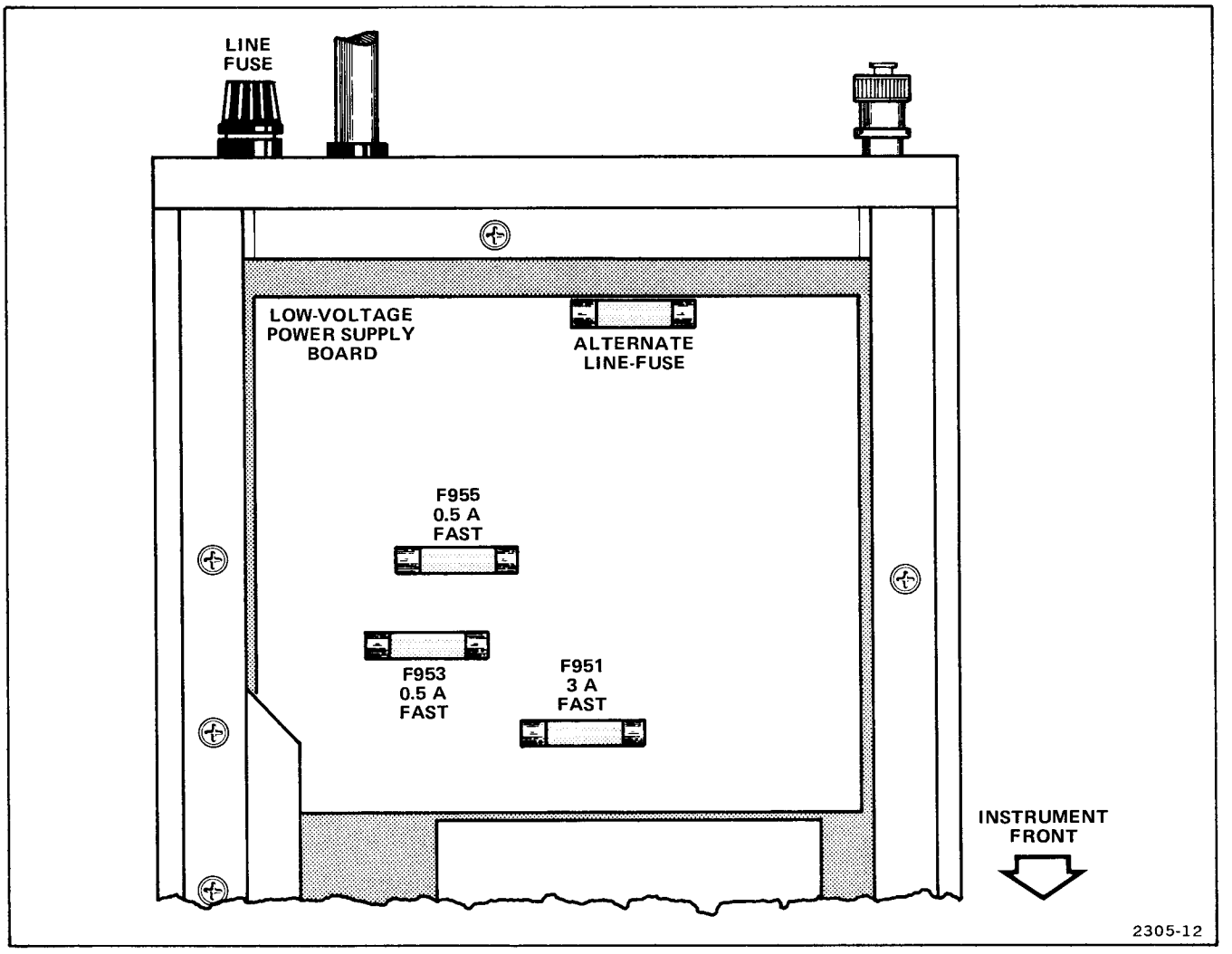


Figure 5-4. Location and rating of power-supply fuses.

Capacitors

A leaky or shorted capacitor can best be detected by checking resistance with an ohmmeter on the highest scale. Do not exceed the voltage rating of the capacitor. The resistance reading should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacitance meter or by checking if the capacitor passes ac signals.

8. REPAIR AND READJUST THE CIRCUIT

If any defective parts are located, follow the replacement procedures given under Component Replacement in this section. Check the performance of any circuit that has been repaired or that has had any electrical components replaced. Adjustment of the circuit may be necessary.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in the 608 Monitor are given here.

OBTAINING REPLACEMENT PARTS

STANDARD PARTS

All electrical and mechanical part replacements can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before ordering or purchasing replacement parts, check the parts list for value, tolerance, rating, and description.

NOTE

When selecting replacement parts, remember that the physical size and shape of a component may affect its performance in the instrument. All replacement parts should be direct replacements unless you know that a different component will not adversly affect instrument performance.

SPECIAL PARTS

Some components of the 608 are manufactured or selected by Tektronix, Inc. to meet specific performance requirements. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local Tektronix Field Office or representative.

ORDERING PARTS

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include the circuit number).
4. Tektronix part number.

SOLDERING TECHNIQUES

WARNING

To avoid electric shock, disconnect the Monitor from the power source before soldering.

The reliability and accuracy of this instrument can be maintained only if proper soldering techniques are used when repairing or replacing parts. General soldering techniques which apply to maintenance of any precision electronic equipment should be used when working on this instrument. Use only 60/40 resin-core, electric-grade solder. The choice of soldering iron is determined by the repair to be made. When soldering on circuit boards or small wiring, use only a 15-watt, pencil-type soldering iron. A higher wattage soldering iron can cause the etched circuit wiring to separate from the board base material and melt the insulation from small wiring. Always keep the soldering-iron tip properly tinned to ensure the best heat transfer to the solder joint. Apply only enough heat to remove the component or to make a good solder joint. To protect heat-sensitive components, hold the component lead with a pair of long-nose pliers between the component body and the solder joint. Use a solder-removing wick to remove excess solder from connections or to clean circuit board pads.

The following technique should be used to replace a component on any of the circuit boards in this instrument. Most components can be replaced without removing the board(s) from the instrument.

1. Touch the soldering iron to the lead at the solder connection. Never place the iron directly on the board, as this may damage the board.

2. Melt a small amount of solder onto the component lead connection. This replaces the flux, which may have been removed during instrument cleaning, and facilitates removal of the component.

3. Grip the component lead with a pair of long-nose pliers. When the solder begins to flow, gently pull the component lead from the board. If unable to separate the lead from the board, try removing the other end of the component.

NOTE

Some components are difficult to remove from the circuit board due to a bend placed in each lead during machine insertion of the component. The purpose of the bent leads is to hold the component in position during a flow-solder manufacturing process which solders all components at once. To make removal of machine inserted components easier, straighten the leads of the component on the back of the circuit board using a small screwdriver or pliers, while heating the soldered connection.

4. Bend the leads of the replacement component to fit the holes in the circuit board. If the component is replaced while the board is mounted in the instrument, cut the leads so they will just protrude through the board. Insert the leads into the holes in the board so that the component is firmly seated against the board, or as originally positioned.

5. Touch the iron to the connection and apply enough solder to make a firm solder joint.

6. Cut off any excess lead protruding through the board (if not clipped in step 4).

7. Clean the area around the solder connection with a flux-removing solvent. Be careful not to remove information printed on the circuit board.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

To avoid electric shock, always disconnect the Monitor from the power source before replacing components.

The exploded-view drawings associated with the Replaceable Mechanical Parts list (located at the rear of this manual) may be helpful in the removal or disassembly of individual components or sub-assemblies.

CATHODE-RAY TUBE REMOVAL

Remove the cathode-ray tube (crt) as follows (see Fig. 5-5).

WARNING

Use care when handling a crt. Breakage of the crt causes a high-velocity scattering of glass fragments (implosion). Protective clothing and safety glasses should be worn. Avoid striking the crt on any object which might cause it to crack or implode. When storing a crt, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate.

NOTE

This procedure and Figure 5-5 depict the Option 30 instrument with the full crt shield. However, the procedure is essentially the same for the standard 608 Monitor.

1. Remove the bezel assembly and snap-in implosion shield with graticule by removing the 2 bezel securing screws on the front of the instrument.

2. Remove any protective side cabinet panels to gain access to the crt leads.

3. Disconnect the 4 leads from the crt X and Y deflection plate pins, and the lead from the crt focus-element pin.

NOTE

The red and black leads entering the crt shield from the Low-Voltage Power Supply board and rear-panel TRACE ROTATION control are connected to the display-rotation coil inside the shield. They will not hamper crt removal and need not be disconnected.

4. Disconnect the anode lead from the crt anode plug. Ground this lead to the chassis to dissipate any stored charge remaining in the crt.

5. Remove the 5 crt rear-cover securing screws and remove the cover.

6. Remove the crt base-pin socket.

7. With one hand on the front of the instrument, gently push on the crt base to slide the crt forward. The crt front supports will slide out with the crt.

8. Remove the crt front supports and gently pull the crt out from the front of the instrument while guiding the crt anode plug through the hole in the crt shield.

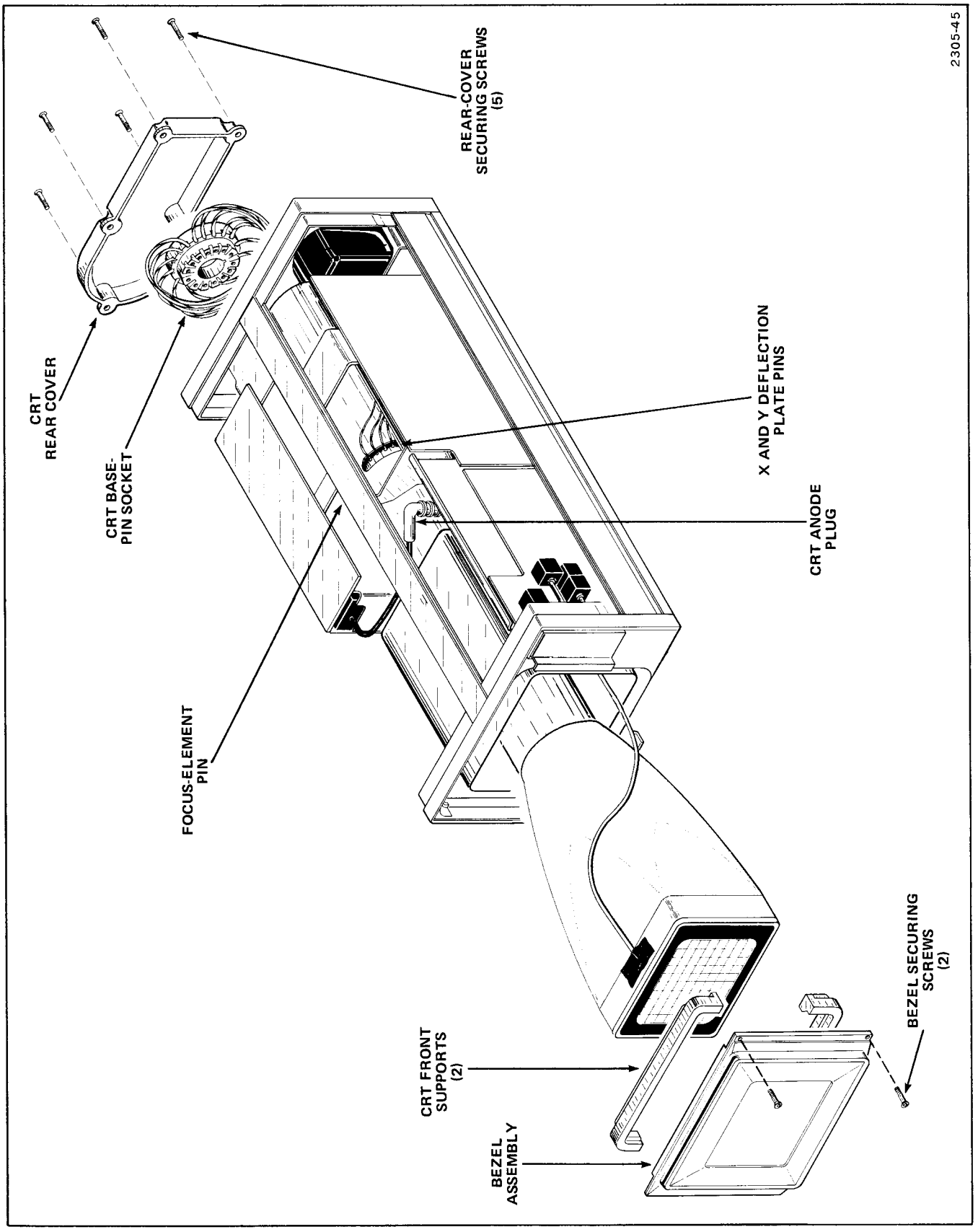


Figure 5-5. Cathode-ray tube (crt) removal and replacement.

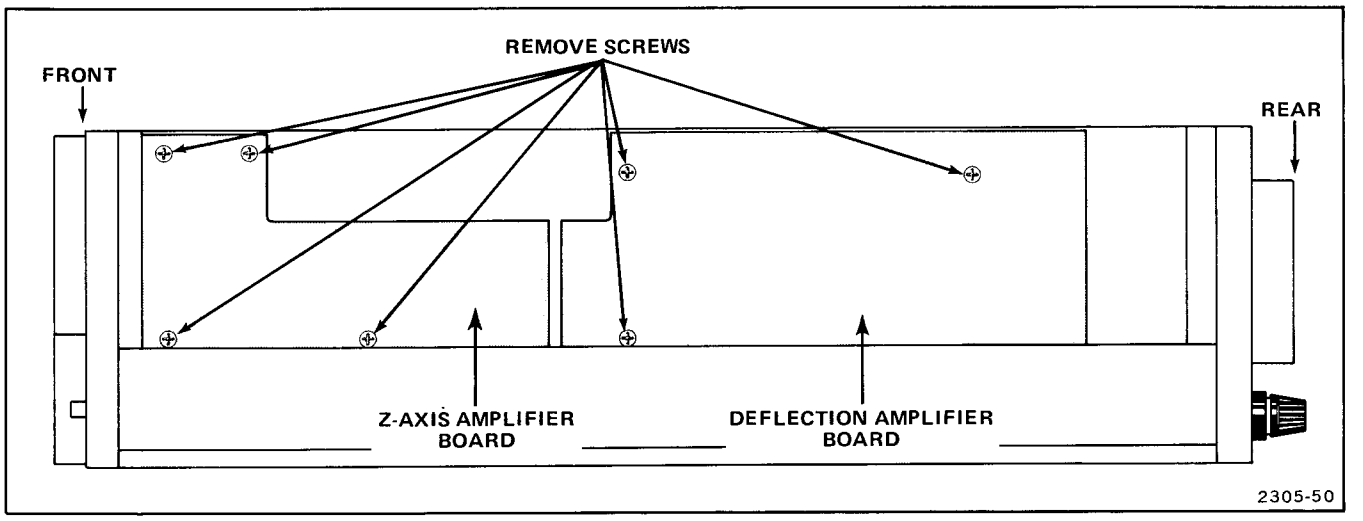


Figure 5-6. Location of screws securing A1 Deflection Amplifier and A2 Z-Axis Amplifier boards.

CATHODE-RAY TUBE REPLACEMENT

Replace the cathode-ray tube (crt) as follows (see Fig. 5-5):

NOTE

This procedure and Figure 5-5 depict the Option 30 instrument with the full crt shield. However, the procedure is essentially the same for the standard 608 Monitor.

1. Press the crt front supports into the front-panel recesses.

2. Insert the neck of the crt part way into the shield.

3. Feed the crt anode plug through the hole in the shield, and fully insert the crt into the shield.

4. Connect the crt anode plug to the mating jack.

5. Mount and fasten the bezel and implosion shield to the front panel with the 2 bezel securing screws.

6. Place the crt base-pin socket onto the crt base pins and replace the rear cover.

7. Connect the 4 leads to the proper X and Y deflection pins, and the lead to the crt focus-element pin.

NOTE

The replacement crt will require that the Monitor be readjusted. Refer to Section 6, Performance Check and Adjustment.

CIRCUIT BOARDS

If a circuit board is damaged beyond repair, the entire assembly, including all soldered-on components, can be replaced. Part numbers for the completely wired boards are given in Section 7, Replaceable Electrical Parts.

A1 Deflection Amplifier and A2 Z-Axis Amplifier Boards

Remove and replace the Deflection Amplifier and Z-Axis Amplifier boards as follows (see Fig. 5-6):

1. Remove the seven screws shown in Figure 5-6.

2. Disconnect all cables, except the deflection leads, from the front of the Deflection and Z-Axis Amplifier boards. Disconnect the cable from the back of the Z-Axis Amplifier board.

3. Disconnect the deflection leads from the crt neck pins.

4. Remove both circuit boards as an assembly by pulling the Deflection Amplifier board up to disengage the inter-board connector, and pulling both boards towards the rear of the instrument until the ASTIG, X GAIN, and Y GAIN controls clear the front panel.

5. To separate the two boards, pull them apart until the inter-board connector disengages.

6. Reverse this procedure to reassemble.

A3 Dynamic Focus and A5 Low-Voltage Power Supply Boards

Remove the Dynamic Focus and Low-Voltage Power Supply boards as follows (see Fig. 5-7):

1. Unsolder the wires to the power transistors (Q816, Q818), noting the position and orientation of each wire.

2. Remove the eight screws shown in Figure 5-7.

3. Remove the mounting bracket.

4. Remove the two spring clips holding the power transistors to the heatsink.

5. Separate the inter-board connections by carefully pulling the Low-Voltage Power Supply board out toward the bottom of the instrument.

6. With the boards loose, separate the Dynamic Focus board by pulling it away from the Low-Voltage Power Supply board.

7. Extend the Low-Voltage Power Supply board from the chassis as far as possible and unsolder all remaining wires from the board, noting the position of each wire.

NOTE

The Dynamic Focus board can be removed separately. First remove the 2 screws securing the board to the chassis and then slide the board toward the instrument front to disengage the inter-board connector.

8. Reverse this procedure to reassemble.

A4 High-Voltage Power Supply Board

Remove the High-Voltage Power Supply board as follows (see Fig. 5-8):

1. Remove the 3 screws securing the high-voltage shield to the top of the chassis and remove the shield.

2. Disconnect the crt anode lead from the high-voltage multiplier (see Fig. 5-8). Ground the anode lead to the chassis to dissipate any stored charge remaining in the crt.

3. Unsolder the leads from the high-voltage multiplier.

4. Loosen the two nuts holding the high-voltage multiplier to the chassis.

5. Remove the high-voltage multiplier.

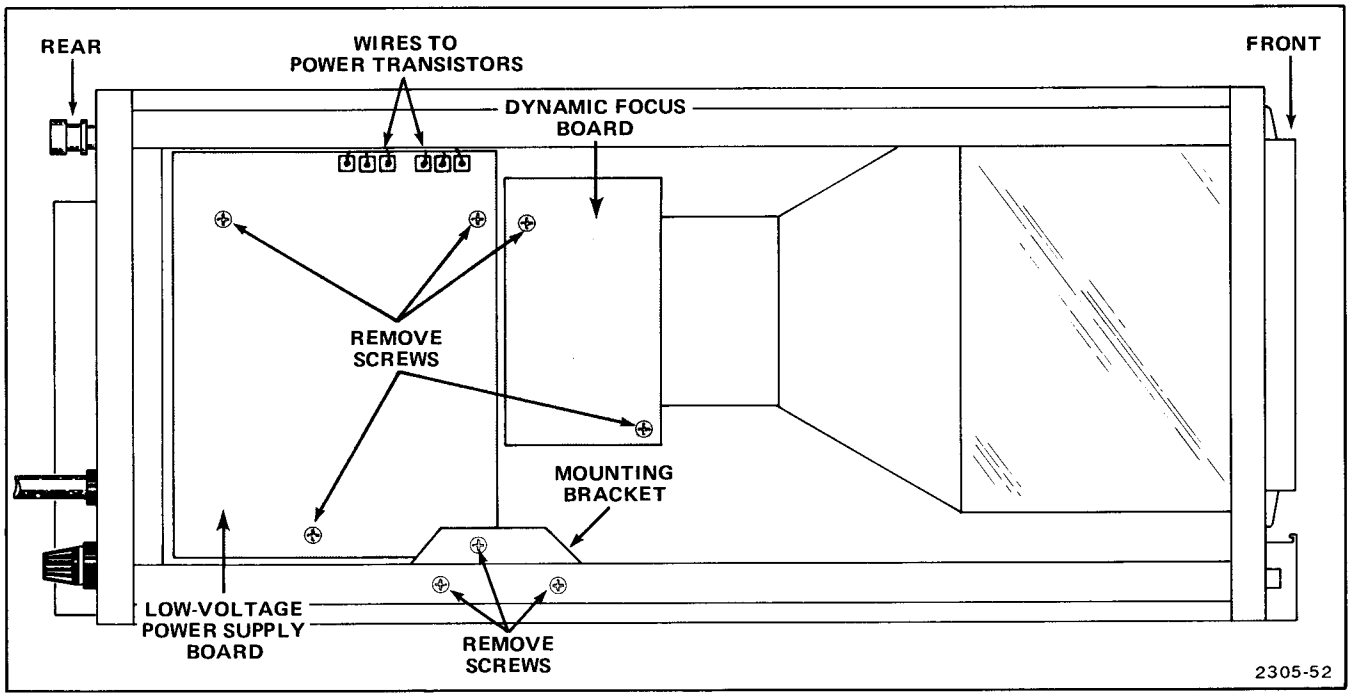


Figure 5-7. Location of screws securing A3 Dynamic Focus and A5 Low-Voltage Power Supply boards.

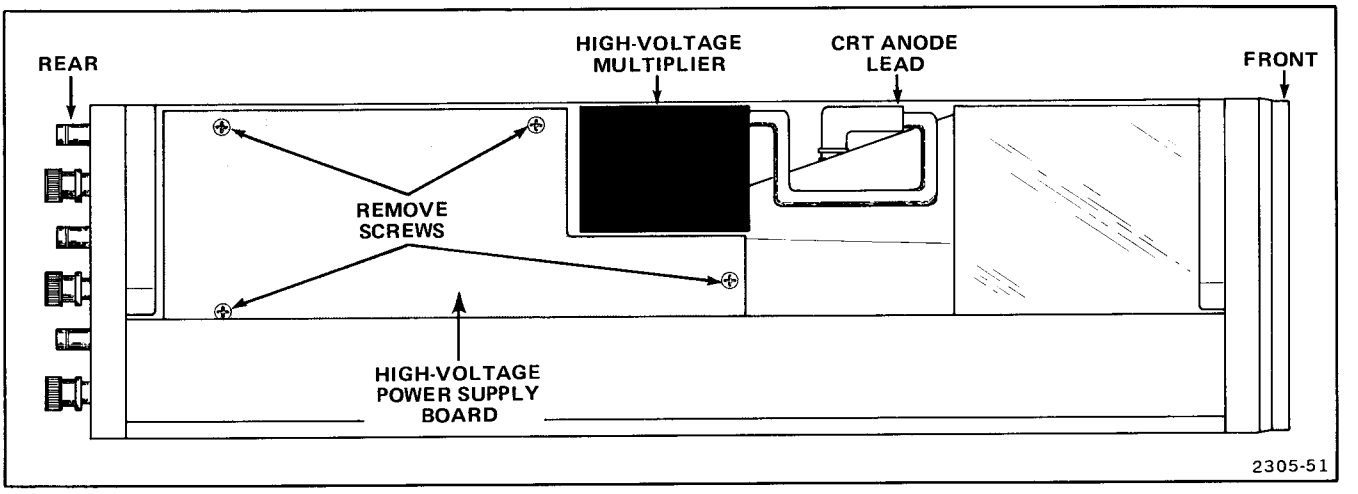


Figure 5-8. Location of screws securing A4 High-Voltage Power Supply board.

6. Disconnect the focus-element lead from the crt neck pin.

7. Disconnect all plug-on cables from the front and back of the board, noting their positions and orientation.

8. Remove the four screws shown in Figure 5-8.

9. Pull the circuit board up (toward the top of the instrument) to disengage the inter-board connector at the bottom of the board.

10. Reverse this procedure to reassemble, being careful to align the inter-board connector to the pins on the Low-Voltage Power Supply board.

SEMICONDUCTORS

Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the adjustment of the instrument. When semiconductors are replaced, check the operation of circuits which may be affected.

WARNING

To avoid electric-shock hazard, always disconnect the Monitor from the power source before replacing components.

Replacement semiconductors should be of the original type or a direct replacement. Lead configurations of the semiconductors used in this instrument are shown in Figure 5-2. Some plastic case transistors have lead configurations which do not agree with those shown. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets in the 608 are wired for the standard basing as used for metal-cased transistors. When removing soldered-in transistors, use a solder-removing wick to remove the solder from the circuit board pads. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace silicone grease on both sides of the insulator plate and on the metal tab, if the transistor has one, when replacing these transistors.

WARNING

Handle silicone grease with care. Avoid getting silicone grease in your eyes. Wash hands thoroughly after use.

An extracting tool should be used to remove the in-line integrated circuit to prevent damaging the pins. This tool is available from Tektronix, Inc., order Tektronix Part 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the integrated circuit. Try to avoid one end disengaging from the socket before the other end.

CIRCUIT-BOARD PIN REPLACEMENT

A circuit-board pin replacement kit, including necessary tools, instructions, and replacement pins with attached spare ferrules, is available from Tektronix, Inc. Order Tektronix Part 040-0542-00.

To replace a damaged pin, first disconnect any pin connectors. Then unsolder the damaged pin (see Soldering Techniques) and pull it from the board with a pair of pliers, leaving the ferrule (see Fig. 5-9) in

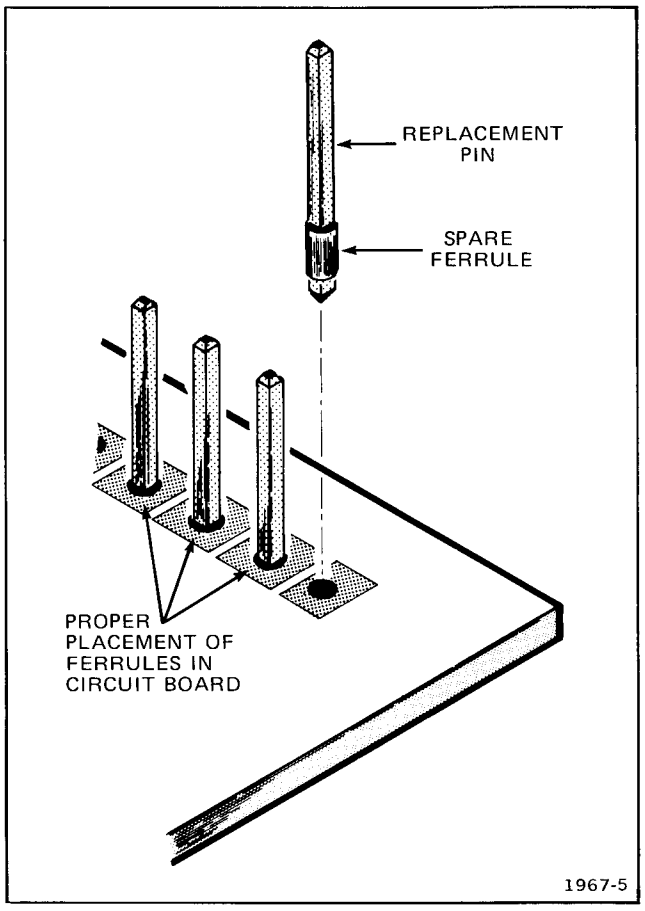


Figure 5-9. Exploded view of circuit-board pin and ferrule.

the hole if possible. If the ferrule remains in the circuit board, remove the spare ferrule from the replacement pin and press the new pin into the hole in the circuit board. If the ferrule is removed with the damaged pin, clean out the hole using a solder-removing wick and a scribe. Then press the replacement pin, with attached spare ferrule, into the hole. Position the replacement pin in the same manner as the original pin had been. Solder the pin to the circuit board on each side of the circuit board. If the original pin was bent at an angle to mate with a connector, carefully bend the new pin to the same angle. Replace the pin connector.

END-LEAD PIN CONNECTORS

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the associated leads. To remove or replace damaged end-lead pin connectors, remove the old pin connector from the end of the lead and clamp the replacement connector to the lead.

Some of the pin connectors are grouped and mounted in a plastic holder; the overall result is that these connectors are removed and installed as a multi-pin connector (see Troubleshooting Aids). If the individual end-lead pin connectors are removed from the plastic holder, note the order of the individual wires for correct replacement in the holder.

PERFORMANCE CHECK AND ADJUSTMENT

This section provides information necessary to: (1) Verify that this instrument meets the electrical specifications in Section 1, General Information, (2) verify that all controls function properly, and (3) perform all internal adjustments. A separate Functional Check procedure, in the Operating Instructions section, can be used to only check the functions of the front- and rear-panel controls and connectors.

PRELIMINARY INFORMATION

USING THIS PROCEDURE

The Performance Check and Adjustment procedures are combined to provide a complete sequential check of instrument performance and make the necessary internal adjustments all at the same time. The procedures are divided into functional block subsections (e.g., A. Power Supply, B. Crt Circuit and Dynamic Focus, etc.). The order in which the subsections and steps appear is the recommended sequence for a complete performance check and adjustment of the instrument. Each subsection procedure can be performed independently. Any step (A1, A2, B1, B2, etc.) within any subsection can also be performed independently, which makes it possible to omit the adjustments and accomplish a Performance Check only. Refer to Partial Procedures for specific instructions on performing a partial procedure.

The functional block subsections begin with a list of required test equipment followed by the Preliminary Control Settings. Each step contains separate setup conditions which, if applicable, include the instrument control settings, an illustrated test setup, and test equipment control settings. The control settings listed under Setup Conditions may include additional settings, changes from the previous step, or changes to the Preliminary Control Settings that are required to perform the procedure. In some instances, the control settings will be repeated from the previous procedure or from the subsection's Preliminary Control Settings. This is necessary to accommodate those who wish to perform just the performance check portions of the procedures. Refer to the following discussion under Partial Procedures for detailed information.

Partial Procedures

A heading system is provided to readily identify the procedures that contain performance check and/or adjustment instructions. For example, if CHECK appears in the title of a step (A1, A2, B1, B2, etc.), the procedure checks a performance requirement listed in the Specifications in Section 1, General Information.

If ADJUST appears as the first word in the title, the procedure concerns one or more internal adjustments. And if CHECK/ADJUST appears in the title, the procedure involves one or more performance requirement checks and adjustments.

The alphabetical instructions under each step (a, b, c, etc.) may contain CHECK, EXAMINE, ADJUST, or INTERACTION as the first word of the instruction. These terms are defined as follows:

1. **CHECK**—indicates that the instruction accomplishes a performance requirement check.

2. **EXAMINE**—usually precedes an ADJUST instruction and describes how to determine whether the adjustment is necessary.

3. **ADJUST**—describes which adjustment to make and the desired result. It is not recommended that adjustments be made if a previous CHECK or EXAMINE instruction indicates that no adjustment is necessary.

4. **INTERACTION**—indicates that the adjustment described in the preceding instruction interacts with other circuits. The nature of the interaction is described and reference is made to the procedure(s) affected.

B. CRT CIRCUIT AND DYNAMIC FOCUS

Equipment Required:

1. **Precision dc voltmeter**
2. **Ramp generator**
3. **Dot generator**
4. **50-ohm cables (3 required)**

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

CRT CIRCUIT AND DYNAMIC FOCUS PRELIMINARY CONTROL SETTINGS:

CAUTION

Do not allow a high-intensity dot to remain stationary on the crt. The crt phosphor could be permanently damaged.

Vertical and Horizontal Position	Midrange
INTENSITY	Visible display
FOCUS	Well-defined display

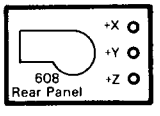
B1. ADJUST CRT BIAS (R862)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.

608 Controls:
Make no changes to the control settings.



No external signals are connected to the 608 Monitor.

a. Position the sharply-focused dot near graticule center.

b. Connect the precision dc voltmeter between TP599 and ground.

c. Slowly set the INTENSITY control for a voltmeter reading of 0.0 V dc. Disconnect the precision dc voltmeter.

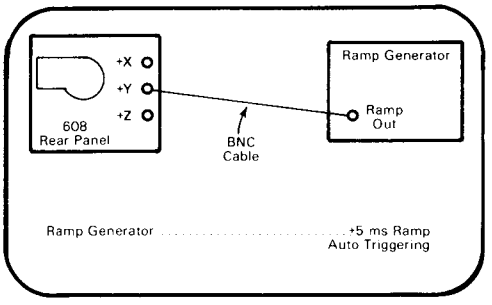
d. **ADJUST**—R862 (Crt Bias) until the dot just disappears.

B2. CHECK ORTHOGONALITY

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the trace to the center vertical graticule line.

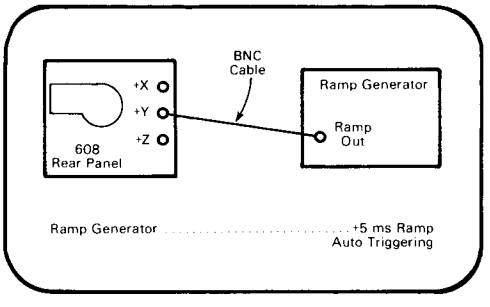
b. **CHECK**—That the vertical trace is aligned with the center vertical graticule line at the top and bottom of the graticule, within 0.1 division.

B3. CHECK/ADJUST GEOMETRY (R943)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the vertical trace to the left edge of the graticule and then to the right edge.

b. **CHECK**—Vertical trace for 0.1 division or less of bowing or tilt at the left and right edge of the graticule.

c. **ADJUST**—R943 (Geometry) for minimum bowing or tilt of the trace at the left and right edges of the graticule.

d. Disconnect the ramp generator from the +Y INPUT and connect it to the +X INPUT. Horizontally center the display on the graticule.

e. Position the horizontal trace to the top edge of the graticule and then to the bottom edge.

f. **CHECK**—Horizontal trace for 0.1 division or less of bowing or tilt at the top and bottom of the graticule.

g. **INTERACTION**—If necessary, readjust R943 (Geometry) for minimum trace bowing or tilt at the top and bottom of the graticule.

2305-47

Figure 6-1. How to perform a partial Performance Check and Adjustment Procedure.

Any of the subsection procedures can be accomplished separately by performing the following instructions. However, these instructions are intended primarily for performing the CHECK steps since it is recommended that the complete subsection procedure be performed if any adjustments are made.

NOTE

Locate the desired subsection and applicable steps (e.g. B1, B2, B3, etc.) in the Performance Check and Adjustment Procedure Index.

(1) Perform the instructions under Before You Begin and Preliminary Control Settings at the beginning of the subsection. Refer to the example in Figure 6-1.

(2) Perform the Setup Conditions instructions for the desired step. Disregard any control settings which are the same as those under Preliminary Control Settings.

(3) Proceed with the lettered instructions (e.g. a, b, c, etc.,). Disregard the ADJUST and INTERACTION instructions, as indicated by the shaded blocks in Figure 6-1, if only a performance check is desired.

NOTE

If the steps performed are consecutive, it is not necessary to repeat the Preliminary Control Settings again after the first step. However, if a step is skipped, the Preliminary Control Settings must be performed again.

Table 6-1, Performance Check Summary, lists the applicable electrical specifications from Section 1, General Information, and provides brief descriptions of the test methods used to verify the specifications. References to the procedures that check the performance requirements are also included in Table 6-1.

The Performance Check and Adjustment Procedure Index provides a convenient means for locating the desired subsections and steps for the purpose of performing partial procedures. For example, if the vertical amplifier had been repaired and a performance check was considered necessary, use the Index to locate the Vertical (Y) Amplifier subsection and the step and page number of the applicable CHECK step(s).

ADJUSTMENT INTERVAL

To maintain instrument accuracy, check the performance of the 608 every 1000 hours of operation, or every 6 months if used infrequently. Before complete adjustment, thoroughly clean and inspect this instrument as outlined in Section 5, Maintenance.

TEKTRONIX FIELD SERVICE

Tektronix Field Service Centers and the Factory Service Center provide instrument repair and adjustment services. Contact your Tektronix Field Office or representative for further information.

TABLE 6-1

Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
VERTICAL (Y) AMPLIFIER			
Deflection Factor	Adjustable from 0.5 V or less, to at least 2.5 V full scale.	A 20-μs + ramp is applied to the +X INPUT and a 1-V, 100-kHz square wave is applied to the +Y INPUT. The amplitude of the square wave display is checked.	Check/Adjust Y GAIN (R125).
Polarity (+Y INPUT)	Positive signal applied deflects beam up; negative signal deflects beam down.	Satisfactory operation is substantiated by other tests.	

TABLE 6-1 (CONT.)

Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
Settling Time	Spot must reach new writing position, within 0.05 cm (0.02 in), in less than 300 ns from any on-screen position.	A 10-μs + ramp is applied to the +X INPUT and a 100-kHz, 8-div square wave is applied to the +Y INPUT. The ramp generator gate out is applied to the +Z INPUT and the ramp is triggered from the square wave. The time required for the leading edge of the displayed square wave to travel from the 0 to the 100% level is checked.	Check Vertical Settling Time.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 5 MHz at -3 dB point.	A 50-kHz, 6.4-div sine wave is applied to the +Y INPUT and a 50-μs + ramp is applied to the +X INPUT. Sine-wave frequency is increased until the display amplitude is 4.5 div and the frequency is noted.	Check Vertical Bandwidth.
Phase Difference (DC to 1.5 MHz)	1° or less between X and Y amplifiers. X and Y amplifier gain (V/div) must be set for the same deflection factor.	A sine wave is applied to the +X and +Y INPUT. The Lissajous display is positioned to graticule center and the phase difference is checked.	Check/Adjust Phasing.
Position Range (With No Input Signal Applied)	Front-panel control allows spot to be set anywhere within the viewing area.	A 20-μs + ramp is applied to the +X INPUT. The displayed trace is positioned vertically over the entire graticule area.	Check Vertical Positioning.
HORIZONTAL (X) AMPLIFIER			
Deflection Factor	Adjustable from 0.5 V or less, to at least 2.5 V full scale.	A 20-μs + ramp is applied to the +Y INPUT and a 1-V, 100-kHz square wave is applied to the +X INPUT. The amplitude of the square wave display is checked.	Check/Adjust X GAIN (R325).
Polarity (+X INPUT)	Positive signal applied deflects beam to the right; negative signal applied deflects beam to the left.	Satisfactory operation is substantiated by other tests.	

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TABLE 6-1 (CONT.)

Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
Settling Time	Spot must reach new writing position, within 0.05 cm (0.02 in), in less than 300 ns from any on-screen position.	A 10-μs + ramp is applied to the +Y INPUT and a 100-kHz, 10-div square wave is applied to the +X INPUT. The ramp generator gate out is applied to the +Z INPUT and the ramp is triggered from the square wave. The time required for the leading edge of the displayed square wave to travel from the 0 to the 100% level is checked.	Check Horizontal Settling Time.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 5 MHz at -3 dB point.	A 50-kHz, 8-div sine wave is applied to the +X INPUT and a 50-μs + ramp is applied to the +Y INPUT. Sine wave frequency is increased until the dis played amplitude is 5.7 div and the frequency is noted.	Check Horizontal Bandwidth.
Position Range (With No Input Signal Applied)	Front-panel control allows spot to be set anywhere within the viewing area.	A 20-μs + ramp is applied to the +Y INPUT. The displayed trace is positioned horizontally over the entire graticule area.	Check Horizontal Positioning.
Z-AXIS AMPLIFIER			
Useful Input Voltage Range (+Z INPUT)	Adjustable. With Z Gain at maximum, no more than +1 V will provide full intensity. With Z Gain at minimum, at least +5 V is required to produce full intensity.	The INTENSITY control is set for 0 V at TP599. A +1 to +5-V, 10-kHz square wave is applied to the +Z INPUT and a 10-μs + ramp is applied to the +X INPUT. The displayed square wave amplitude is checked.	Check/Adjust Z-Axis Gain (R525).
Useful Frequency Range	Dc to at least 10 MHz at -3 dB point.	A test oscilloscope is connected to TP599 and a 50-kHz sine wave is applied to the +Z INPUT. The INTENSITY control and sine-wave amplitude is set for a 6-div display on the test oscilloscope. The sine-wave frequency is increased until the display amplitude decreases to 4.2 div.	Check Z-Axis Amplifier Bandwidth.

TABLE 6-1 (CONT.)

Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
CATHODE-RAY TUBE DISPLAY			
Geometry (Within Graticule Area)	Bowing or tilt is 0.1 division or less.	A 5-ms + ramp is applied to the +Y INPUT. Vertical trace is checked for bowing and tilt at the left and right edges of the graticule. The ramp is then applied to the +X INPUT and the horizontal trace is checked at the top and bottom edges of the graticule.	Check/Adjust Geometry (R943).
Orthogonality (Within Graticule Area)	90° within 0.7°.	A 5-ms + ramp is applied to the +Y INPUT. The vertical trace is checked for alignment with the center vertical graticule line.	Check Orthogonality.

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 6-2 is required for complete performance check and adjustment of this instrument. The specifications for test equipment, given in Table 6-2, are the minimum required to meet the Performance Requirements. Detailed operating instructions for test equipment are omitted in this procedure. Refer to the test equipment instruction manual if more information is needed.

If only a performance check is to be performed, not all of the listed test equipment is required. Items used only for adjustment are indicated by footnote 1. The remaining pieces of equipment are common to both procedures.

SPECIAL FIXTURES

Special fixtures are used only where they facilitate instrument adjustment. These fixtures are available from Tektronix, Inc. Order by part number from Tektronix Field Offices or representatives.

TEST EQUIPMENT ALTERNATIVES

All of the listed test equipment is required to completely check and adjust this instrument. However, complete checking or adjusting may not always be necessary or desirable. You may be satisfied with checking only selected characteristics, thereby reducing the amount of test equipment actually required.

The Performance Check and Adjustment procedures are based on the first item of equipment given as an example. When other equipment is substituted, control settings or setups may need to be altered. If the exact item of equipment given as an example in Table 6-2 is not available, first check the specifications column carefully to see if any other equipment might suffice. Then check the Purpose column to see what this item is used for. If used for a check or adjustment that is of little or no importance for your measurement requirements, the item and corresponding step(s) can be deleted.

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TABLE 6-2
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
1. Precision dc voltmeter[1] (with test leads)	Measurement range, -15 to +100 V; measurement accuracy, within 0.1%.	Adjust +15 V supply. Check low-voltage supplies. Adjust crt bias.	a. TEKTRONIX DM 502 Digital Multi-Meter (operates in TM 500-series power module).
2. Dc voltmeter[1]	Measurement range, -4455 to -4545 V.	Adjust high-voltage supply.	a. Triplet Model 630-NA. b. Simpson Model 262.
3. Ramp generator	Ramp duration, 5 ms to 10 μs within 3%; ramp amplitude, 0.5 to 2 V into 1 MΩ; external trigger input, compatible with square-wave generator trigger output; gate output, 1 to 3 V into 1 MΩ.	Adjust gain and compensation of the vertical, horizontal, and Z-Axis amplifiers. Check vertical and horizontal settling time, bandwidth, and positioning. Adjust TRACE ROTATION and geometry. Check orthogonality.	a. TEKTRONIX RG 501 Ramp Generator (operates in TM 500-series power module).
4. Square-wave generator	Frequency range, 10 kHz to 500 kHz; amplitude, 0.5 to 1 V when terminated into 50 Ω; trigger output, compatible with ramp generator external trigger input.	Adjust gain and compensation of the vertical, horizontal, and Z-Axis amplifiers. Check vertical and horizontal settling time.	a. TEKTRONIX PG 506 Calibration Generator (operates in TM 500-series power module).
5. Sine-wave generator	Frequency range, 1.5 MHz to at least 10 MHz; reference frequency, 50 kHz; amplitude, 0.5 to 5 V when terminated into 50 Ω; amplitude accuracy, constant within 5% of reference as output frequency changes.	Check bandwidth of the vertical, horizontal, and Z-Axis amplifiers. Check and adjust phasing between the vertical and horizontal amplifiers.	a. TEKTRONIX SG 503 Leveled Sine-Wave Generator (operates in TM 500-series power module).
6. Dot generator[1]	Provides dot-raster display; frame rate, at least 60 hertz.	Adjust focus correction. (An alternative method is provided which does not require a dot generator.)	a. TEKTRONIX 067-0561-01 Test Display Generator Calibration Fixture.
7. Test oscilloscope (with 10X probe)	Bandwidth, dc to at least 50 MHz; deflection factor, 0.1 to 10 V/div within 2%; sweep rate, 5 ms/div to 0.5 μs/div.	Adjust gain of vertical, horizontal, and Z-Axis amplifiers. Adjust Z-axis compensation. Check Z-Axis bandwidth.	a. TEKTRONIX 5440 Oscilloscope with 5A45 Amplifier, 5B40 Time Base, and P6105 1-meter probe. b. TEKTRONIX 7603 Oscilloscope with 7A15A Amplifier, 7B50A Time Base, and P6053B 3.5-foot probe. c. Refer to the Tektronix catalog for compatible oscilloscope system.

[1]Used for calibration only; NOT used for performance check.

TABLE 6-2 (CONT.)
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
8. Dual-input coupler	BNC connectors.	Check and adjust phasing between the vertical and horizontal amplifiers.	a. TEKTRONIX 067-0525-00 Calibration Fixture.
9. 50-ohm termination (2 required)	Impedance, 50 Ω within 2%; BNC connectors.	Adjust gain and compensation and check bandwidth of the vertical, horizontal, and Z-Axis amplifiers. Check vertical and horizontal settling time. Check and adjust phasing between the vertical and horizontal amplifiers.	a. Tektronix part 011-0049-01.
10. 50-ohm cables (4 required)	Impedance, 50 Ω; length, 42 inches; connectors, BNC.	Provide signal interconnection.	a. Tektronix part 012-0057-01.
11. Screwdriver[1]	3-inch shaft, 3/32-inch bit.	Adjust variable resistors.	a. Xcelite R3323.
12. Low-capacitance screwdriver[1]	3-3/4 inch shaft.	Adjust variable capacitors.	a. Tektronix part 003-0675-00.

[1]Used for calibration only; NOT used for performance check.

PERFORMANCE CHECK AND ADJUSTMENT PROCEDURE INDEX

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POWER UP SEQUENCE

NOTE

The performance of this instrument can be checked at any ambient temperature from 0° to +50° C unless otherwise stated. Adjustments must be performed at an ambient temperature from +15° to +25° C for specified accuracies.

1. Check that the internal Line Voltage Selector plug has been set for the correct input line voltage (see Section 3, Installation).

2. Check that the crt has an 8 X 10 division graticule over the display area.

3. Remove any cabinet panels to gain access to the internal controls and test points.

4. Connect the instrument to the line-voltage source.

NOTE

The 608 Monitor is adjusted for optimum performance at the factory. Instrument performance may exceed that required by the specifications. Therefore, you may desire to check instrument performance without changing the adjustments. Refer to Using This Procedure in the introductory portion of this section for Performance Check instructions.

5. Push in the ON/OFF pushbutton and allow at least 20 minutes warmup before proceeding.

CAUTION

Do not allow a high-intensity dot to remain stationary on the crt. The crt phosphor could be permanently damaged.

A. POWER SUPPLY

Equipment Required:

1. Precision dc voltmeter
2. Dc voltmeter

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

POWER-SUPPLY PRELIMINARY CONTROL SETTINGS:

Vertical and
Horizontal Position .....Midrange
INTENSITY .....Fully counterclockwise

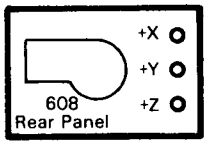
A1. ADJUST +15-VOLT SUPPLY (R958)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Power-Supply Preliminary Control Settings, then proceed with the following instructions.

608 Controls:
Make no changes to the control settings.



No external signals are connected to the 608 Monitor.

a. Table 6-3 lists the low-voltage supplies in this instrument. Connect the precision dc voltmeter between the appropriate test point and ground.

TABLE 6-3
Low-Voltage Supply Accuracy

Supply (dc)	Voltage Range
-15 V	-14.7 V to -15.3 V
+15 V	+14.96 V to +15.04 V
+100 V	+97 V to +103 V

b. **EXAMINE**—The voltmeter for a reading within the voltage range given in Table 6-3 for the appropriate supply.

c. **ADJUST**—R958 (+15 V Adj) for a voltmeter reading of +15.00 volts.

d. **INTERACTION**—If any of the low-voltage supplies in Table 6-3 are out of tolerance, re-examine the adjustment of the +15-volt supply in part b and the high-voltage supply in step A2.

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A2. ADJUST HIGH-VOLTAGE SUPPLY (R918)

WARNING

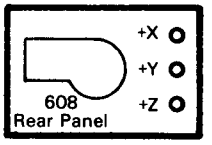
Turn off the instrument when connecting and disconnecting the dc voltmeter. Potentially dangerous voltage exists at several points on the high-voltage power supply board and crt socket.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Power-Supply Preliminary Control Settings, then proceed with the following instructions.

608 Controls:
Make no changes to the control settings.



No external signals are connected to the 608 Monitor.

a. Turn off the instrument. Remove the rear crt cover (5 screws) from the rear panel. Then remove the crt socket cover.

b. Connect the dc voltmeter (set for at least -5000 dc volts full scale) between pin 2 of the crt socket (second pin clockwise from the socket index) and ground.

c. Push in the front-panel ON/OFF pushbutton.

d. **EXAMINE**—The voltmeter for a reading between -4455 volts and -4545 volts.

e. **ADJUST**—R918 (HV Adj) for exactly -4500 volts.

f. Turn off the instrument and disconnect the voltmeter. Replace the crt socket cover and the rear crt cover.

g. **INTERACTION**—Readjustment of R918 (HV Adj) and R958 (+15 V Adj) may be necessary to bring all power supplies within their specified tolerances. The setting of R918 affects both the High-Voltage Supply and the +100 Volt Supply; the setting of R958 affects both the +15 Volt Supply and the -15 Volt Supply. Repeating step A1 is necessary if R918 is readjusted.

B. CRT CIRCUIT AND DYNAMIC FOCUS

Equipment Required:

1. Precision dc voltmeter
2. Ramp generator
3. Dot generator
4. 50-ohm cables (3 required)

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

CRT CIRCUIT AND DYNAMIC FOCUS PRELIMINARY CONTROL SETTINGS:

CAUTION

Do not allow a high-intensity dot to remain stationary on the crt. The crt phosphor could be permanently damaged.

Vertical and
Horizontal Position .....Midrange
INTENSITY .....Visible display
FOCUS .....Well-defined display

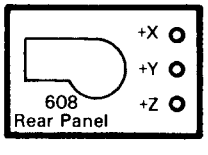
B1. ADJUST CRT BIAS (R862)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.

608 Controls:
Make no changes to the control settings.



No external signals are connected to the 608 Monitor.

a. Position the sharply-focused dot near graticule center.

b. Connect the precision dc voltmeter between TP599 and ground.

c. Slowly set the INTENSITY control for a voltmeter reading of 0.0 V dc. Disconnect the precision dc voltmeter.

d. **ADJUST**—R862 (Crt Bias) until the dot just disappears.

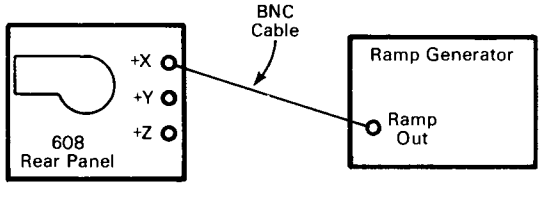
B2. ADJUST TRACE ROTATION (R949)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.

608 Controls:
INTENSITY .....Visible Display



Ramp Generator .....+5 ms Ramp
Auto Triggering

a. Set the ramp-generator amplitude for a 10-division horizontal trace on the crt.

b. Position the trace to the center horizontal graticule line.

c. **EXAMINE**—The trace for alignment with the center horizontal graticule line.

d. **ADJUST**—R949 (rear-panel TRACE ROTATION) to align the trace with the center horizontal graticule line.

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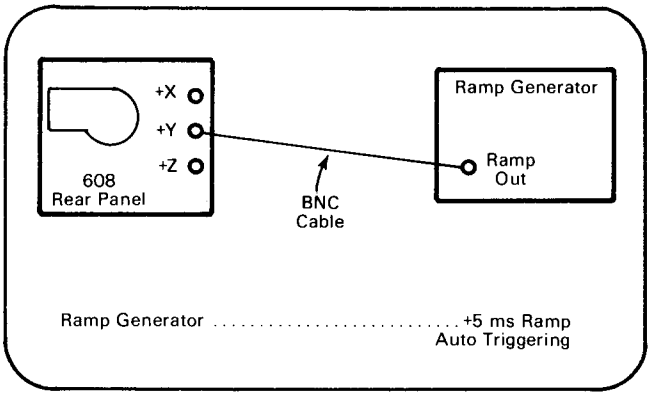
B3. CHECK ORTHOGONALITY

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the trace to the center vertical graticule line.

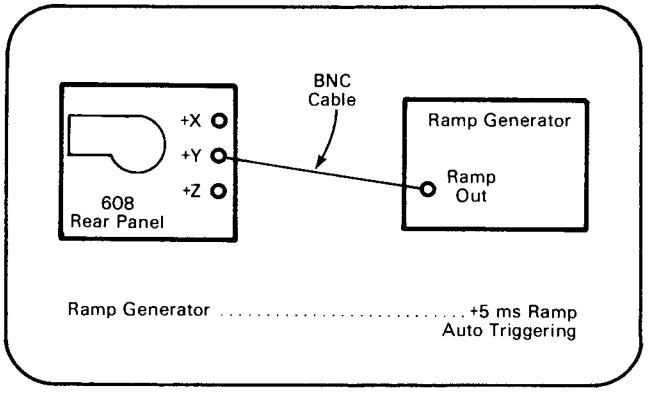
b. **CHECK**—That the vertical trace is aligned with the center vertical graticule line at the top and bottom of the graticule, within 0.1 division.

B4. CHECK/ADJUST GEOMETRY (R943)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the vertical trace to the left edge of the graticule and then to the right edge.

b. **CHECK**—Vertical trace for 0.1 division or less of bowing or tilt at the left and right edge of the graticule.

c. **ADJUST**—R943 (Geometry) for minimum bowing or tilt of the trace at the left and right edges of the graticule.

d. Disconnect the ramp generator from the +Y INPUT and connect it to the +X INPUT. Horizontally center the display on the graticule.

e. Position the horizontal trace to the top edge of the graticule and then to the bottom edge.

f. **CHECK**—Horizontal trace for 0.1 division or less of bowing or tilt at the top and bottom of the graticule.

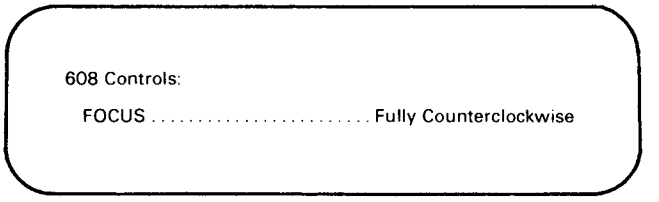
g. **INTERACTION**—If necessary, readjust R943 (Geometry) for minimum trace bowing or tilt at the top and bottom of the graticule. Then, repeat step B3 until optimum geometry is achieved.

B5. ADJUST ASTIGMATISM (R841)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the dot display near graticule center.

b. **EXAMINE**—The dot display for a defocused, round dot.

c. **ADJUST**—R841 (front-panel ASTIG) for a symmetrically round dot.

B6. ADJUST FOCUS CORRECTION (R715, R725, R735, AND R745)

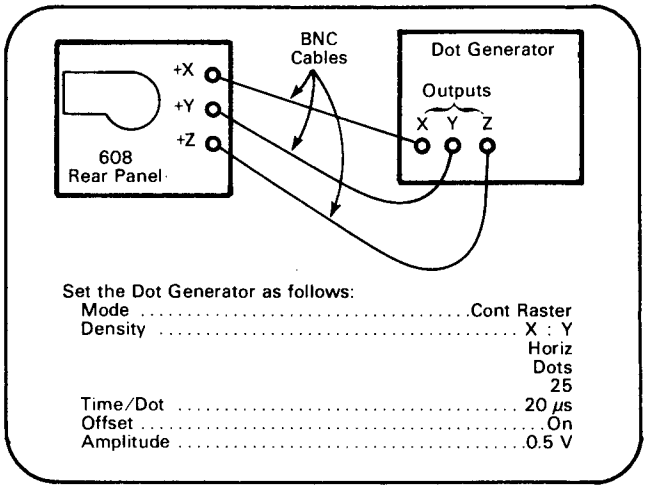
NOTE

The recommended method for adjustment of the Dynamic Focus circuit (step B6) is based on the use of a dot-generator display. If a dot generator is not available, an alternative procedure is given in step B7.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Set the FOCUS and ASTIG controls for optimum focus of the dot display near graticule center.

b. **EXAMINE**—The dot display for well-defined symmetrical dots.

c. **ADJUST**—Refer to Figure 6-2. Adjust the focus-correction adjustment, corresponding to the appropriate area of the dot display, for well-defined symmetrical dots. Use the X and Y offset controls of the dot generator to position the dot display to the appropriate area of the graticule.

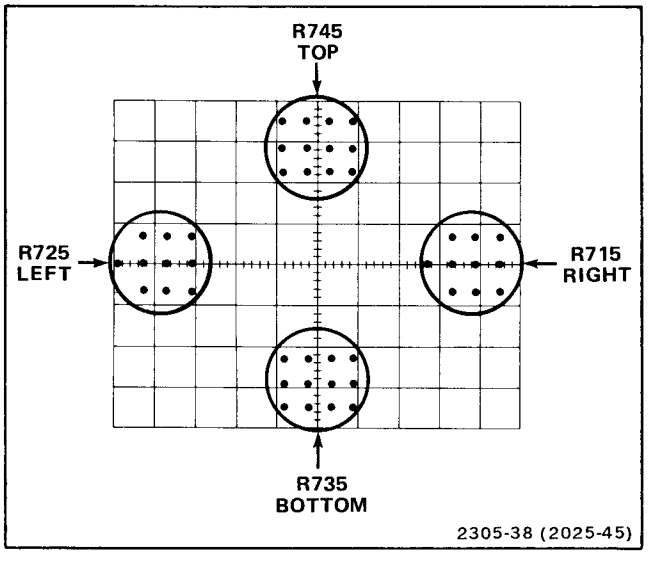


Figure 6-2. Focus adjustments corresponding to the appropriate area of the dot display.

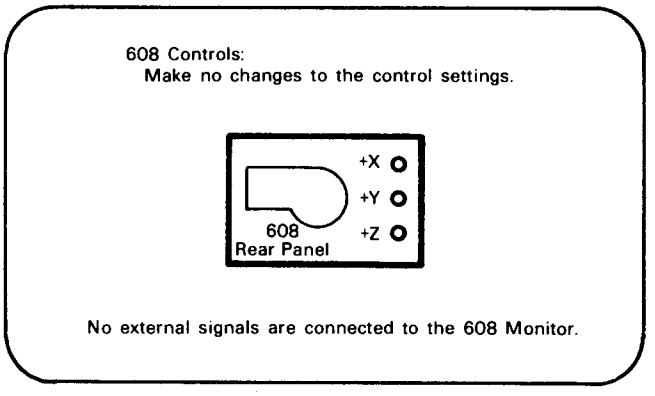
d. **INTERACTION**—Compromise the adjustment of R715, R725, R735, and R745 as necessary for optimum dot definition over the entire display area.

B7. ALTERNATIVE METHOD—ADJUST FOCUS CORRECTION (R715, R725, R735, AND R745)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Crt Circuit and Dynamic Focus Preliminary Control Settings, then proceed with the following instructions.



a. Position the dot to graticule center. Set the FOCUS and ASTIG controls for optimum focus of the displayed dot.

b. **EXAMINE**—The displayed dot for symmetry and definition.

c. **ADJUST**—Refer to Figure 6-2. Position the displayed dot to the appropriate display area and adjust the corresponding focus-correction adjustment for a well-defined symmetrical dot.

d. **INTERACTION**—Position the displayed dot slowly over the display area. Compromise the adjustment of R715, R725, R735, and R745 as necessary for optimum definition over the display area.

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C. HORIZONTAL (X) AMPLIFIER

Equipment Required:

1. Test oscilloscope
2. Ramp generator
3. Square-wave generator
4. Sine-wave generator
5. 50-ohm cables (4 required)
6. 50-ohm terminations (2 required)

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

HORIZONTAL PRELIMINARY CONTROL SETTINGS:

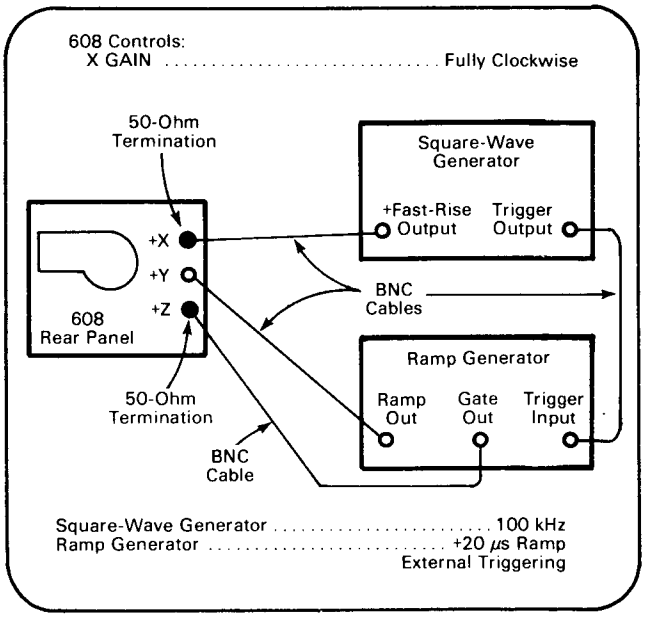
Vertical and
Horizontal Position .....Midrange
INTENSITY .....Visible display
FOCUS .....Well-defined display

C1. ADJUST HORIZONTAL (X) COMPENSATION (R361 AND C367)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude to display about 3 cycles of square-wave display (position as necessary).

b. Set the square-wave generator amplitude for an 8-division display (position as necessary).

c. **EXAMINE**—The display for optimum rising edge and square corner.

d. **ADJUST**—Preset R361 (HF Comp) fully counter-clockwise. Adjust C367 (HF Comp), using a low-capacitance screwdriver, for a fast rising edge without overshoot. (See Fig. 6-3.) Then adjust R361 clockwise for optimum square corner.

e. **INTERACTION**—R361 and C367 will interact; repeat adjustments in part d as necessary to obtain optimum square corner. Changing the adjustment of R361 or C367 may affect the checks in steps C3 and C4.

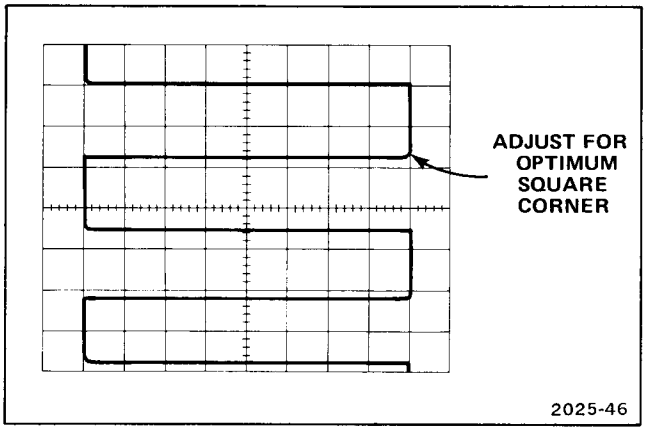


Figure 6-3. Typical crt display for adjustment of horizontal (X) compensation and gain.

C2. CHECK/ADJUST X GAIN (R325)

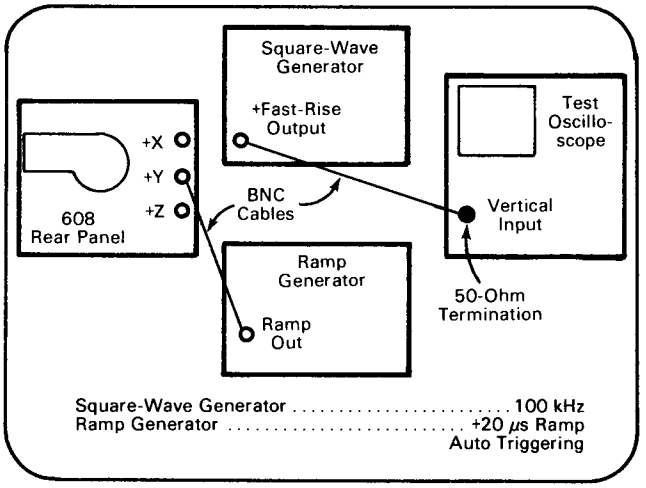
NOTE

The X GAIN (R325) in this procedure is set to provide 8 divisions of deflection from a 1-volt input signal. This procedure can be altered for any voltage, from +0.5 to +2.5 volts, for the desired sensitivity.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings, then proceed with the following instructions.



a. Set the square-wave generator amplitude for a 1-volt output, as indicated on the test oscilloscope.

b. Disconnect the square-wave generator from the test oscilloscope and connect it to the +X INPUT.

c. **CHECK**—The 608 crt for an 8-division, within 2%, square-wave display.

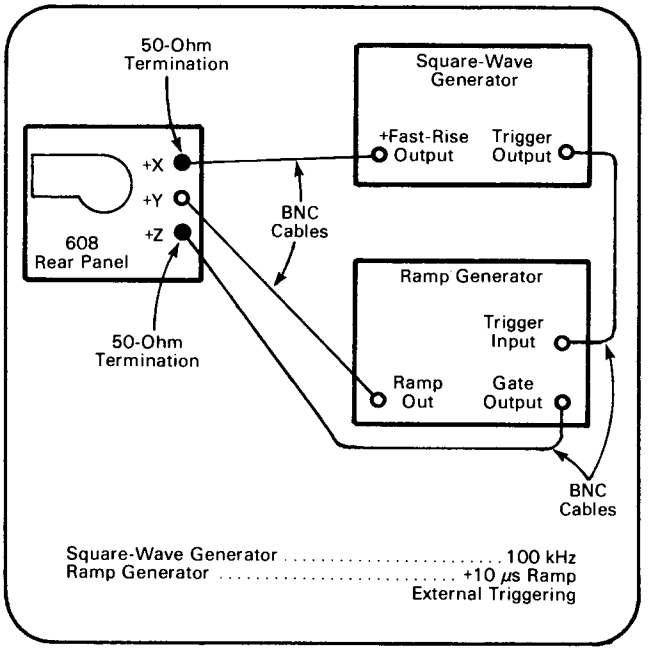
d. **ADJUST**—R325 (front-panel X GAIN control) for an 8-division square-wave display.

C3. CHECK HORIZONTAL SETTLING TIME

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for exactly 8 divisions of trace length.

b. Set the square-wave generator amplitude for 10 divisions of horizontal display, and set the repetition rate to display approximately 1 cycle.

c. **CHECK**—That the time required for the leading edge of the square wave to travel from the zero percent level (see Fig. 6-4) to within 0.508 millimeters (about one trace width) of the 100 percent level is 300 nanoseconds (0.375 division) or less.

d. **INTERACTION**—If the check requirements in part c cannot be met, repeat step C1.

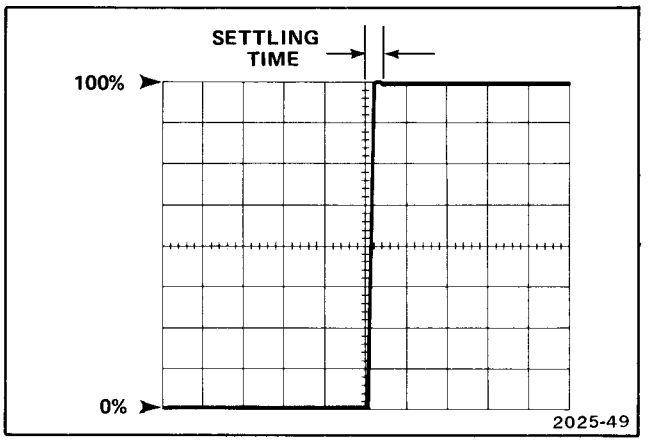


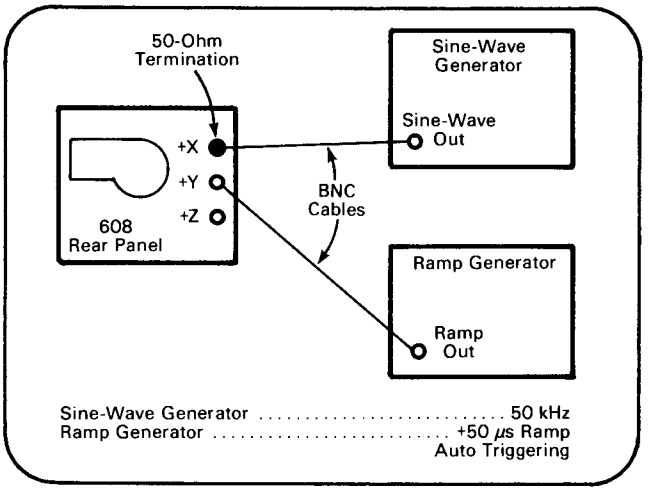
Figure 6-4. Typical crt display for horizontal settling-time measurement (settling time includes corner distortion).

C4. CHECK HORIZONTAL BANDWIDTH

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for more than 8 divisions of vertical deflection.

b. Set the sine-wave generator amplitude for 8 divisions of horizontal deflection.

c. Slowly increase the sine-wave generator output frequency until the display's horizontal amplitude is 5.7 divisions.

d. **CHECK**—That the sine-wave generator output frequency is at least 5 megahertz.

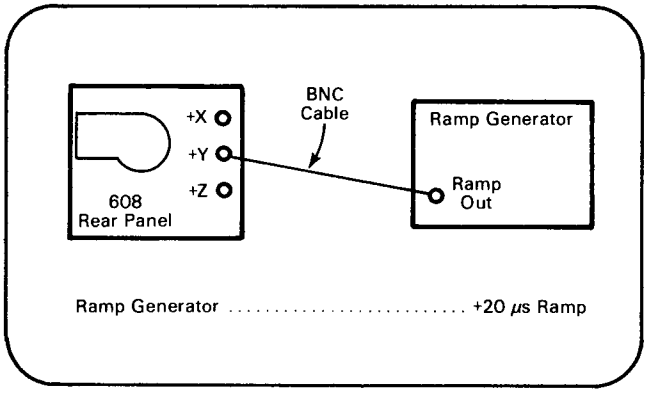
e. **INTERACTION**—If the check requirement in part d cannot be met, repeat step C1.

C5. CHECK HORIZONTAL POSITIONING

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings, then proceed with the following instructions.



a. **CHECK**—Rotate the Horizontal Position control and check that the vertical trace can be positioned horizontally anywhere in the graticule area.

D. VERTICAL (Y) AMPLIFIER

Equipment Required:

1. Test oscilloscope
2. Ramp generator
3. Square-wave generator
4. Sine-wave generator
5. 50-ohm cables (4 required)
6. 50-ohm terminations (2 required)
7. Dual-input coupler

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

VERTICAL PRELIMINARY CONTROL SETTINGS:

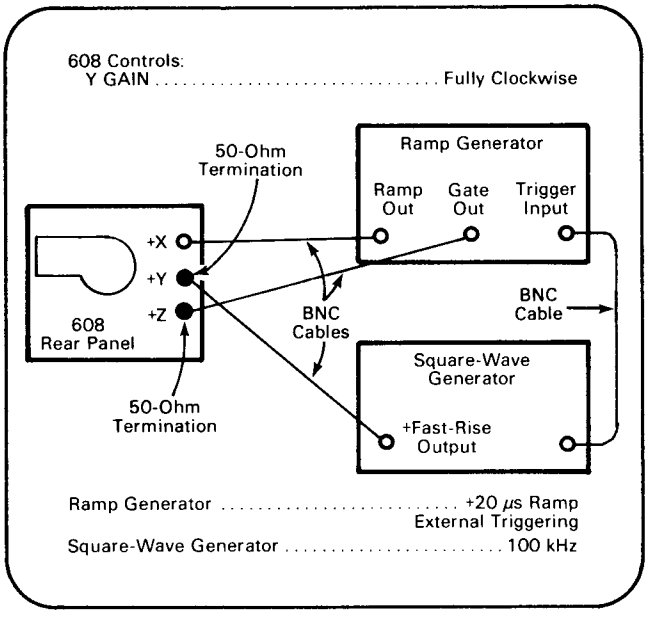
Vertical and
Horizontal Position .....Midrange
INTENSITY .....Visible display
FOCUS .....Well-defined display

D1. ADJUST VERTICAL (Y) COMPENSATION (R161 AND C167)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude to display about 2 cycles of square-wave display (position as necessary).

b. Set the square-wave generator amplitude for a 6-division display (position as necessary).

c. **EXAMINE**—The display for optimum rising edge and square wave.

d. **ADJUST**—Preset R161 (HF Comp) fully counter-clockwise. Adjust C167 (HF Comp), using a low-capacitance screwdriver, for a fast rising edge without overshoot. (See Fig. 6-5.) Then adjust R161 clockwise for optimum square corner.

e. **INTERACTION**—R161 and C167 will interact; repeat adjustments in part d as necessary to obtain optimum square corner. Changing the adjustment of R161 or C167 may affect the checks in steps D2, D4, and D5.

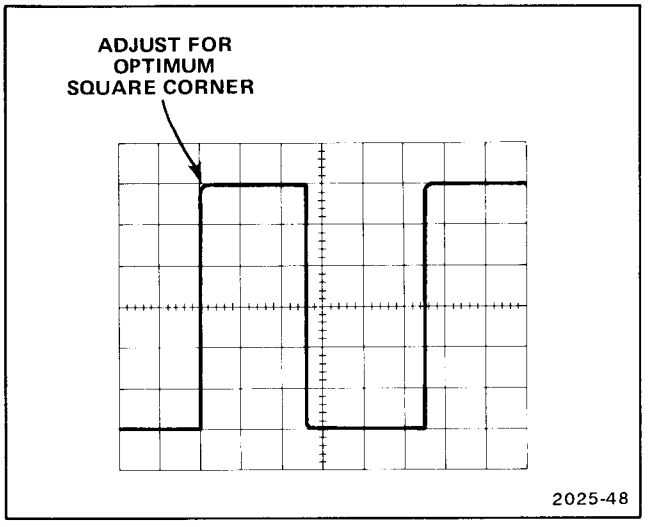


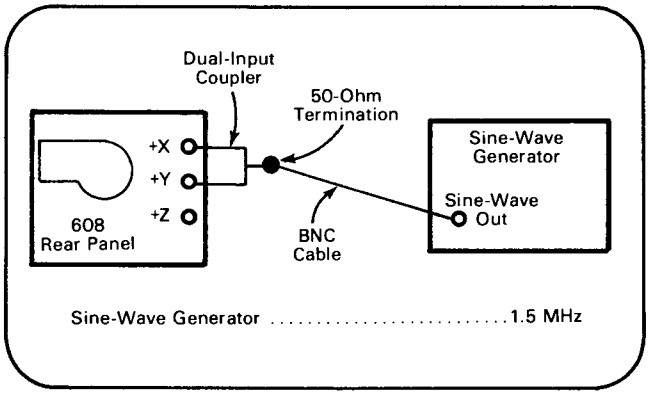
Figure 6-5. Typical crt display for adjustment of vertical (Y) compensation and gain.

D2. CHECK/ADJUST PHASING

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the sine-wave generator amplitude for 1 volt.

b. Set the front-panel X GAIN, Y GAIN, and Position controls for a display as shown in Figure 6-6.

c. **CHECK**—That the diameter of the displayed ellipse, measured vertically at the center of the graticule, is 0.1 division or less (see Fig. 6-6).

d. **ADJUST**—C167 (HF Comp), using a low-capacitance screwdriver, to close the phasing loop.

e. **INTERACTION**—Changing the adjustment of C167 may affect step D1.

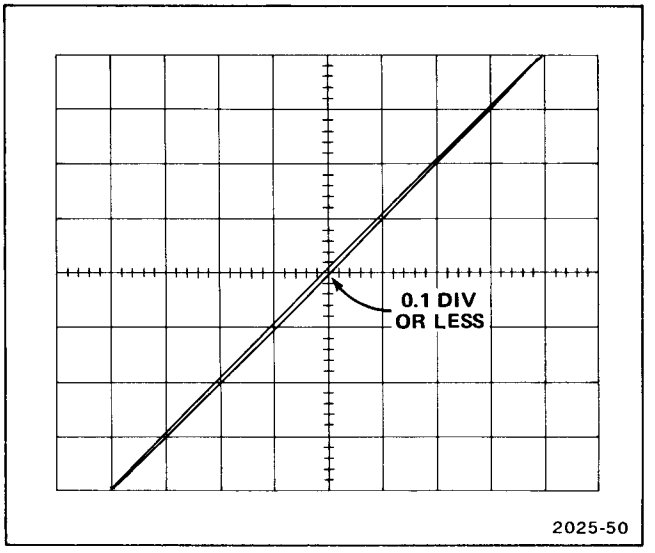


Figure 6-6. Typical horizontal and vertical phase difference display.

D3. CHECK/ADJUST Y GAIN (R125)

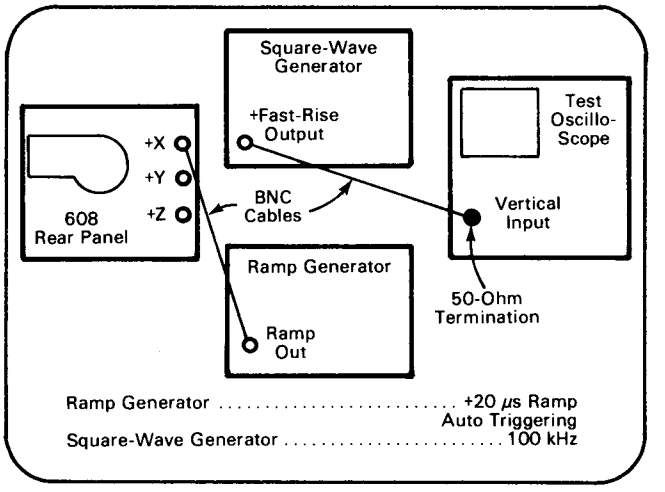
NOTE

The Y Gain (R125) in this procedure is set to provide 8 divisions of deflection from a 1-volt input signal. This procedure can be altered for any voltage, from +0.5 to +2.5 volts, for the desired sensitivity.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the square-wave generator amplitude for a 1-volt output, as indicated on the test oscilloscope.

b. Disconnect the square-wave generator from the test oscilloscope and connect it to the +Y INPUT.

c. **CHECK**—The 608 crt for an 8-division, within 2%, square-wave display.

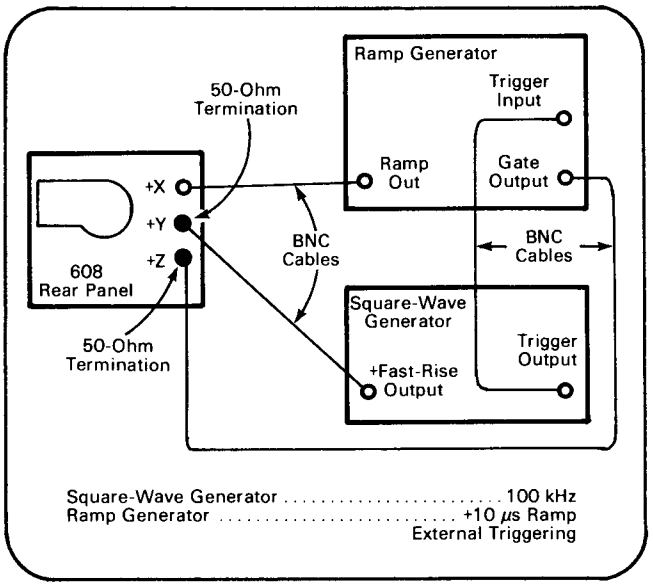
d. **ADJUST**—R125 (front-panel Y GAIN control) for an 8-division square-wave display.

D4. CHECK VERTICAL SETTLING TIME

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for exactly 10 divisions of trace length.

b. Set the square-wave generator amplitude for 8 divisions of vertical display and set the repetition rate to display approximately 1 cycle.

c. **CHECK**—That the time required for the leading edge of the square wave to travel from the zero percent level (see Fig. 6-7) to within 0.508 millimeters (about one trace width) of the 100 percent level is 300 nanoseconds (0.3 division) or less.

d. **INTERACTION**—If the check requirements in part c cannot be met, repeat step D1.

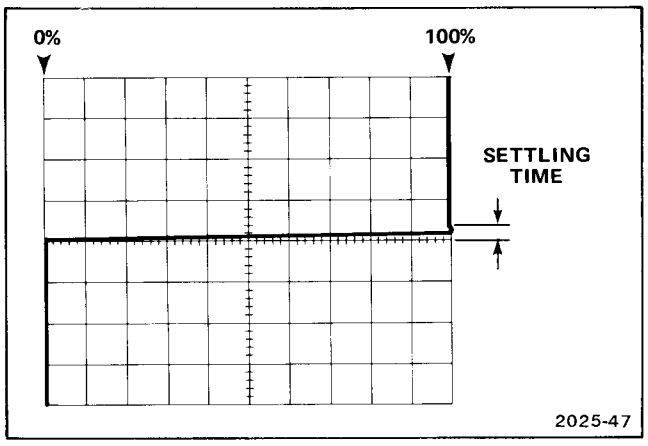


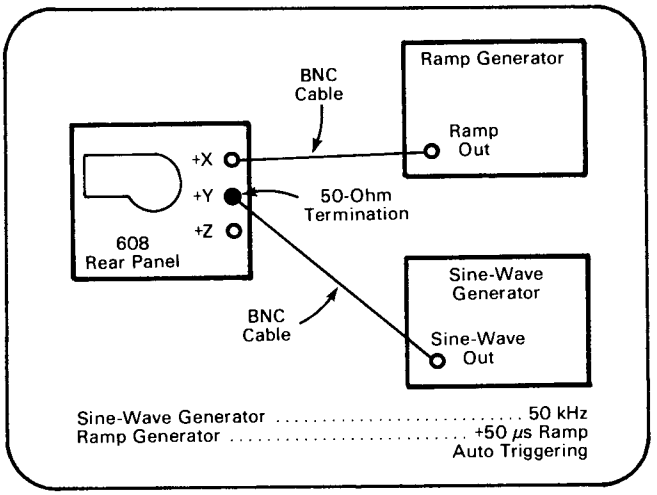
Figure 6-7. Typical crt display for vertical settling-time measurement (settling time includes corner distortion).

D5. CHECK VERTICAL BANDWIDTH

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for more than 10 divisions of horizontal deflection.

b. Set the sine-wave generator amplitude for 6.4 divisions of vertical deflection.

c. Slowly increase the sine-wave generator output frequency until the display amplitude is 4.5 divisions.

d. **CHECK**—That the sine-wave generator output frequency is at least 5 megahertz.

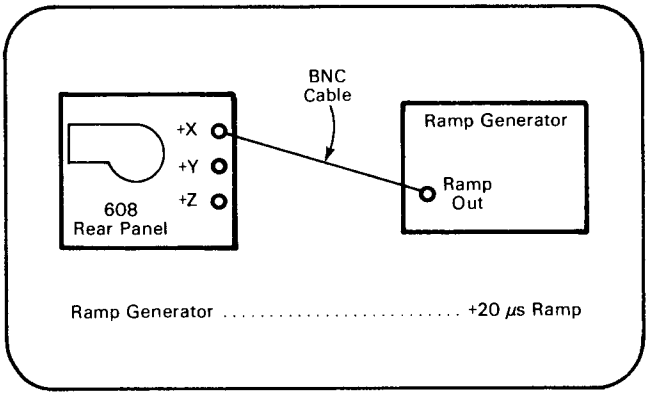
e. **INTERACTION**—If the check requirement is part d cannot be met, repeat step D1.

D6. CHECK VERTICAL POSITIONING

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. **CHECK**—Rotate the Vertical Position control and check that the horizontal trace can be positioned vertically anywhere in the graticule area.

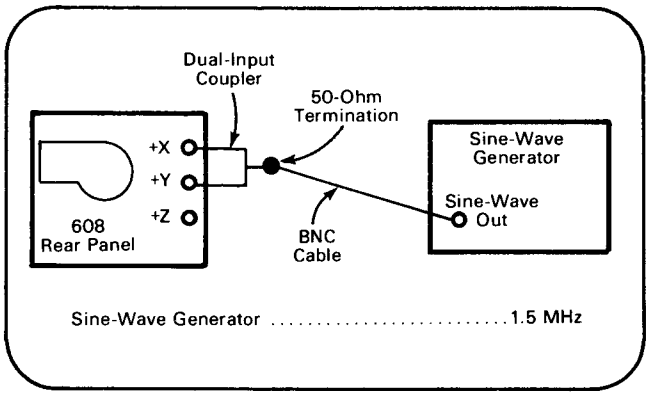
@

D2. CHECK/ADJUST PHASING

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the sine-wave generator amplitude for 1 volt.

b. Set the front-panel X GAIN, Y GAIN, and Position controls for a display as shown in Figure 6-6.

c. **CHECK**—That the diameter of the displayed ellipse, measured vertically at the center of the graticule, is 0.1 division or less (see Fig. 6-6).

d. **ADJUST**—C167 (HF Comp), using a low-capacitance screwdriver, to close the phasing loop.

e. **INTERACTION**—Changing the adjustment of C167 may affect step D1.

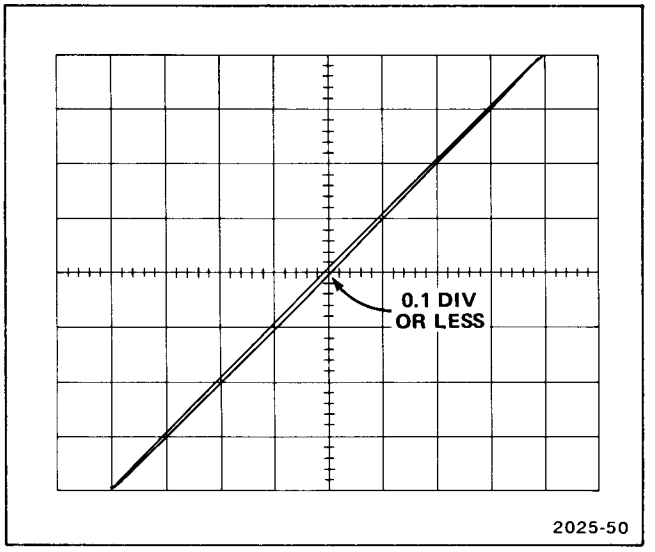


Figure 6-6. Typical horizontal and vertical phase difference display.

D3. CHECK/ADJUST Y GAIN (R125)

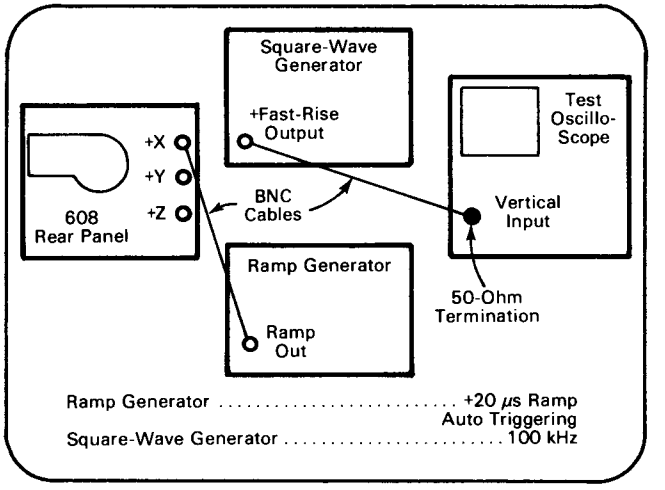
NOTE

The Y Gain (R125) in this procedure is set to provide 8 divisions of deflection from a 1-volt input signal. This procedure can be altered for any voltage, from +0.5 to +2.5 volts, for the desired sensitivity.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the square-wave generator amplitude for a 1-volt output, as indicated on the test oscilloscope.

b. Disconnect the square-wave generator from the test oscilloscope and connect it to the +Y INPUT.

c. **CHECK**—The 608 crt for an 8-division, within 2%, square-wave display.

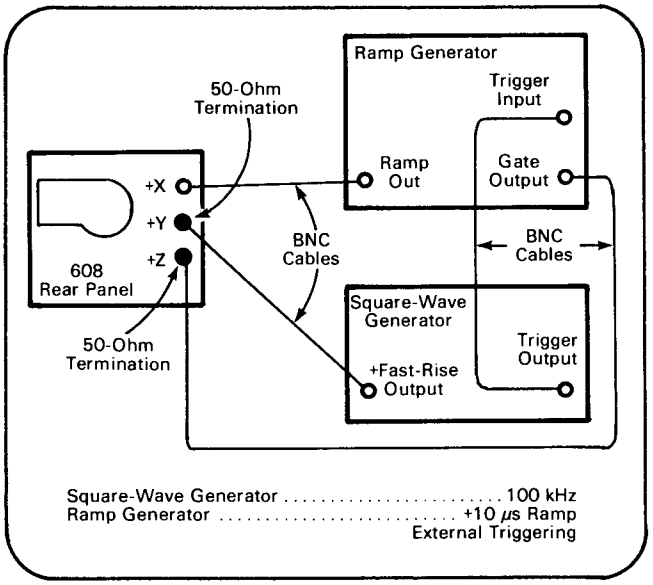
d. **ADJUST**—R125 (front-panel Y GAIN control) for an 8-division square-wave display.

D4. CHECK VERTICAL SETTLING TIME

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for exactly 10 divisions of trace length.

b. Set the square-wave generator amplitude for 8 divisions of vertical display and set the repetition rate to display approximately 1 cycle.

c. **CHECK**—That the time required for the leading edge of the square wave to travel from the zero percent level (see Fig. 6-7) to within 0.508 millimeters (about one trace width) of the 100 percent level is 300 nanoseconds (0.3 division) or less.

d. **INTERACTION**—If the check requirements in part c cannot be met, repeat step D1.

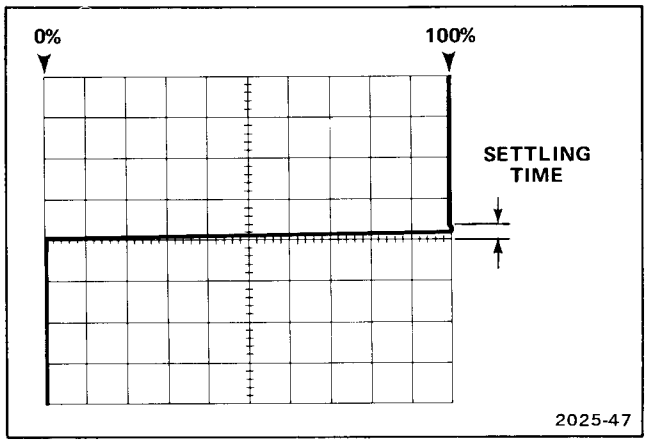


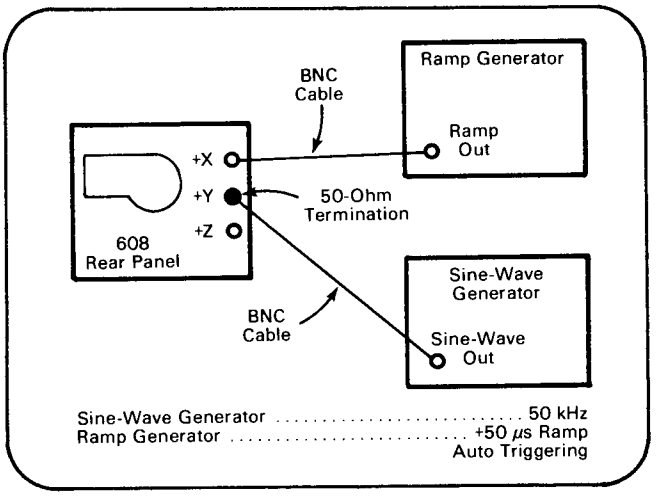
Figure 6-7. Typical crt display for vertical settling-time measurement (settling time includes corner distortion).

D5. CHECK VERTICAL BANDWIDTH

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. Set the ramp-generator amplitude for more than 10 divisions of horizontal deflection.

b. Set the sine-wave generator amplitude for 6.4 divisions of vertical deflection.

c. Slowly increase the sine-wave generator output frequency until the display amplitude is 4.5 divisions.

d. **CHECK**—That the sine-wave generator output frequency is at least 5 megahertz.

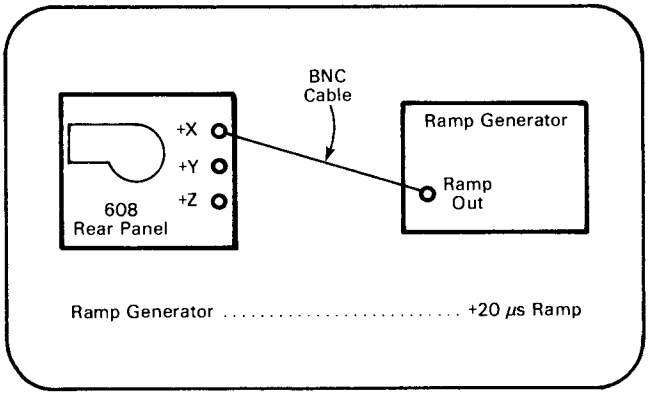
e. **INTERACTION**—If the check requirement is part d cannot be met, repeat step D1.

D6. CHECK VERTICAL POSITIONING

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings, then proceed with the following instructions.



a. **CHECK**—Rotate the Vertical Position control and check that the horizontal trace can be positioned vertically anywhere in the graticule area.

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E. Z-AXIS AMPLIFIER

Equipment Required:

1. Ramp generator
2. Square-wave generator
3. Sine-wave generator
4. Test oscilloscope
5. 50-ohm cables (2 required)
6. 50-ohm termination

BEFORE YOU BEGIN:

(1) Perform the Power Up Sequence preceding the Performance Check and Adjustment procedure.

(2) Refer to Section 9, Instrument Options, and the Change Information at the rear of this manual for any modifications which may affect this procedure.

(3) See the Test Point and Adjustment Locations foldout page in Section 8, Diagrams and Circuit Board Illustrations.

Z-AXIS PRELIMINARY CONTROL SETTINGS:

Vertical and
Horizontal Position .....Midrange
INTENSITY .....Visible display
FOCUS .....Well-defined display

E1. CHECK/ADJUST Z-AXIS GAIN (R525)

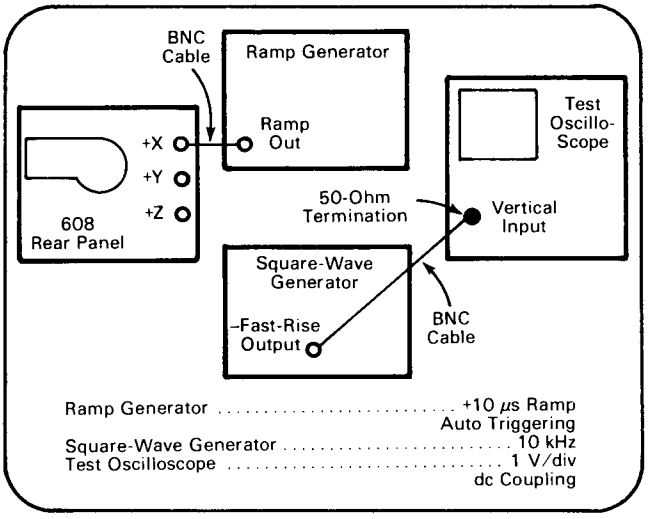
NOTE

The following procedure sets the Z-Axis Amplifier Gain for full intensity from a +1-volt input signal. This procedure can be altered for any voltage, from +1 volt to +5 volts, to provide the desired intensity control.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Z-Axis Preliminary Control Settings, then proceed with the following instructions.



a. Set the square-wave generator amplitude for +1 volt as indicated on the test oscilloscope.

b. Disconnect the +1-volt square wave from the test oscilloscope.

c. Connect a 10X probe from the test oscilloscope vertical input to TP599. Set the test oscilloscope for a deflection factor of 10 volts/division with 10X probe.

d. Set the INTENSITY control for a zero volt level on the test oscilloscope.

e. Connect the +1-volt square-wave signal to the +Z INPUT.

f. **CHECK**—The amplitude of the square wave displayed on the test oscilloscope is at least 70 volts (position as necessary).

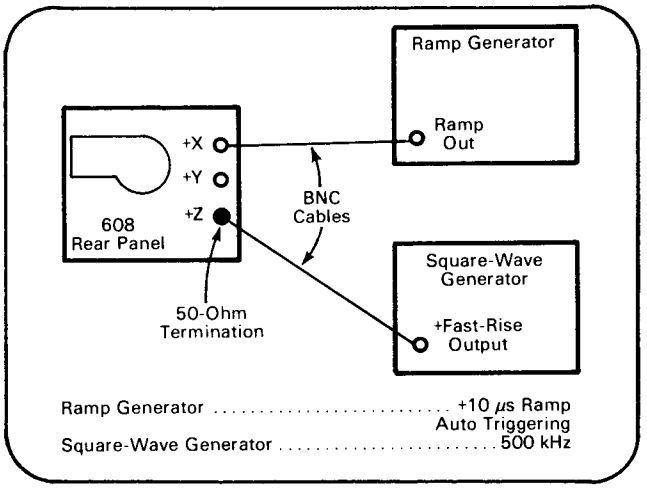
g. **ADJUST**—R525 (Z Gain) so that the amplitude of the square wave displayed on the test oscilloscope is 70 volts.

E2. ADJUST Z-AXIS COMPENSATION (R693 AND C693)

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Z-Axis Preliminary Control Settings, then proceed with the following instructions.



a. Connect a 10X probe from the test oscilloscope vertical input to TP599. Set the test oscilloscope for dc input coupling, 10 volts/division deflection factor (with 10X probe), and 0.5 microsecond/division sweep rate.

b. Set the INTENSITY control and square-wave generator amplitude for 6 divisions amplitude (5 volts dc to 65 volts dc) as indicated on the test oscilloscope.

c. **EXAMINE**—The square wave displayed on the test oscilloscope for optimum front corner, flat top, and minimum aberrations.

d. **ADJUST**—Preset R693 (HF Comp) and C693 (HF Comp) to midrange. Adjust R693 for minimum aberrations and C693 for a flat top. Then readjust R693 for optimum square front corner. (Use a low-capacitance screwdriver when adjusting C693.)

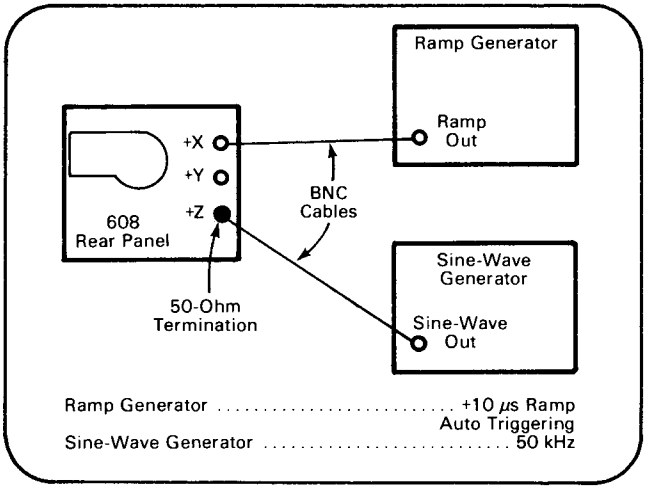
e. **INTERACTION**—R693 and C693 will interact; repeat adjustments in part d for optimum square corner, flat top, and minimum aberrations. Changing the adjustment of R693 or C693 may affect the check in step E3.

E3. CHECK Z-AXIS AMPLIFIER BANDWIDTH

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Z-Axis Preliminary Control Settings, then proceed with the following instructions.



a. Connect a 10X probe from the test oscilloscope vertical input to TP599. Set the test oscilloscope for dc input coupling, 10 volts/division deflection factor (with 10X probe), and 10 microsecond/division sweep rate.

b. Set the INTENSITY control and the sine-wave generator amplitude for a 6-division (5 volts dc to 65 volts dc) display on the test oscilloscope (make sure that no clipping occurs on the test oscilloscope display).

c. Slowly increase the sine-wave generator output frequency until the display amplitude is 4.2 divisions on the test oscilloscope.

d. **CHECK**—That the sine-wave generator output frequency is at least 10 megahertz.

e. **INTERACTION**—If the check requirement in part d cannot be met, repeat the adjustments in step E2.

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REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
05397	UNION CARBIDE CORPORATION, MATERIALS SYSTEMS DIVISION	11901 MADISON AVENUE	CLEVELAND, OH 44101
07910	TELEDYNE SEMICONDUCTOR	12515 CHADRON AVE.	HAWTHORNE, CA 90250
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
50437	RELIANCE STEEL PRODUCTS COMPANY	3700 WALNUT STREET	MCKEESPORT, PA 15132
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
74276	SIGNALITE DIV., GENERAL INSTRUMENT CORP.	1933 HECK AVE.	NEPTUNE, NJ 07753
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
79727	C-W INDUSTRIES	550 DAVISVILLE RD.,P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83003	VARO, INC.	P O BOX 411, 2203 WALNUT STREET	GARLAND, TX 75040
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E WASHINGTON STREET P O BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-5212-00			CKT BOARD ASSY:DEFLECTION	80009	670-5212-00
A1[1]	670-5477-00			CKT BOARD ASSY:DEFLECTION	80009	670-5477-00
A2	670-5216-00			CKT BOARD ASSY:Z AXIS & CONTROL	80009	670-5216-00
A2[1]	670-5478-00			CKT BOARD ASSY:Z AXIS & CONTROL	80009	670-5478-00
A3	670-5215-00			CKT BOARD ASSY:DYNAMIC FOCUS	80009	670-5215-00
A4	670-5213-00			CKT BOARD ASSY:HIGH VOLTAGE	80009	670-5213-00
A5	670-5214-00			CKT BOARD ASSY:LOW VOLTAGE & POWER SUPPLY	80009	670-5214-00
C110[1]						
C112[1]						
C116	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	301-000C0H0439C
C120	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C130	281-0659-00			CAP.,FXD,CER DI:4.3PF,+/-0.25PF,500V	72982	301-000C0H0439C
C131	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C133	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C142	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C161	281-0578-00			CAP.,FXD,CER DI:18PF,5%,500V	72982	301-050C0G0180J
C167	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C174	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C182	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C184	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C188	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C192	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C210[1]						
C212[1]						
C216	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C230	281-0659-00			CAP.,FXD,CER DI:4.3PF,+/-0.25PF,500V	72982	301-000C0H0439C
C242	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C274	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C282	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C284	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C288	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C303	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C307	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C310[1]						
C312[1]						
C316	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C320	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C330	281-0659-00			CAP.,FXD,CER DI:4.3PF,+/-0.25PF,500V	72982	301-000C0H0439C
C331	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C342	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C361	281-0578-00			CAP.,FXD,CER DI:18PF,5%,500V	72982	301-050C0G0180J
C367	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C374	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C382	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C384	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C388	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C392	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C410[1]						
C412[1]						
C416	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C430	281-0659-00			CAP.,FXD,CER DI:4.3PF,+/-0.25PF,500V	72982	301-000C0H0439C
C442	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C474	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C482	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C484	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C488	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C503	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C505	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C507	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C509	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C516	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C530	281-0501-00			CAP.,FXD,CER DI:4.7PF,+/-1PF,500V	72982	301-000S2H0479F
C531	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C542	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C549	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C573	281-0593-00			CAP.,VAR,AIR DI:3.9PF,10%,500V	72982	301-000C0J099C
C585	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C586	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C590	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C596	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C597	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C616	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C630	281-0501-00			CAP.,FXD,CER DI:4.7PF,+/-1PF,500V	72982	301-000S2H0479F
C642	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C673	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
C690	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C691	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C692	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C693	281-0153-00			CAP.,FXD,CER DI:1.7-10PF,250V	74970	187-0106-05
C696	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C761	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C770	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,30V	72982	8131N039Z5U-104Z
C774	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C776	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C780	281-0584-00			CAP.,FXD,CER DI:100PF,5%,500V	72982	301-00Y5D101J
C788	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF	72982	301-000C0K0808B
C789	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF	72982	301-000C0K0808B
C793	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C795	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C797	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C816	290-0719-00			CAP.,FXD,ELCTLT:47UF,20%,25V	56289	196D476X0025TE3
C818	290-0719-00			CAP.,FXD,ELCTLT:47UF,20%,25V	56289	196D476X0025TE3
C819	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
C830	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
C831	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C832	283-0134-00			CAP.,FXD,CER DI:0.47UF,+80-20%,50V	72982	8141N078E474Z
C834	283-0341-00			CAP.,FXD,CER DI:0.047,10%,100V	72982	8131N127X7R0473K
C837	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-551B272J
C852	283-0034-00			CAP.,FXD,CER DI:0.005UF,20%,4000V	56289	41C107A
C854	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P103980
C858	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P103980
C860	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
C866	283-0092-00			CAP.,FXD,CER DI:0.03UF,+80-20%,200V	72982	845-534E303Z
C871	290-0766-00			CAP.,FXD,ELCTLT:2.2UF,+50-10%,160V	56289	502D232
C872	283-0300-00			CAP.,FXD,CER DI:0.001UF,+80-20%,10,000V	72982	3910BW509C142K

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C879	285-1138-00			CAP.,FXD,PLSTC:0.01UF,10%,8000V	56289	430P103980
C889	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C890	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C900	283-0211-00			CAP.,FXD,CER DI:0.1UF,10%,200V	72982	8141N227C104K
C902	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
C904	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C920	283-0188-00			CAP.,FXD,CER DI:0.001UF,20%,6000V	72982	8486KVX5T0102M
C921	283-0013-00			CAP.,FXD,CER DI:0.01UF,+100-0%,1000V	56289	33C29A7
C927	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
C929	283-0300-00			CAP.,FXD,CER DI:0.001UF,+80-20%,10,000V	72982	3910BW509C142K
C930	283-0071-00			CAP.,FXD,CER DI:0.0068UF,+80-30%,5000V	56289	45C10A1
C934	283-0071-00			CAP.,FXD,CER DI:0.0068UF,+80-30%,5000V	56289	45C10A1
C938	283-0341-00			CAP.,FXD,CER DI:0.047UF,10%,100V	72982	8131N127X7R0473K
C943	283-0341-00			CAP.,FXD,CER DI:0.047UF,10%,100V	72982	8131N127X7R0473K
C946	283-0341-00			CAP.,FXD,CER DI:0.047UF,10%,100V	72982	8131N127X7R0473K
C950	290-0325-00			CAP.,FXD,ELCTLT:330UF,+75-10%,50V	56289	60ID337G050FL4
C951	290-0506-00			CAP.,FXD,ELCTLT:9600UF,+100-10%,30V	56289	68D10471
C952	290-0583-00			CAP.,FXD,ELCTLT:3000UF,+100-10%,35V	56289	68D10490
C954	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
C959	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C961	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
C965	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C976	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
C978	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C983	281-0549-00			CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C994	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
CR118	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR130	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR140	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR170	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR171	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR218	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR230	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR240	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR270	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR271	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR318	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR330	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR340	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR370	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR371	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR418	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR430	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR440	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR470	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR471	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR518	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR530	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR540	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR550[1]						
CR565	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR575	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR580	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR591	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR618	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	07910	CD12676
CR630, CR650[1]	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR680	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR691	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR701	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR702	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR704	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR706	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR708	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR710	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR720	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR730	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR740	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR750	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR752	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR753	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR755	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR756	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR810	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR816	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR818	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR819	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR820	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR822	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR826	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR830	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR831	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR832	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR833	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR852	152-0409-00			SEMICOND DEVICE:SILICON,12,000V,5MA	83003	VG12X
CR853	152-0409-00			SEMICOND DEVICE:SILICON,12,000V,5MA	83003	VG12X
CR860	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR864	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR868	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR870	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR871	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR872	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR874	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR876	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR888	152-0400-00			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0400-00
CR889	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR890	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR907	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR925	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR927	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR929	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR930	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	12969	NDP341
CR938	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR943	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR951	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	04713	1N4721

[1]See option section

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CR952	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	04713	1N4721
CR953	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	04713	1N4721
CR954	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	04713	1N4721
CR955	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR957	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR962	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR972	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR976	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR978	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	80009	152-0066-00
CR981	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR993	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
DS512	150-1017-00			LAMP,LED:55MA,GREEN	50437	LSM-161
DS920	150-0111-00			LAMP,GLOW:NEON,1.2MA	74276	2AA
E856	119-0181-00			SURGE VOLTAGE P:230VAC,+/-15%	80009	119-0181-00
E876	119-0181-00			SURGE VOLTAGE P:230VAC,+/-15%	80009	119-0181-00
E878	119-0181-00			SURGE VOLTAGE P:230VAC,+/-15%	80009	119-0181-00
E925	119-0181-00			SURGE VOLTAGE P:230VAC,+/-15%	80009	119-0181-00
E932	119-0181-00			SURGE VOLTAGE P:230VAC,+/-15%	80009	119-0181-00
F950	159-0018-00			FUSE,CARTRIDGE:3AG,0.8A,250V,SLOW-BLOW	71400	MDL 8/10
F951	159-0015-00			FUSE,CARTRIDGE:3AG,3A,250V,FAST-BLOW	71400	AGC3
F953	159-0025-00			FUSE,CARTRIDGE:3AG,0.5A,250V,FAST-BLOW	71400	AGC 1/2
F955	159-0025-00			FUSE,CARTRIDGE:3AG,0.5A,250V,FAST-BLOW	71400	AGC 1/2
J101	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/H	05091	31-279
J201[1]						
J301	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/H	05091	31-279
J401[1]						
J501	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/H	05091	31-279
J551[1]						
J601						
L889	108-0155-00			COIL,RF:FIXED,1MH	80009	108-0155-00
L951	108-0337-00			COIL,RF:25UH	80009	108-0337-00
L980	108-0889-00			COIL,TUBE DEFL:TRACE ROTATOR	80009	108-0889-00
Q120A,B	151-1090-00			TRANSISTOR:SILICON,DUAL,N CHANNEL,FET	80009	151-1090-00
Q130	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q134	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q140	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q142	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q170	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q172	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q176	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q184	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q186	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q190	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q195	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q230	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q234	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q240	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q242	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q270	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q272	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q276	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q284	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q286	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q290	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q295	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q320A,B	151-1090-00			TRANSISTOR:SILICON,DUAL,N CHANNEL,FET	80009	151-1090-00
Q330	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q334	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q340	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q342	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q370	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q372	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q376	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q384	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q386	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q390	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q395	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q430	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q434	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q440	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q442	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q470	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q472	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q476	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q484	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q486	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q490	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q495	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q520A,B	151-1042-00			TRANSISTOR:MATCHED PAIR FET	80009	151-1042-00
Q530	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q534	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q540	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q542[1]	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q550[1]						
Q570	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q576	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q580	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q590	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q596	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q630	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q634	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q642[1]	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q650[1]						
Q658[1]						
Q670	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q680	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q690	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q696	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q710	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q720	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q730	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q740	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q750	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q760	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q765	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q770	151-0407-00			TRANSISTOR:SILICON,NPN	80009	151-0407-00
Q776	151-0406-00			TRANSISTOR:SILICON,PNP	80009	151-0406-00
Q810	151-0136-00			TRANSISTOR:SILICON,NPN	02735	35495
Q814	151-0134-00			TRANSISTOR:SILICON,PNP	80009	151-0134-00
Q816	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	80009	151-0349-00
Q818	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	80009	151-0349-00
Q826	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q864	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q895	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q900	151-0647-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q907	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q911	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q914	151-0347-00			TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q955	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q962	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q965	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q970	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
Q976	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q981	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q987	151-0350-00			TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q994	151-0190-00			TRANSISTOR:SILICON,NPN	80009	151-0190-00
R105	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R110[1]						
R112[1]						
R114	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R116	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R118	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R120	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R123	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
R124	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R125	311-1957-00			RES.,VAR,NONWIR:1K OHM,10%,0.375W	01121	SERIES 73(ADVISE)
R130	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R134	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
R140	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R142	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R144	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
R146	321-0349-00			RES.,FXD,FILM:42.2K OHM,1%,0.125W	91637	MFF1816G42201F
R147	311-1958-00			RES.,VAR,NONWIR:1K OHM,10%,0.5W	01121	WP1G032S102UA
R149	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	91637	MFF1816G23200F
R161	311-1268-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	32997	3329P-L58-103
R163	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R167	321-0189-00			RES.,FXD,FILM:909 OHM,1%,0.125W	91637	MFF1816G909R0F
R170	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R172	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R174	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R176	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R180	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R181	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
R184	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
R186	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R188	323-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.50W	75042	CECT0-3482F

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R190	321-0157-00			RES.,FXD,FILM:422 OHM,1%,0.125W	91637	MFF1816G422R0F
R192	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
R195	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R197	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R210[1]						
R212[1]						
R214	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R216	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R218	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R220	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R224	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R230	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R234	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
R240	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R242	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R244	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
R246	321-0349-00			RES.,FXD,FILM:42.2K OHM,1%,0.125W	91637	MFF1816G42201F
R270	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R272	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R274	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R276	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R280	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R281	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
R284	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
R286	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R288	323-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.50W	75042	CECT0-3482F
R290	321-0157-00			RES.,FXD,FILM:422 OHM,1%,0.125W	91637	MFF1816G422R0F
R292	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
R295	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R305	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R310[1]						
R312[1]						
R314	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R316	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R318	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R320	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R323	321-0111-00			RES.,FXD,FILM:140 OHM,1%,0.125W	91637	MFF1816G140R0F
R324	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R325	311-1957-00			RES.,VAR,NONWIR:1K OHM,10%,0.5W	01121	SERIES 73(ADVISE)
R330	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R334	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
R340	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R342	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R344	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
R346	321-0349-00			RES.,FXD,FILM:42.2K OHM,1%,0.125W	91637	MFF1816G42201F
R347	311-1958-00			RES.,VAR,NONWIR:1K OHM,10%,0.5W	01121	WP1G0325102UA
R349	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	91637	MFF1816G23200F
R361	311-1268-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	32997	3329P-L58-103
R363	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R367	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R370	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R372	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R374	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R376	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R380	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R381	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
R384	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	91637	MFF1816G576R0F
R386	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R388	323-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.50W	75042	CECT0-3482F
R390	321-0157-00			RES.,FXD,FILM:422 OHM,1%,0.125W	91637	MFF1816G422R0F
R392	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
R395	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R397	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R410						
R412						
R414	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R416	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R418	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R420	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R424	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R430	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R434	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
R440	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R442	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R444	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	91637	MFF1816G46400F
R446	321-0349-00			RES.,FXD,FILM:42.2K OHM,1%,0.125W	91637	MFF1816G42201F
R470	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R472	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R474	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R476	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R480	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R481	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
R484	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	91637	MFF1816G576R0F
R486	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R488	323-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.50W	75042	CECT0-3482F
R490	321-0157-00			RES.,FXD,FILM:422 OHM,1%,0.125W	91637	MFF1816G422R0F
R492	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
R495	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
R507	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R509	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R512	301-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.50W	01121	EB3625
R514	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R516	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R518	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R520	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R523	321-0149-00			RES.,FXD,FILM:348 OHM,1%,0.125W	91637	MFF1816G348R0F
R524	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R525	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A R2K
R530	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R534	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887R0F
R539	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R540	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R542	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R544	321-0248-00			RES.,FXD,FILM:3.74K OHM,1%,0.125W	91637	MFF1816G37400F
R546	321-0351-00			RES.,FXD,FILM:44.2K OHM,1%,0.125W	91637	MFF1816G44201F
R547	311-1958-00			RES.,VAR,NONWIR:1K OHM,10%,0.5W	01121	WP1G032S102UA

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R549	321-0218-00			RES.,FXD,FILM:1.82K OHM,1%,0.125W	91637	MFF1816G18200F
R550[1]						
R552[1]						
R555[1]						
R570	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
R571	321-0254-00			RES.,FXD,FILM:4.32K OHM,5%,0.25W	91637	MFF1816G91637
R572	321-0227-00			RES.,FXD,FILM:2.26K OHM,1%,0.125W	91637	MFF1816G22600F
R573	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R575	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
R576	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
R580	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R582	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R584	315-0150-00			RES.,FXD,CMPSN:15 OHM,5%,0.25W	01121	CB1505
R585	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R586	321-0278-00			RES.,FXD,FILM:7.68K OHM,1%,0.125W	91637	MFF1816G76800F
R588	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
R590	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G10000F
R591	315-0150-00			RES.,FXD,CMPSN:15 OHM,5%,0.25W	01121	CB1505
R596	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R597	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R614	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	91637	MFF1816G10003F
R616	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R618	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R620	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
R624	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
R630	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R634	321-0188-00			RES.,FXD,FILM:887 OHM,1%,0.125W	91637	MFF1816G887R0F
R640	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R642	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R650[1]						
R651[1]						
R654[1]						
R656[1]						
R658[1]						
R671	321-0254-00			RES.,FXD,FILM:4.32K OHM,5%,0.25W	91637	MFF1816G43200F
R673	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R680	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R682	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R690	321-0158-00			RES.,FXD,FILM:432 OHM,5%,0.25W	91637	MFF1816G47500F
R692	323-0318-00			RES.,FXD,FILM:20K OHM,1%,0.50W	75042	CECT0-2002F
R693	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91A R2K
R696	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R701	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R702	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R704	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R706	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R708	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R710	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R712	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R715	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500
R720	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R722	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R725	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500

[1]See option section

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R730	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R732	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R735	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500
R740	321-0187-00			RES.,FXD,FILM:866 OHM,1%,0.125W	91637	MFF1816G866R0F
R742	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R745	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91A R2500
R749	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R750	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R753	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R756	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
R760	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R761	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
R765	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R770	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R773	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
R774	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
R776	321-0168-00			RES.,FXD,FILM:549 OHM,1%,0.125W	91637	MFF1816G549R0F
R780	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R789	301-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.50W	01121	EB2035
R810	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R811	307-0051-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.50W	01121	EB27G5
R812	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R814	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R816	308-0679-00			RES.,FXD,WW:0.51 OHM,5%,2W	75042	BWH-R5100J
R818	308-0679-00			RES.,FXD,WW:0.51 OHM,5%,2W	75042	BWH-R5100J
R819	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R820	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R822	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R824	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R826	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R830	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R831	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R832	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R834	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R836	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R837	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R839	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R841	311-1960-00			RES.,VAR,NONWIR:50K OHM,20%,0.75W	01121	SERIES 73(ADVISE)
R844	311-1959-00			RES.,VAR,NONWIR:50M OHM,20%,0.50W	01121	WP1G032S505MA
R850	307-0051-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.50W	01121	EB27G5
R854	301-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.50W	01121	EB4705
R856	301-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.50W	01121	EB1035
R858	301-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.50W	01121	EB4705
R860	315-0125-00			RES.,FXD,CMPSN:1.2M OHM,5%,0.25W	01121	CB1255
R862	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91A R50K
R863	321-0342-00			RES.,FXD,FILM:35.7K OHM,1%,0.125W	91637	MFF1816G35701F
R864	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R866	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R868	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R870	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R872	301-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.50W	01121	EB4725
R874	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R876	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R878	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R879	301-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.50W	01121	EB1515
R880	301-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.50W	01121	EB2215
R888	315-0180-00			RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
R889	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R893	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R895	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R896	307-0057-00			RES.,FXD,CMPSN:5.1 OHM,5%,0.50W	01121	EB51G5
R898	308-0127-00			RES.,FXD,WW:2.5K OHM,5%,5W	91637	RS5-B25000J
R902	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R904	321-0367-00			RES.,FXD,FILM:64.9K OHM,1%,0.125W	91637	MFF1816G64901F
R906	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R907	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R909	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R910	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R911	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R912	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R914	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R918	311-1563-00			RES.,VAR,NONWIR:1K OHM,20%,0.50W	73138	91A R1K
R919	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
R920A-D	307-0572-00			RES.,NETWK,FXD FI:HIGH VOLTAGE DIVIDER	80009	307-0572-00
R925	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R927	315-0564-00			RES.,FXD,CMPSN:560K OHM,5%,0.25W	01121	CB5645
R929	301-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.50W	01121	EB1035
R930	301-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.50W	01121	EB2215
R932	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R934	301-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.50W	01121	EB2725
R935	301-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.50W	01121	EB4715
R937	323-0298-00			RES.,FXD,FILM:12.4K OHM,1%,0.50W	75042	CECT0-1242F
R939	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R942	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R943	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91AR50K
R944	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R946	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R947	301-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
R949	311-1332-00			RES.,VAR,NONWIR:5K OHM,10%,2W	12697	389-CM40936
R954	308-0767-00			RES.,FXD,WW:1.1 OHM,5%,1W	75042	BW20-1R100J
R955	308-0079-00			RES.,FXD,WW:117 OHM,5%,5W	91637	RS5-K117R0J
R957	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	91637	MFF1816G25500F
R958	311-1564-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A R500
R959	321-0213-00			RES.,FXD,FILM:1.62K OHM,1%,0.125W	91637	MFF1816G16200F
R961	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R962	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R963	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R965	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R967	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R968	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
R970	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R972	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R973	301-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.50W	01121	EB3035
R975	308-0686-00			RES.,FXD,WW:2.2 OHM,5%,2W	75042	BWH-2R200J
R976	308-0079-00			RES.,FXD,WW:117 OHM,5%,5W	91637	RS5-K117R0J
R978	321-0779-03			RES.,FXD,FILM:7.020K OHM,0.25%,0.125W	91637	MFF1816D70200C

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R979	321-0274-00			RES.,FXD,FILM:6.98K OHM,1%,0.125W	91637	MFF1816G69800F
R981	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R983	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R985	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R987	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R988	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R990	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB1825
R991	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R993	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91A R50K
R994	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R995	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
S110[1]						
S210[1]						
S310[1]						
S330	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S410[1]						
S550[1]						
S950	260-0413-00			SW,THERMOSTATIC:10A,240V	73803	200700L63-253
S960	260-1849-02			SWITCH,PUSH:DPDT,4A,250VAC,W/BRACKET		
T850	120-1132-00			XFMR,PWR,SDN & SU:HIGH VOLTAGE	80009	120-1132-00
T950	120-1133-00			XFMR,PWR,SDN & SU:	80009	120-1133-00
U832	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U885	152-0552-00			SEMICOND DEVICE:V MULTR,5KV IN,15KV OUT	80009	152-0552-00
V950	154-0787-00			ELECTRON TUBE:CRT,T6080-30-1 W/GRATICULE	80009	154-0786-00
VR130	152-0195-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR330	152-0195-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR530	152-0279-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0279-00
VR750	152-0279-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0279-00
VR770	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	07910	1N4372A
VR822	152-0428-00			SEMICOND DEVICE:ZENER,0.4W,120V,5%	04713	1N987B
VR891	152-0309-00			SEMICOND DEVICE:ZENER,1W,6.2V,5%	04713	1N3828A
VR938	152-0241-00			SEMICOND DEVICE:ZENER,0.4W,33V,5%	04713	1N973B
VR968	152-0212-00			SEMICOND DEVICE:ZENER,0.5W,9V,5%	04713	SZ50646

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).

Resistors = Ohms (Ω).

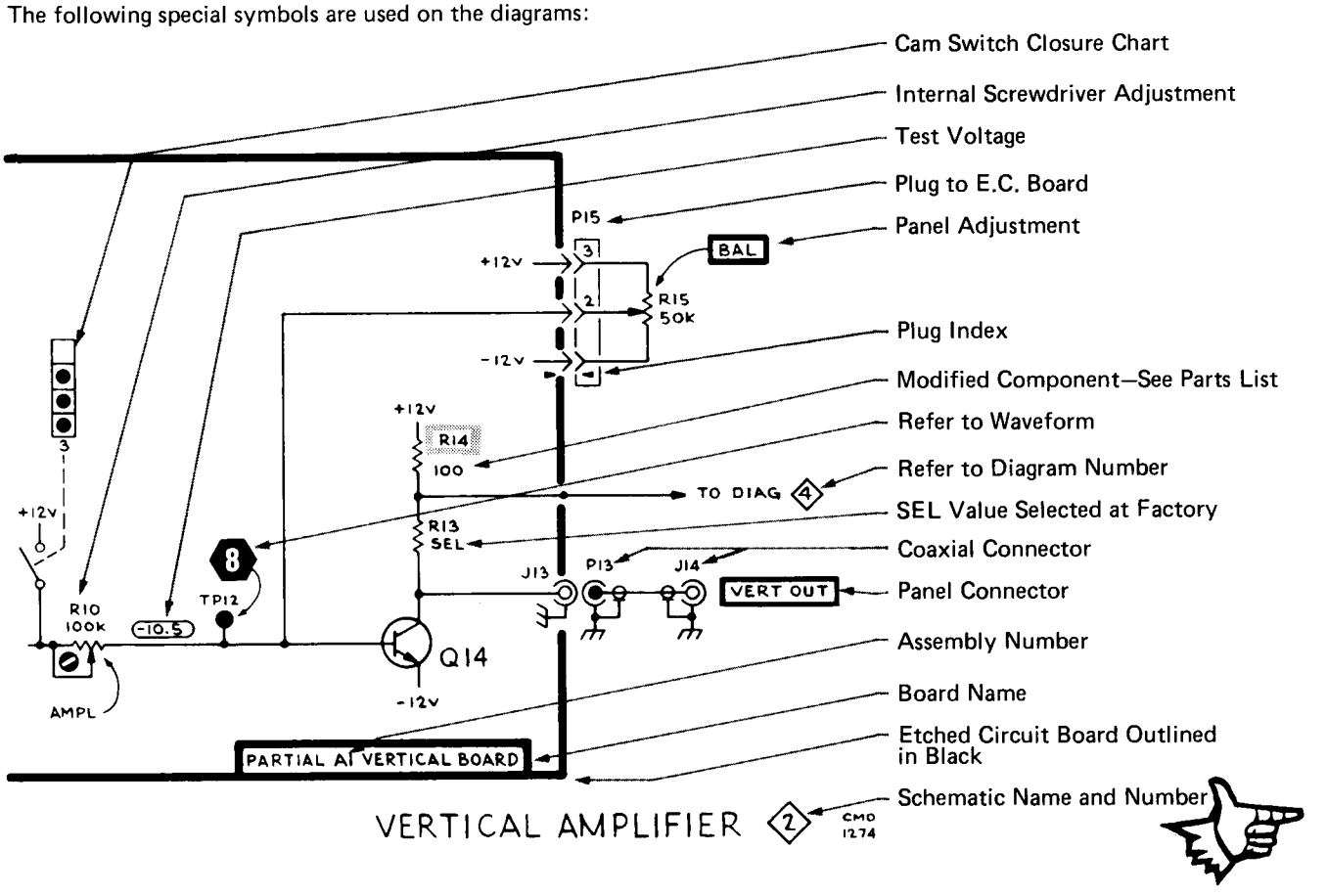
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)	H	Heat dissipating device (heat sink, heat radiator, etc.)	RT	Thermistor
AT	Attenuator, fixed or variable	HR	Heater	S	Switch
B	Motor	HY	Hybrid circuit	T	Transformer
BT	Battery	J	Connector, stationary portion	TC	Thermocouple
C	Capacitor, fixed or variable	K	Relay	TP	Test point
CB	Circuit breaker	L	Inductor, fixed or variable	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	V	Electron tube
DL	Delay line	M	Meter	VR	Voltage regulator (zener diode, etc.)
DS	Indicating device (lamp)	P	Connector, movable portion	Y	Crystal
E	Spark Gap	Q	Transistor or silicon-controlled rectifier	Z	Phase shifter
F	Fuse	R	Resistor, fixed or variable		
FL	Filter				

The following special symbols are used on the diagrams:



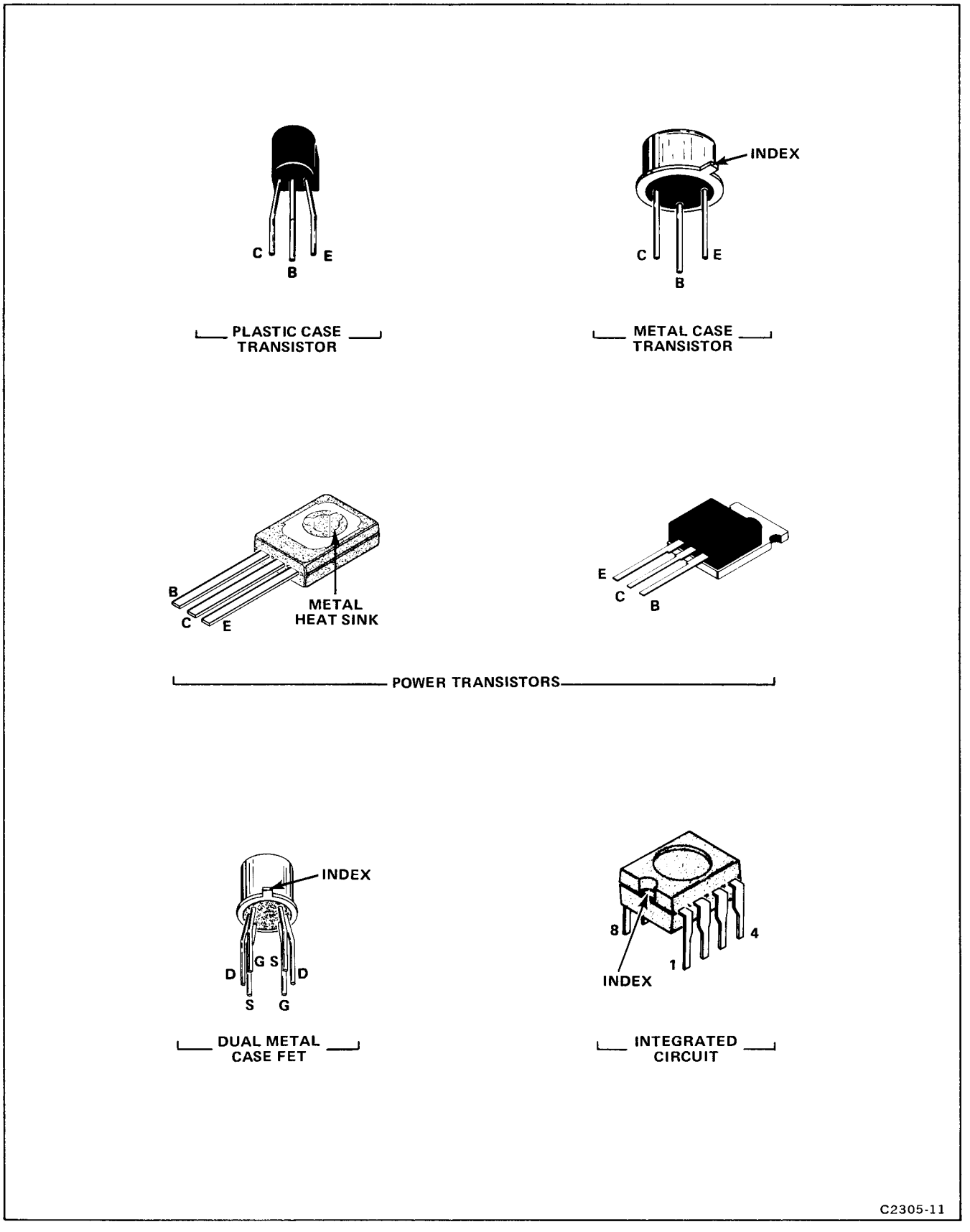


Figure 8-1. Semiconductor Lead Configurations.

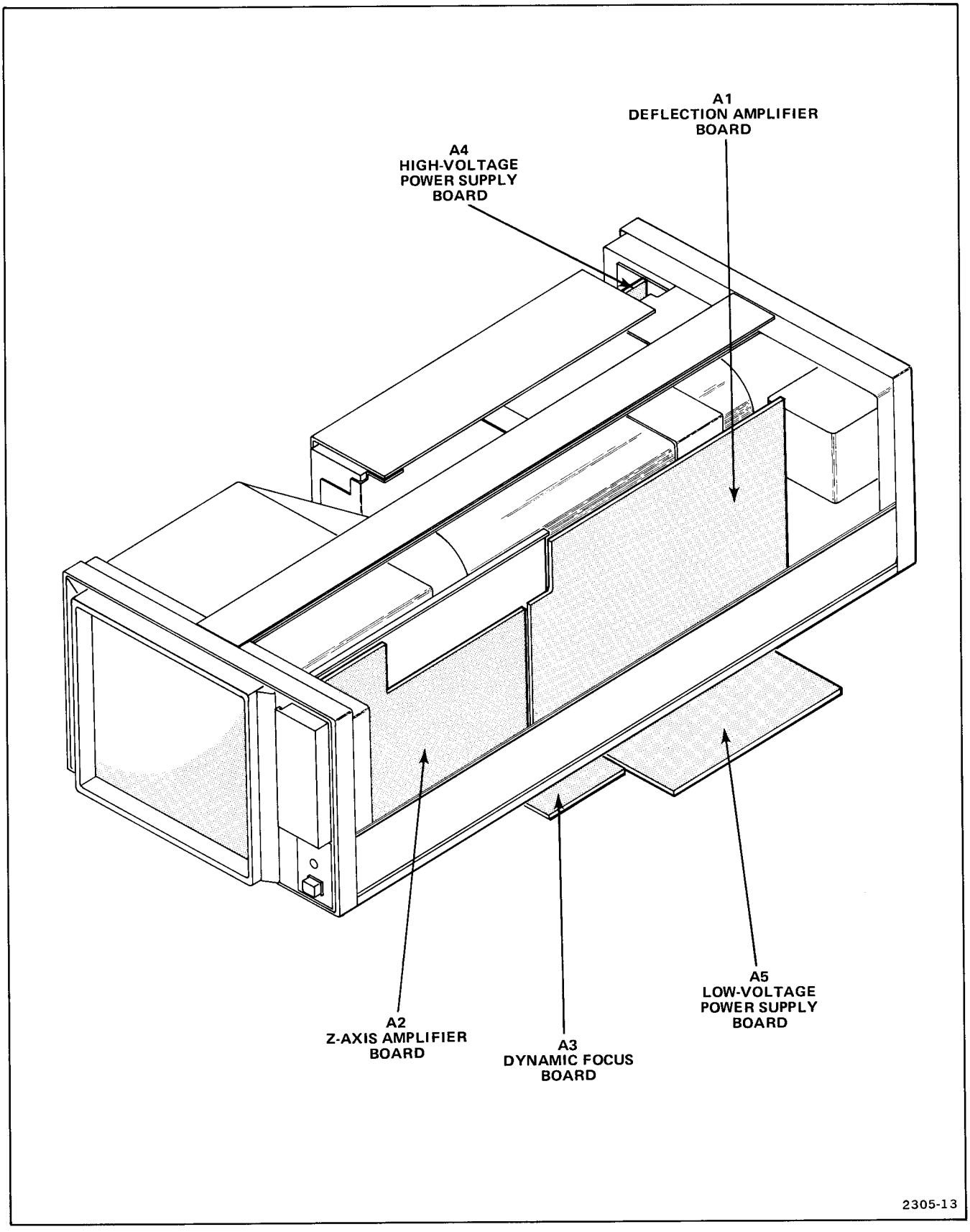


Figure 8-2. Circuit Board Locations.

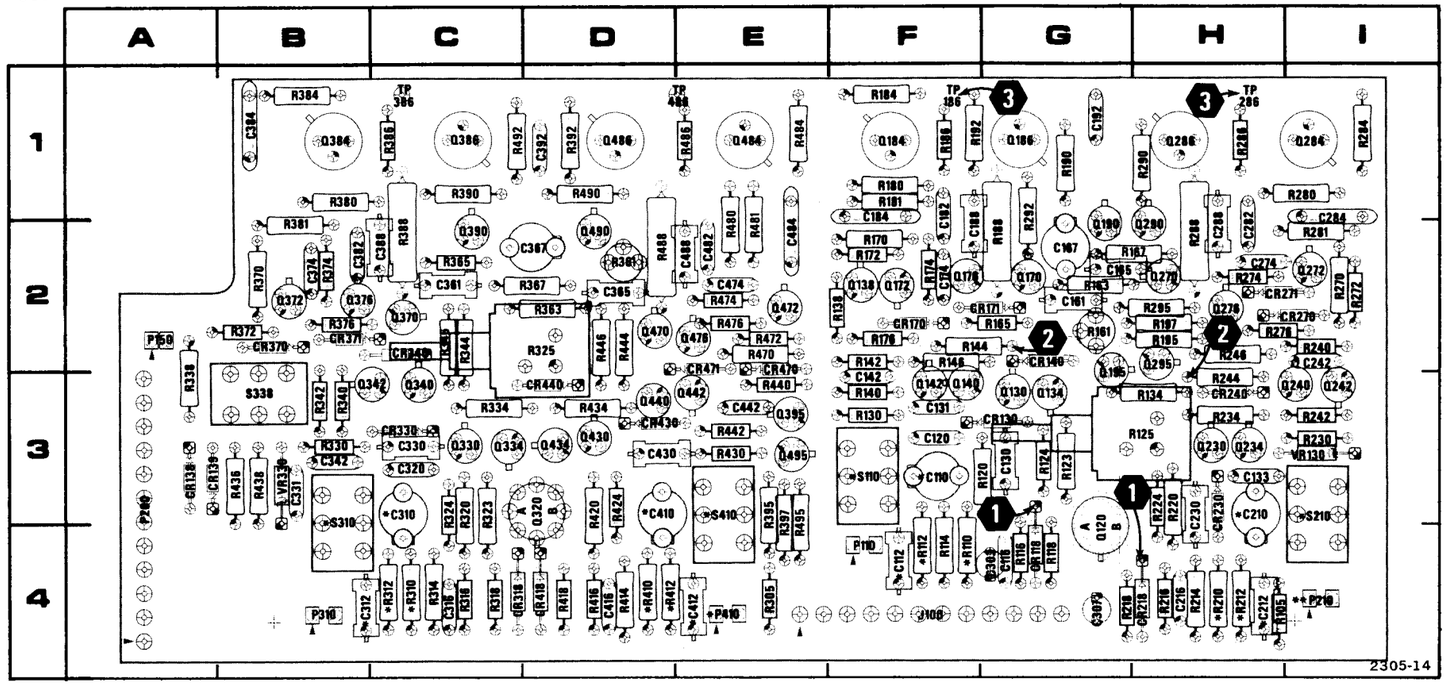


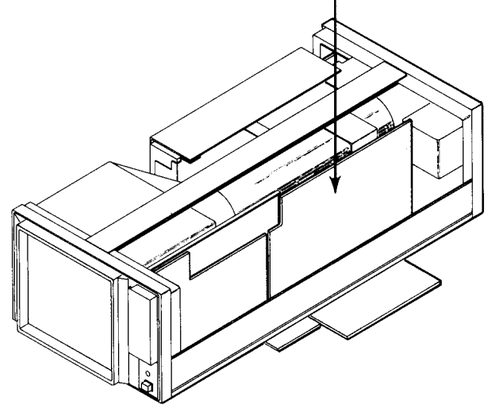
Figure 8-3. A1—Vertical (Y) Amplifier components and waveform test points locator.

Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
*C110	3F	C320	3C	CR230	3H	Q170	2G	Q430	3D	R161	2G	R270	2I	R363	2D	R470	2E
*C112	4F	C330	3C	CR240	3H	Q172	2F	Q434	3D	R163	2G	R272	2I	R365	2C	R472	2E
C116	4G	C331	3B	CR270	2I	Q176	2F	Q440	3D	R165	2G	R274	2H	R367	2D	R474	2E
C120	3F	C342	3B	CR271	2H	Q184	1F	Q442	3E	R167	2G	R276	2H	R370	2B	R476	2E
C130	3G	C361	2C	CR318	4C	Q186	1G	Q470	2D	R170	2F	R280	1I	R372	2B	R480	2E
C131	3F	C365	2D	CR330	3C	Q190	2G	Q472	2E	R172	2F	R281	2I	R374	2B	R481	2E
C133	3H	C367	2D	CR340	2C	Q195	3G	Q476	2E	R174	2F	R284	1I	R376	2B	R484	1E
C142	3F	C374	2B	CR370	2B	Q230	3H	Q484	1E	R176	2F	R286	1H	R380	1B	R486	1E
C161	2G	C382	2B	CR371	2B	Q234	3H	Q486	1D	R180	1F	R288	2H	R381	2B	R488	2D
C165	2G	C384	1B	CR418	4D	Q240	3I	Q490	2D	R181	1F	R290	1H	R384	1B	R490	1D
C167	2G	C388	2C	CR430	3D	Q242	3I	Q495	3E	R184	1F	R292	2G	R386	1C	R492	1C
C174	2F	C392	1D	CR440	3D	Q270	2H			R186	1F	R295	2H	R388	2C	R495	3E
C182	1F	*C410	3D	CR470	2E	Q272	2I	R105	4H	R188	2G	R305	4E	R390	1C		
C184	1F	*C412	4E	CR471	2E	Q276	2H	*R110	4F	R190	1G	*R310	4C	R392	1D	*S110	3F
C188	2F	C416	4D			Q284	1I	*R112	4F	R192	1F	*R312	4C	R395	3E	*S210	3I
C192	1G	C430	3D	J100	4F	Q286	1H	R114	4F	R195	2H	R314	4C	R397	3E	*S310	3B
*C210	3H	C442	3E			Q290	2H	R116	4G	R197	2H	R316	4C	*R410	4D	S338	3B
*C212	4H	C474	2E	P110	4F	Q295	2H	R118	4G	*R210	4H	R318	4C	*R412	4D	*S410	3E
C216	4H	C482	2E	P150	2A	Q320	3D	R120	3G	*R212	4H	R320	3C	R414	4D		
C230	3H	C484	2E	P200	3A	Q330	3C	R123	3G	R214	4H	R323	3C	R416	4D	TP186	1F
C242	2I	C488	2E	**P210	4I	Q334	3C	R124	3G	R216	4H	R324	3C	R420	3D	TP286	1H
C274	2H			P310	4B	Q340	3C	R125	3H	R218	4G	R325	2D	R424	3D	TP386	1C
C282	2H	CR118	4G	*P410	4E	Q342	3B	R130	3F	R220	3H	R330	3B	R430	3E	TP486	1E
C288	2H	CR130	3G			Q370	2C	R134	3H	R224	3H	R334	3C	R434	3D		
C284	1I	CR138	3A	Q120	4G	Q372	2B	R138	2F	R230	3I	R338	3A	R436	3B	VR130	3I
C303	4G	CR139	3A	Q130	3G	Q376	2B	R140	3F	R234	3H	R340	3B	R438	3B	VR330	3B
C307	4G	CR140	2G	Q134	3G	Q384	1B	R142	2F	R240	2I	R342	3B	R440	3E		
*C310	3C	CR170	2F	Q138	2F	Q386	1C	R144	2F	R242	3I	R344	2C	R442	3E		
*C312	4B	CR171	2G	Q140	3F	Q390	2C	R146	2F	R244	3H	R346*	2C	R444	2D		
C316	4C	CR218	4H	Q142	3F	Q395	3E	R148	4D	R246	2H	R361	2D	R446	2D		

@ *SEE OPTION 22 IN INSTRUMENT OPTIONS SECTION.
**SEE OPTION 21 IN INSTRUMENT OPTIONS SECTION.

A1
DEFLECTION AMPLIFIER
BOARD



VOLTAGE AND WAVEFORM CONDITIONS

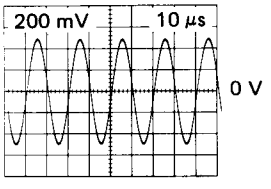
NOTE

The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.

Waveform Conditions. The following waveforms were monitored with a test oscilloscope and a 10X probe. A 1-volt peak-to-peak 50-kilohertz, sinewave was applied to the 608 +Y input connector with the vertical position control centered. The Y GAIN control was adjusted to provide 8 divisions of deflection with a 1-volt input. Test oscilloscope deflection factor and sweep rate settings appear on the waveform illustrations.

1



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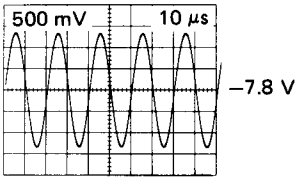

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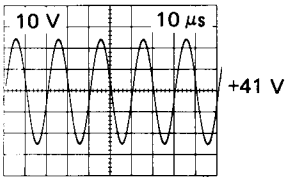
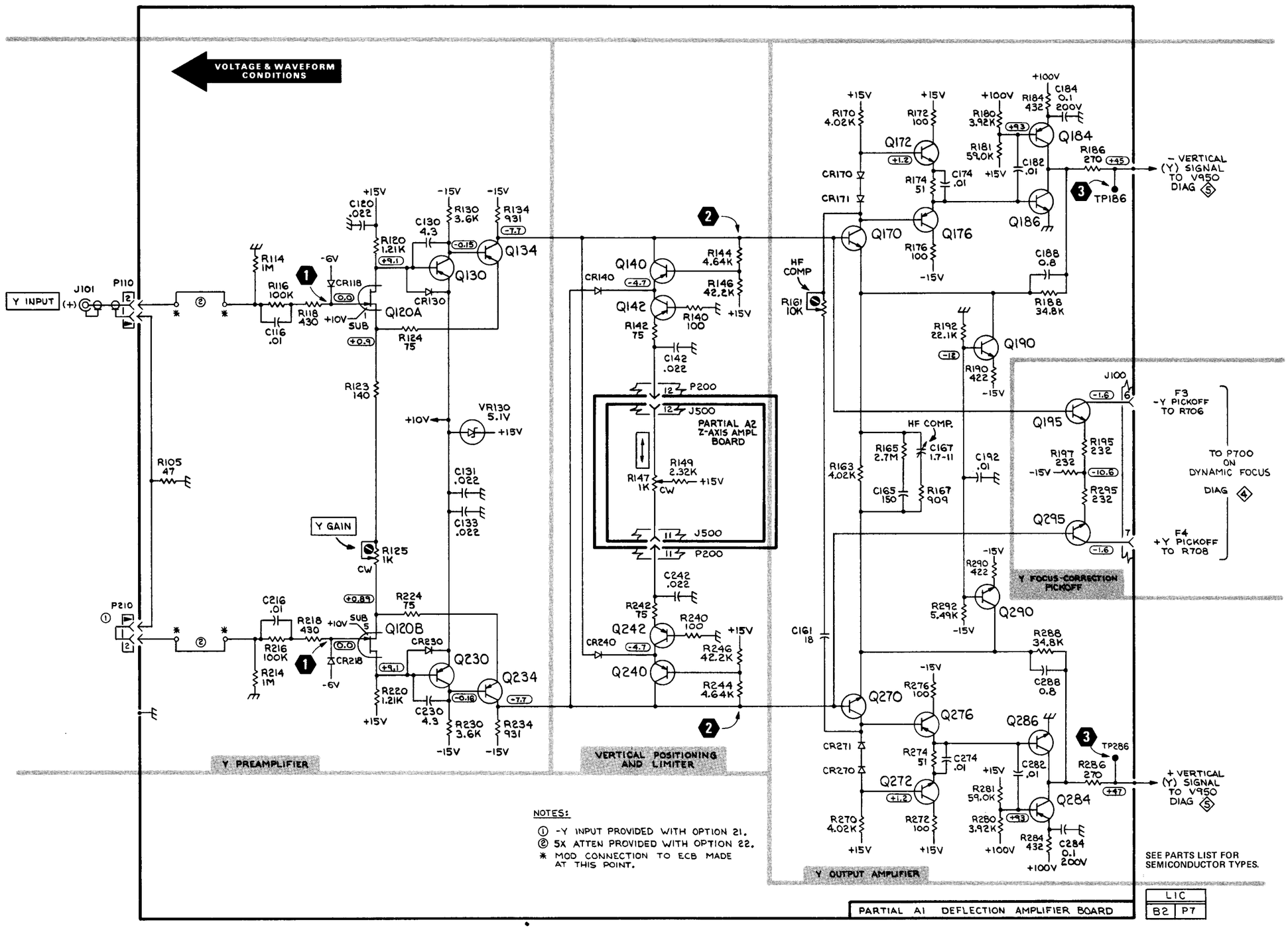




VERTICAL (Y) DEFLECTION AMPLIFIER 1

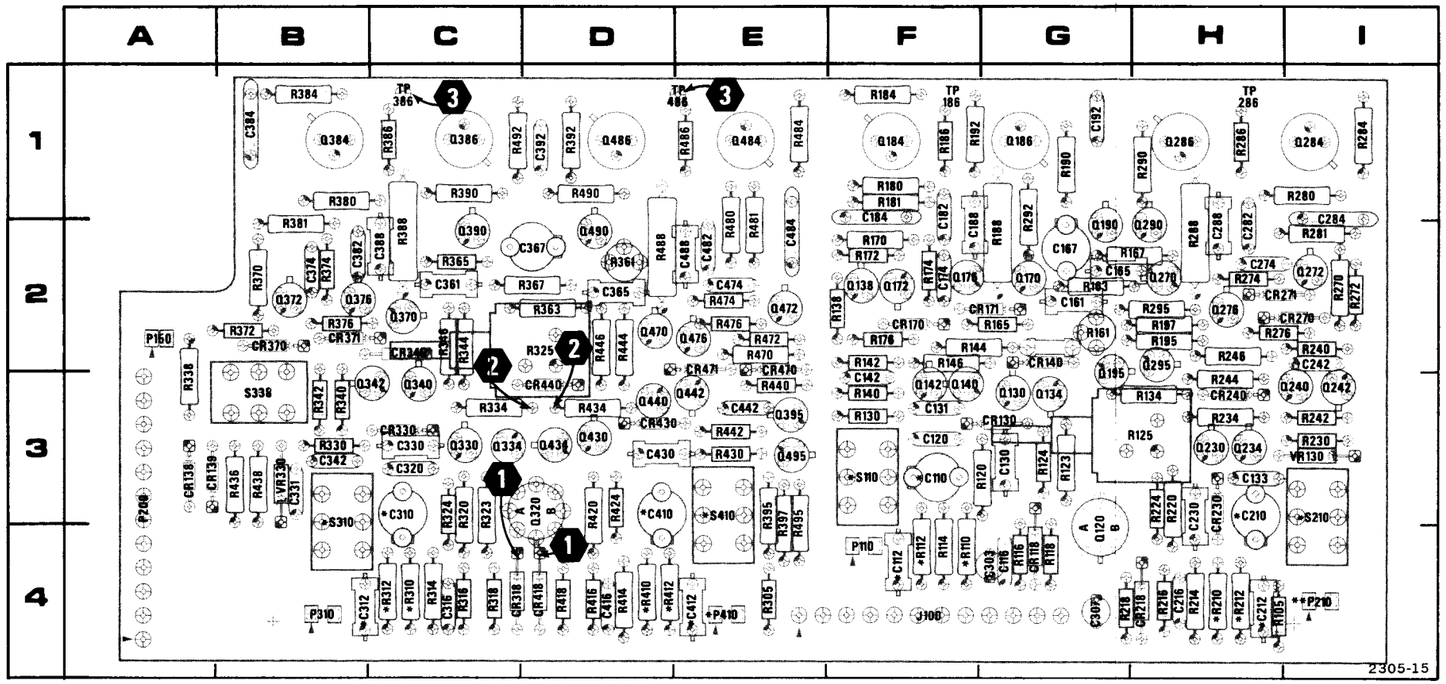
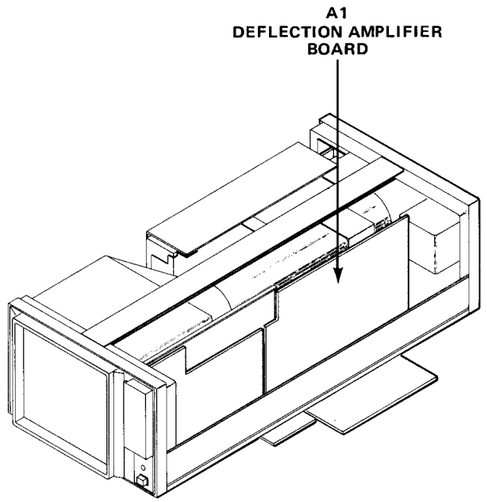


Figure 8-4. A1—Horizontal (X) Amplifier components and waveform test points locator.

Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
*C110	3F	C320	3C	CR230	3H	Q170	2G	Q430	3D	R161	2G	R270	2I	R363	2D	R470	2E
*C112	4F	C330	3C	CR240	3H	Q172	2F	Q434	3D	R163	2G	R272	2I	R365	2C	R472	2E
C116	4G	C331	3B	CR270	2I	Q176	2F	Q440	3D	R165	2G	R274	2H	R367	2D	R474	2E
C120	3F	C342	3B	CR271	2H	Q184	1F	Q442	3E	R167	2G	R276	2H	R370	2B	R476	2E
C130	3G	C361	2C	CR318	4C	Q186	1G	Q470	2D	R170	2F	R280	1I	R372	2B	R480	2E
C131	3F	C365	2D	CR330	3C	Q190	2G	Q472	2E	R172	2F	R281	2I	R374	2B	R481	2E
C133	3H	C367	2D	CR340	2C	Q195	3G	Q476	2E	R174	2F	R284	1I	R376	2B	R484	1E
C142	3F	C374	2B	CR370	2B	Q230	3H	Q484	1E	R176	2F	R286	1H	R380	1B	R486	1E
C161	2G	C382	2B	CR371	2B	Q234	3H	Q486	1D	R180	1F	R288	2H	R381	2B	R488	2D
C165	2G	C384	1B	CR418	4D	Q240	3I	Q490	2D	R181	1F	R290	1H	R384	1B	R490	1D
C167	2G	C388	2C	CR430	3D	Q242	3I	Q495	3E	R184	1F	R292	2G	R386	1C	R492	1C
C174	2F	C392	1D	CR440	3D	Q270	2H			R186	1F	R295	2H	R388	2C	R495	3E
C182	1F	*C410	3D	CR470	2E	Q272	2I	R105	4H	R188	2G	R305	4E	R390	1C		
C184	1F	*C412	4E	CR471	2E	Q276	2H	*R110	4F	R190	1G	*R310	4C	R392	1D	*S110	3F
C188	2F	C416	4D			Q284	1I	*R112	4F	R192	1F	*R312	4C	R395	3E	*S210	3I
C192	1G	C430	3D	J100	4F	Q286	1H	R114	4F	R195	2H	R314	4C	R397	3E	*S310	3B
*C210	3H	C442	3E			Q290	2H	R116	4G	R197	2H	R316	4C	*R410	4D	S338	3B
*C212	4H	C474	2E	P110	4F	Q295	2H	R118	4G	*R210	4H	R318	4C	*R412	4D	*S410	3E
C216	4H	C482	2E	P150	2A	Q320	3D	R120	3G	*R212	4H	R320	3C	R414	4D		
C230	3H	C484	2E	P200	3A	Q330	3C	R123	3G	R214	4H	R323	3C	R416	4D	TP186	1F
C242	2I	C488	2E	**P210	4I	Q334	3C	R124	3G	R216	4H	R324	3C	R420	3D	TP286	1H
C274	2H			P310	4B	Q340	3C	R125	3H	R218	4G	R325	2D	R424	3D	TP386	1C
C282	2H	CR118	4G	*P410	4E	Q342	3B	R130	3F	R220	3H	R330	3B	R430	3E	TP486	1E
C288	2H	CR130	3G			Q370	2C	R134	3H	R224	3H	R334	3C	R434	3D		
C284	1I	CR138	3A	Q120	4G	Q372	2B	R138	2F	R230	3I	R338	3A	R436	3B	VR130	3I
C303	4G	CR139	3A	Q130	3G	Q376	2B	R140	3F	R234	3H	R340	3B	R438	3B	VR330	3B
C307	4G	CR140	2G	Q134	3G	Q384	1B	R142	2F	R240	2I	R342	3B	R440	3E		
*C310	3C	CR170	2F	Q138	2F	Q386	1C	R144	2F	R242	3I	R344	2C	R442	3E		
*C312	4B	CR171	2G	Q140	3F	Q390	2C	R146	2F	R244	3H	R346	2C	R444	2D		
C316	4C	CR218	4H	Q142	3F	Q395	3E	R148	4D	R246	2H	R361	2D	R446	2D		

@ *SEE OPTION 22 IN INSTRUMENT OPTIONS SECTION.
**SEE OPTION 21 IN INSTRUMENT OPTIONS SECTION.



VOLTAGE AND WAVEFORM CONDITIONS

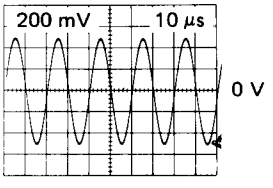
NOTE

The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.

Waveform Conditions. The following waveforms were monitored with a test oscilloscope and a 10X probe. A 1-volt peak-to-peak, 50-kilohertz, sinewave was applied to the 608 +X input connector with the vertical position control centered. The X GAIN control was adjusted to provide 8 divisions of deflection with a 1-volt input. Test oscilloscope deflection factor and sweep rate settings appear on the waveform illustrations.

1



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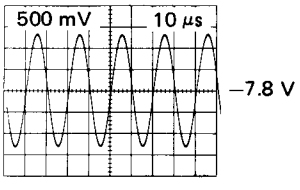

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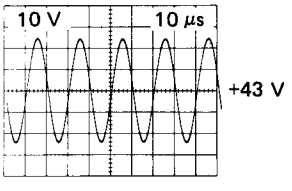
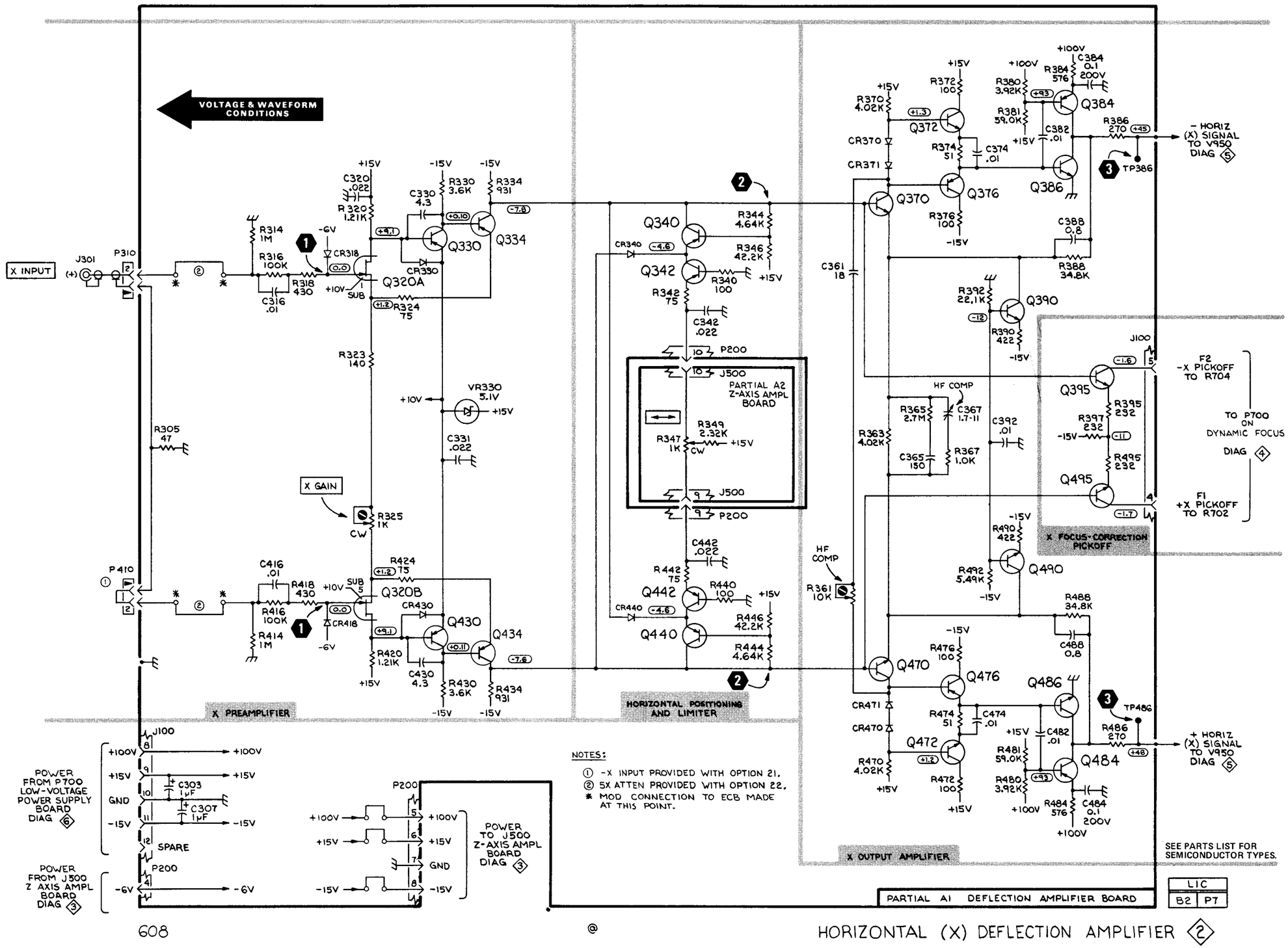




608

@

HORIZONTAL (X) DEFLECTION AMPLIFIER 2

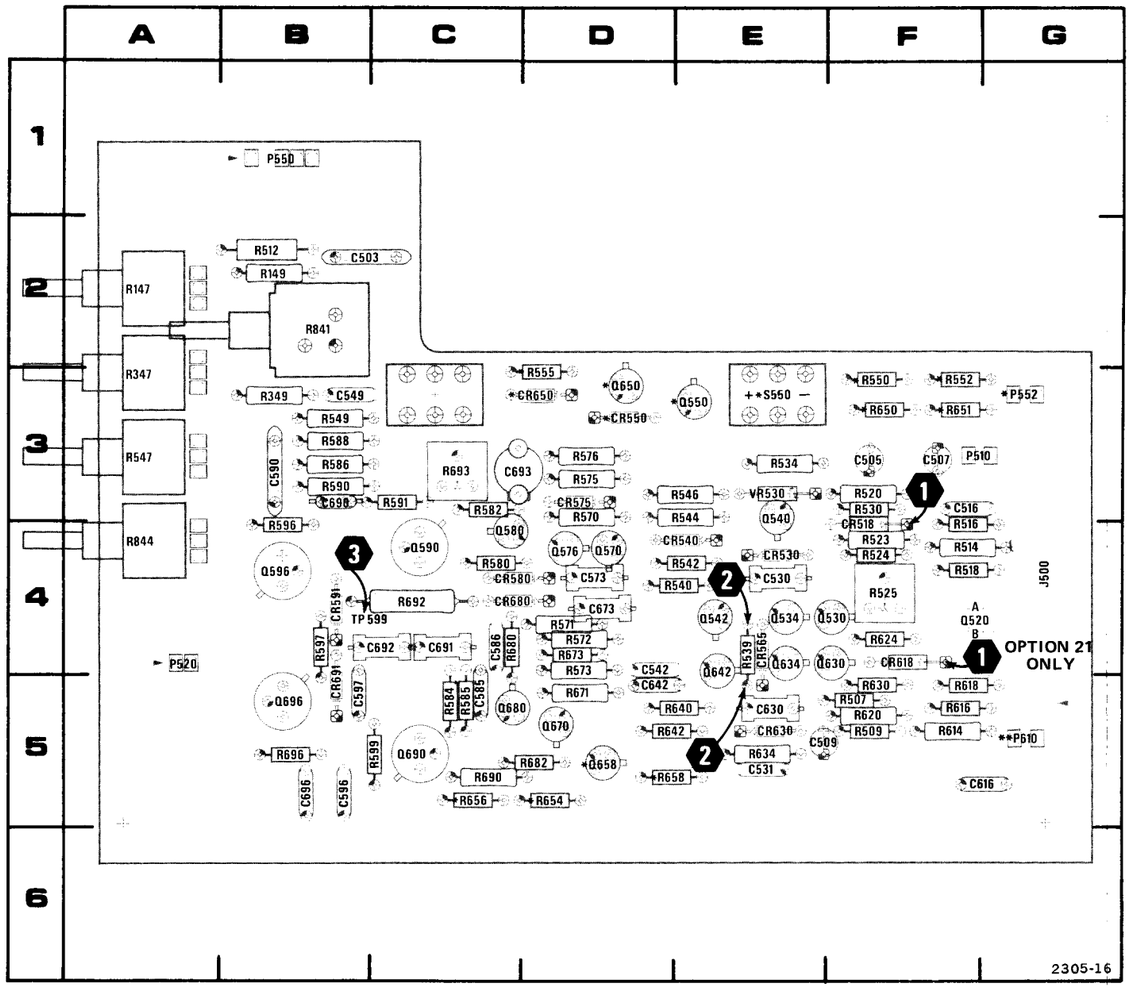
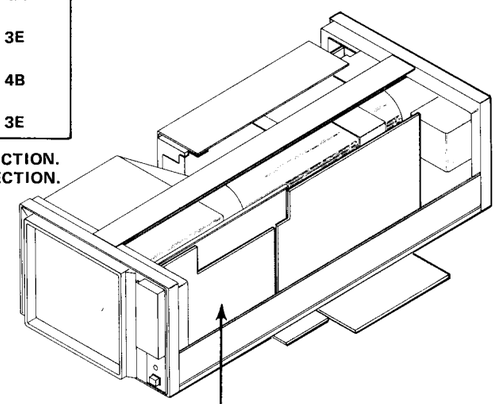


Figure 8-5. A2—Z-Axis Amplifier components and waveform test points locator.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C503	2B	Q520	4F	R570	3D
C505	3F	Q530	4F	R571	4D
C507	3F	Q534	4E	R572	4D
C509	5E	Q540	3E	R573	4D
C516	3F	Q542	4E	R575	3D
C530	4E	*Q550	3E	R576	3D
C531	5E	Q570	4D	R580	4C
C542	4D	Q576	4D	R582	3C
C549	3B	Q580	4C	R584	5C
C573	4D	Q590	4C	R585	5C
C585	5C	Q596	4B	R586	3B
C586	4C	Q630	4F	R588	3B
C590	3B	Q634	4E	R590	3B
C596	5B	Q642	4E	R591	3C
C597	5B	*Q650	3D	R596	4B
C616	5G	*Q658	5D	R597	4B
C630	5E	Q670	5D	R599	5C
C642	5D	Q680	5C	R614	5F
C673	4D	Q690	5C	R616	5F
C690	3B	Q696	5B	R618	5F
C691	4C			R620	5F
C692	4C	R147	2A	R624	4F
C693	3C	R149	2B	R630	5F
C696	5B	R347	3A	R634	5E
		R349	3B	R640	5E
CR518	3F	R507	5F	R642	5E
CR530	4E	R509	5F	*R650	3F
CR540	4E	R512	2B	*R651	3F
*CR550	3D	R514	4F	*R654	5D
CR565	4E	R516	3F	*R656	5C
CR575	3D	R518	4F	*R658	5E
CR580	4C	R520	3F	R671	5D
CR591	4B	R523	4F	R673	4D
CR618	4F	R524	4F	R680	4C
CR630	5E	R525	4F	R682	5D
*CR650	3D	R530	3F	R690	5C
CR680	4C	R534	3E	R692	4C
CR691	5B	R539	4E	R693	3C
		R540	4E	R696	5B
J500	4G	R542	4E	R841	2B
		R544	3E	R844	4A
		R546	3E		
P510	3F	R547	3A	*S550	3E
P520	4A	R549	3B		
P550	1B	*R550	3F	TP599	4B
*P552	3G	*R552	3F		
**P610	5G	*R555	3D	VR530	3E

*SEE OPTION 25 IN INSTRUMENT OPTIONS SECTION.
**SEE OPTION 21 IN INSTRUMENT OPTIONS SECTION.

Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7



VOLTAGE AND WAVEFORM CONDITIONS

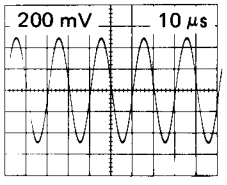
NOTE

The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.

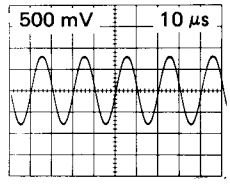
Waveform Conditions. The following waveforms were monitored with a test oscilloscope and a 10X probe. A 1-volt peak-to-peak, 50-kilohertz, sinewave was applied to the 608 +Z input connector with the displayed spot positioned off screen (to prevent burning the crt phosphor. The INTENSITY control was was set for approximately +35 volts dc as monitored at the Z-Axis Amplifier output (TP599). Test oscilloscope deflection factor and sweep rate settings appear on the waveform illustrations.

1



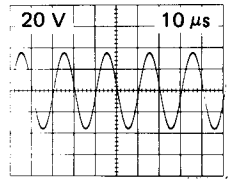
0 V

2

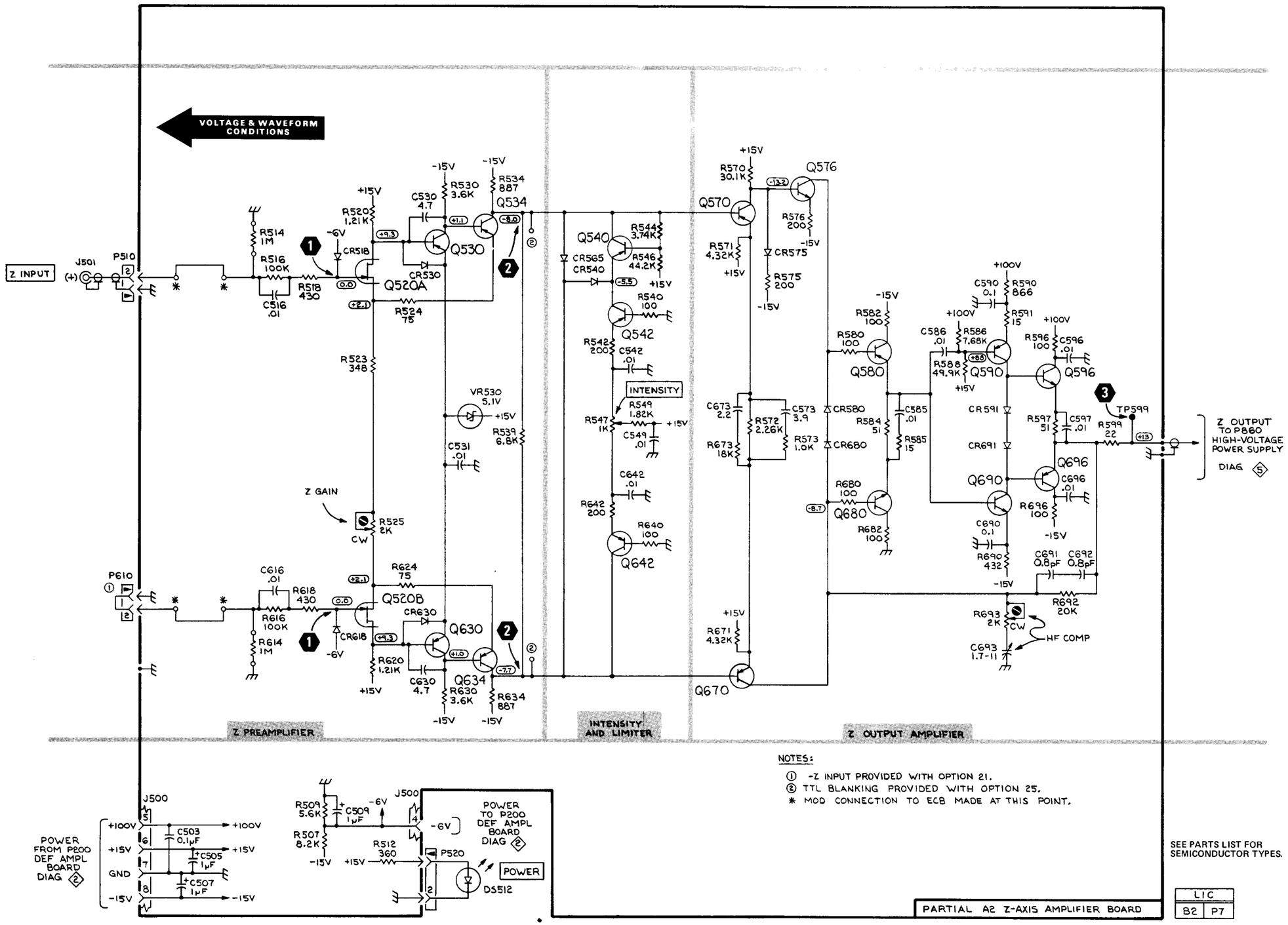


−8.4 V

3



+34 V


VOLTAGE & WAVEFORM CONDITIONS
Z INPUT
J501
P510
R514 1M
R516 100K
C516 .01
R518 430
CR518
Q520A
R520 1.21K
+15V
-6V
C530 4.7
R530 3.6K
-15V
R534 887
Q534
Q530
CR530
R524 75
R523 348
VR530 5.1V
R539 6.8K
C531 .01
Z GAIN
R525 2K CW
P610
C616 .01
R618 430
R616 100K
R614 1M
Q520B
CR618
R624 75
CR630
Q630
R620 1.21K
C630 4.7
Q634
R630 3.6K
R634 887
Q540
CR565
CR540
R544 3.74K
R546 44.2K
R540 100
Q542
R542 200
C542 .01
INTENSITY
R549 1.82K
R547 1K
C549 .01
C642 .01
R642 200
R640 100
Q642
Q570
R570 30.1K
R571 4.32K
Q576
R576 200
CR575
R575 200
R671 4.32K
Q670
R582 100
R580 100
Q580
CR580
CR680
R584 51
R680 100
Q680
R682 100
C673 2.2
R672 2.26K
R673 18K
C573 3.9
R573 1.0K
C585 .01
R585 15
+100V
C590 0.1
R590 866
R591 15
C586 .01
R586 7.68K
R588 49.9K
Q590
CR591
CR691
Q690
R690 432
C690 0.1
R596 100
C596 .01
Q596
R597 51
C597 .01
R599 22
TP599
Q696
C696 .01
R696 100
C691 0.8pF
C692 0.8pF
R692 20K
R693 2K CW
HF COMP
C693 1.7-11
Z OUTPUT TO P860 HIGH-VOLTAGE POWER SUPPLY
DIAG 5
Z PREAMPLIFIER
INTENSITY AND LIMITER
Z OUTPUT AMPLIFIER
J500
POWER FROM P200 DEF AMPL BOARD DIAG 2
+100V
+15V
GND
-15V
C503 0.1μF
C505 1μF
C507 1μF
R509 5.6K
C509 1μF
R507 8.2K
R512 360
P520
POWER
DS512
POWER TO P200 DEF AMPL BOARD DIAG 2
NOTES:
① -Z INPUT PROVIDED WITH OPTION 21.
② TTL BLANKING PROVIDED WITH OPTION 25.
* MOD CONNECTION TO ECB MADE AT THIS POINT.
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
PARTIAL A2 Z-AXIS AMPLIFIER BOARD
LIC
B2 P7

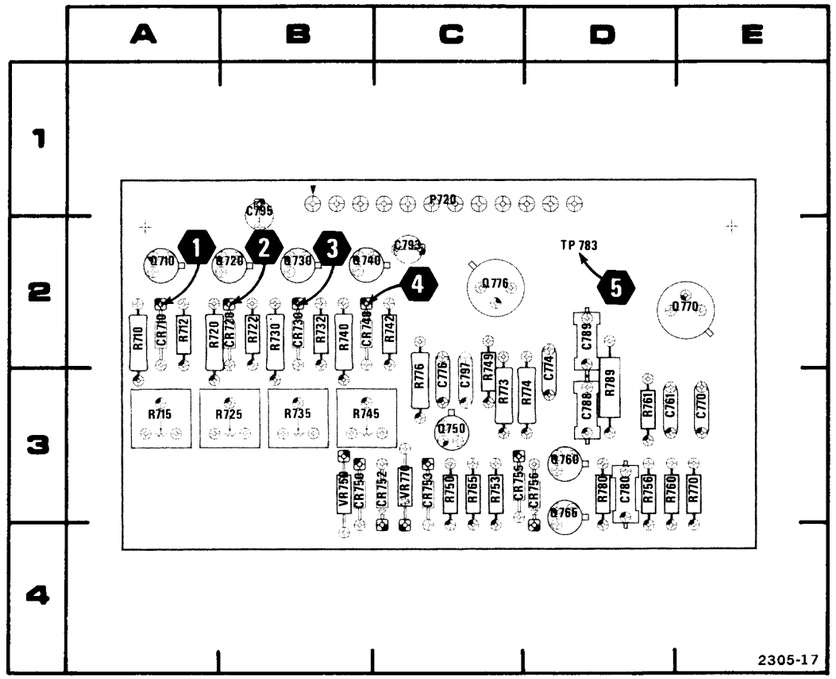
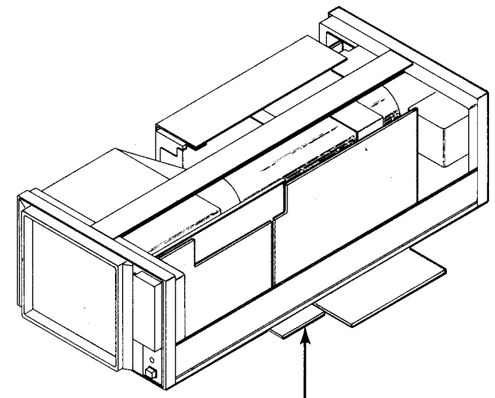


Figure 8-6. A3—Dynamic Focus components and waveform test points locator.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C761	3D	P720	1C	R735	3B
C770	3E			R740	2B
C774	2D	Q710	2A	R745	3B
C776	3C	Q720	2B	R749	3C
C780	3D	Q730	2B	R750	3C
C788	3D	Q740	2B	R753	3C
C789	2D	Q750	3C	R756	3D
C793	2C	Q760	3D	R760	3D
C795	1B	Q765	3D	R761	3D
C797	3C	Q770	2D	R765	3C
		Q776	2C	R770	3E
CR710	2A			R773	3C
CR720	2B	R710	2A	R776	3C
CR730	2B	R712	2A	R780	3D
CR740	2B	R715	3A	R789	3D
CR750	3B	R720	2A		
CR752	3C	R722	2B	TP783	2D
CR753	3C	R725	3B		
CR755	3C	R730	2B	VR750	3B
CR756	3D	R732	2B	VR770	3C



Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7

VOLTAGE AND WAVEFORM CONDITIONS

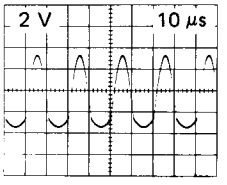
NOTE

The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.

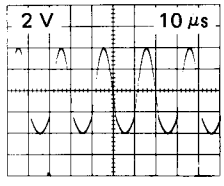
Waveform Conditions. The following waveforms were monitored with a test oscilloscope and a 10X probe. A 1-volt peak-to-peak, 50-kilohertz, sinewave was applied to the 608 +X and +Y input connectors with the Vertical and Horizontal Position controls centered. The X and Y GAIN controls were adjusted to provide 8 divisions of deflection with a 1-volt input. Test oscilloscope deflection factor and sweep rate settings appear on the waveform illustrations.

1



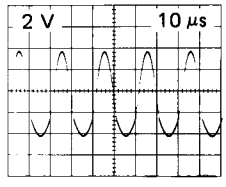
+7.3 V

2



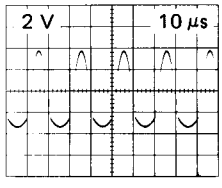
+7.3 V

3



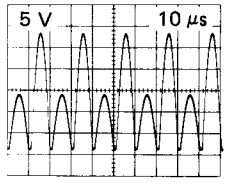
+7.3 V

4

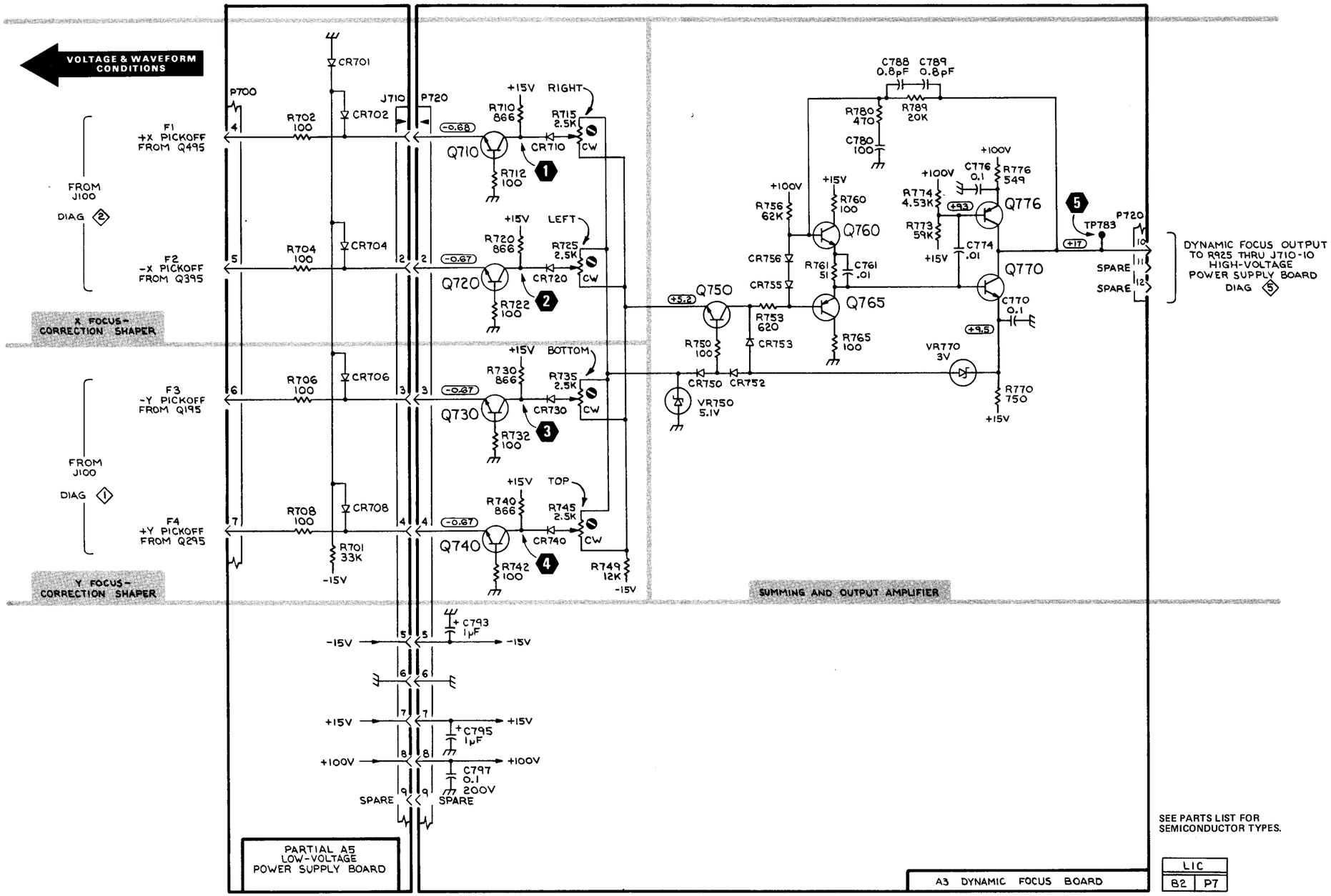


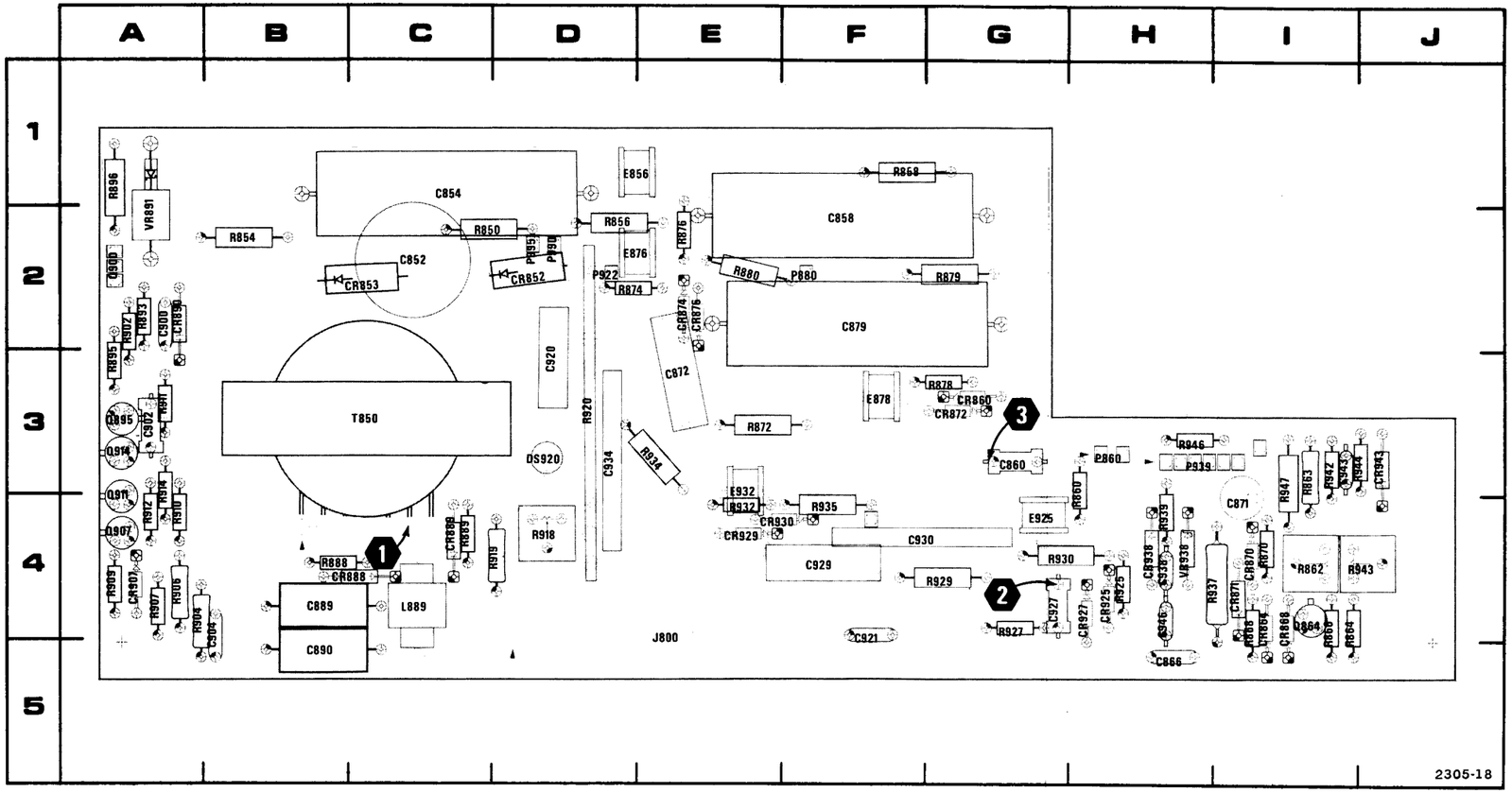
+7.3 V

5



+32 V

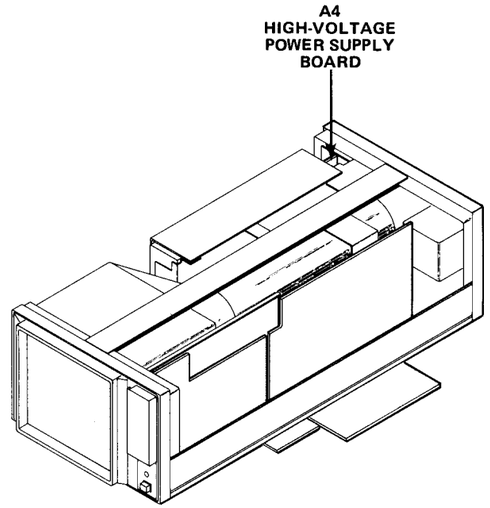

VOLTAGE & WAVEFORM CONDITIONS
F1 +X PICKOFF FROM Q495
FROM J100 DIAG 2
F2 -X PICKOFF FROM Q395
X FOCUS-CORRECTION SHAPER
F3 -Y PICKOFF FROM Q195
FROM J100 DIAG 1
F4 +Y PICKOFF FROM Q295
Y FOCUS-CORRECTION SHAPER
SUMMING AND OUTPUT AMPLIFIER
P700
J710
P720
CR701
CR702
CR704
CR706
CR708
R702 100
R704 100
R706 100
R708 100
R701 33K
-15V
+15V
RIGHT
LEFT
BOTTOM
TOP
R710 866
R715 2.5K
CR710
Q710
R712 100
R720 866
R725 2.5K
CR720
Q720
R722 100
R730 866
R735 2.5K
CR730
Q730
R732 100
R740 866
R745 2.5K
CR740
Q740
R742 100
R749 12K
-0.68
-0.67
-0.67
-0.67
CW
1
2
3
4
C793 1μF
C795 1μF
C797 0.1 200V
SPARE
SPARE
C788 0.8pF
C789 0.8pF
R780 470
C780 100
R789 20K
+100V
R756 62K
CR756
CR755
Q750
+5.2
R750 100
CR750
CR752
VR750 5.1V
R753 620
CR753
Q760
R760 100
R761 51
C761 .01
Q765
R765 100
+100V
C776 0.1
R776 549
R774 4.53K
+93
Q776
R773 59K
C774 .01
+15V
Q770
C770 0.1
+9.5
VR770 3V
R770 750
+15V
5
TP783
+17
P720
10
11
12
SPARE
SPARE
DYNAMIC FOCUS OUTPUT TO R925 THRU J710-10 HIGH-VOLTAGE POWER SUPPLY BOARD DIAG 5
PARTIAL A5 LOW-VOLTAGE POWER SUPPLY BOARD
A3 DYNAMIC FOCUS BOARD
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
LIC
B2
P7



Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7

Figure 8-7. A4—High-Voltage Power Supply components and waveform test points locator.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C852	2C	C946	4H	CR943	3J	Q864	4I	R878	3G	R927	4G
C854	1C					Q895	3A	R879	2G	R929	4G
C858	2F	CR852	2D	DS920	3D	Q900	2A	R880	2E	R930	4G
C860	3G	CR853	2C			Q907	4A	R888	4B	R932	4E
C866	5H	CR860	3G	E856	1E	Q911	4A	R889	4C	R934	3E
C871	4I	CR864	4I	E876	2D	Q914	3A	R893	2A	R935	4F
C872	3E	CR868	4I	E878	3F			R895	3A	R937	4I
C879	2F	CR870	4I	E925	4G	R850	2C	R896	1A	R939	4H
C889	4B	CR871	4I	E932	3E	R854	2B	R902	2A	R942	3I
C890	5B	CR872	3G			R856	2D	R904	4A	R943	4I
C900	2A	CR874	2E	J800	4E	R858	1F	R906	4A	R944	3I
C902	3A	CR876	2E			R860	4H	R907	4A	R946	3H
C904	4B	CR888	4B	L889	4C	R862	4I	R909	4A	R947	3I
C920	3D	CR889	4C			R863	3I	R910	4A		
C921	4F	CR890	2A			R864	4I	R911	3A	T850	3C
C927	4G	CR907	4A	P860	3H	R866	4I	R912	4A		
C929	4F	CR925	4H	P880	2F	R868	4I	R914	4A	VR891	2A
C930	4F	CR927	4H	P922	2D	R870	4I	R918	4D	VR938	4H
C934	3D	CR929	4E	P939	3H	R872	3E	R919	4C		
C938	4H	CR930	4E	P990	2D	R874	2D	R920	3D		
C943	3I	CR938	4H	P995	2D	R876	2E	R925	4H		



VOLTAGE AND WAVEFORM CONDITIONS

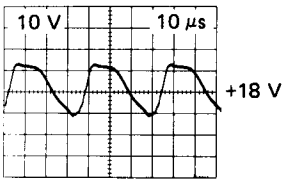
NOTE

The test equipment used to obtain the voltages and waveforms is listed in Table 6-1, Test Equipment.

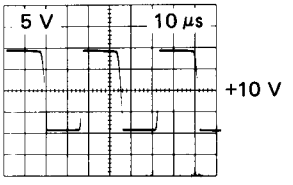
Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.

Waveform Conditions. The following waveforms were monitored with a test oscilloscope and a 10X probe. No input was applied to the 608; the display is a barely visible spot positioned at near center screen. Test oscilloscope deflection factor and sweep rate settings appear on the waveform illustrations.

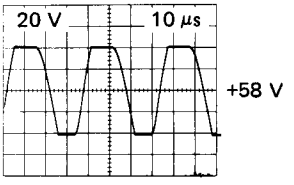
1



2



3



VOLTAGE & WAVEFORM CONDITIONS

HIGH-VOLTAGE OSCILLATOR

CURRENT LIMITER

ERROR AMPLIFIER

CATHODE SUPPLY

CONTROL GRID DC RESTORER

+100V REGULATED SUPPLY

FOCUS-ELEMENT DC RESTORER

CRT INTERCONNECTS

PARTIAL A5 LOW-VOLTAGE POWER SUPPLY BOARD

PARTIAL A2 Z AXIS AMPLIFIER BOARD

PARTIAL A1 DEFLECTION AMPLIFIER BOARD

A4 HIGH-VOLTAGE POWER SUPPLY BOARD

NOTES:
DENOTES +18V GND RETURN DIAG 6

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

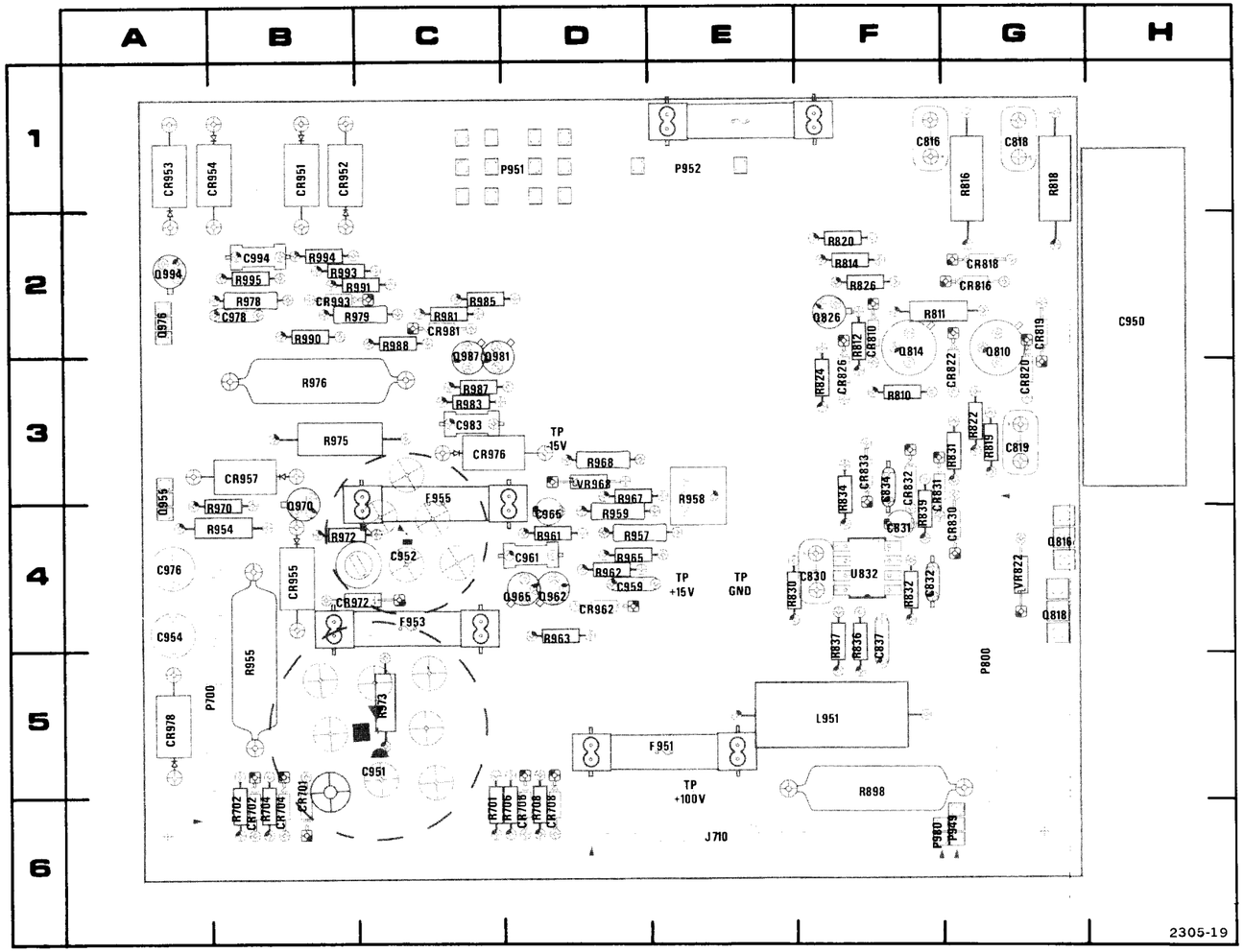
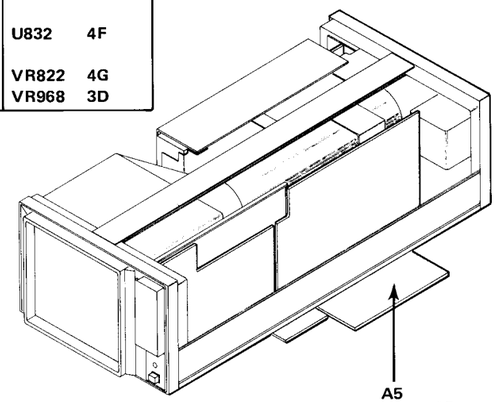


Figure 8-8. A5—Low-Voltage Power Supply components locator.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C815	3G	CR981	2C	R826	2F
C816	1F	CR993	2B	R830	4E
C818	1G			R831	3G
C819	3G	F951	5E	R832	4F
C830	4F	F953	4C	R834	3F
C831	4F	F955	3C	R836	4F
C832	4F			R837	4F
C834	3F	J710	6E	R839	4F
C837	4F			R898	5F
C950	2H	L951	5F	R954	4B
C951	5C			R955	5B
C952	4C	P700	5A	R957	4D
C954	4A	P800	5G	R958	3E
C959	4D	P949	6G	R959	4D
C961	4D	P951	1D	R961	4D
C965	4D	P952	1E	R962	4D
C976	4A	P980	6F	R963	4D
C978	2B			R965	4D
C983	3C	Q810	2G	R967	3D
C994	2B	Q814	2F	R968	3D
		Q816	4G	R970	4B
CR593	1A	Q818	4G	R972	4B
CR701	6B	Q826	2F	R973	5C
CR702	6B	Q955	3A	R975	3B
CR704	6B	Q962	4D	R976	3B
CR706	6D	Q965	4D	R978	2B
CR708	6D	Q970	4B	R979	2B
CR810	2F	Q976	2A	R981	2C
CR816	2G	Q981	2C	R983	3C
CR818	2G	Q987	2C	R985	2C
CR819	2G	Q994	2A	R987	3C
CR820	3G			R988	2C
CR822	3G	R701	6C	R990	2B
CR826	3F	R702	6B	R991	2B
CR830	4G	R704	6B	R993	2B
CR831	3F	R706	6D	R994	2B
CR832	3F	R708	6D	R995	2B
CR833	3F	R810	3F		
CR951	1B	R811	2F	TPGND	4E
CR952	1B	R812	2F	TP-15V	3D
CR954	1B	R814	2F	TP+100V	5E
CR955	4B	R816	1G	TP+15V	4E
CR957	3B	R818	1G		
CR962	4D	R819	3G	U832	4F
CR972	4B	R820	2F		
CR976	3C	R822	3G	VR822	4G
CR978	5A	R824	3F	VR968	3D

Assembly	Location of Complete or Partial Board on Diagrams
A1—Deflection Amplifier Board	Diag. 1 2 5 7
A2—Z Axis Amplifier Board	Diag. 1 2 3 5 7
A3—Dynamic Focus Board	Diag. 4 7
A4—HV Power Supply Board	Diag. 5 7
A5—LV Power Supply Board	Diag. 4 5 6 7

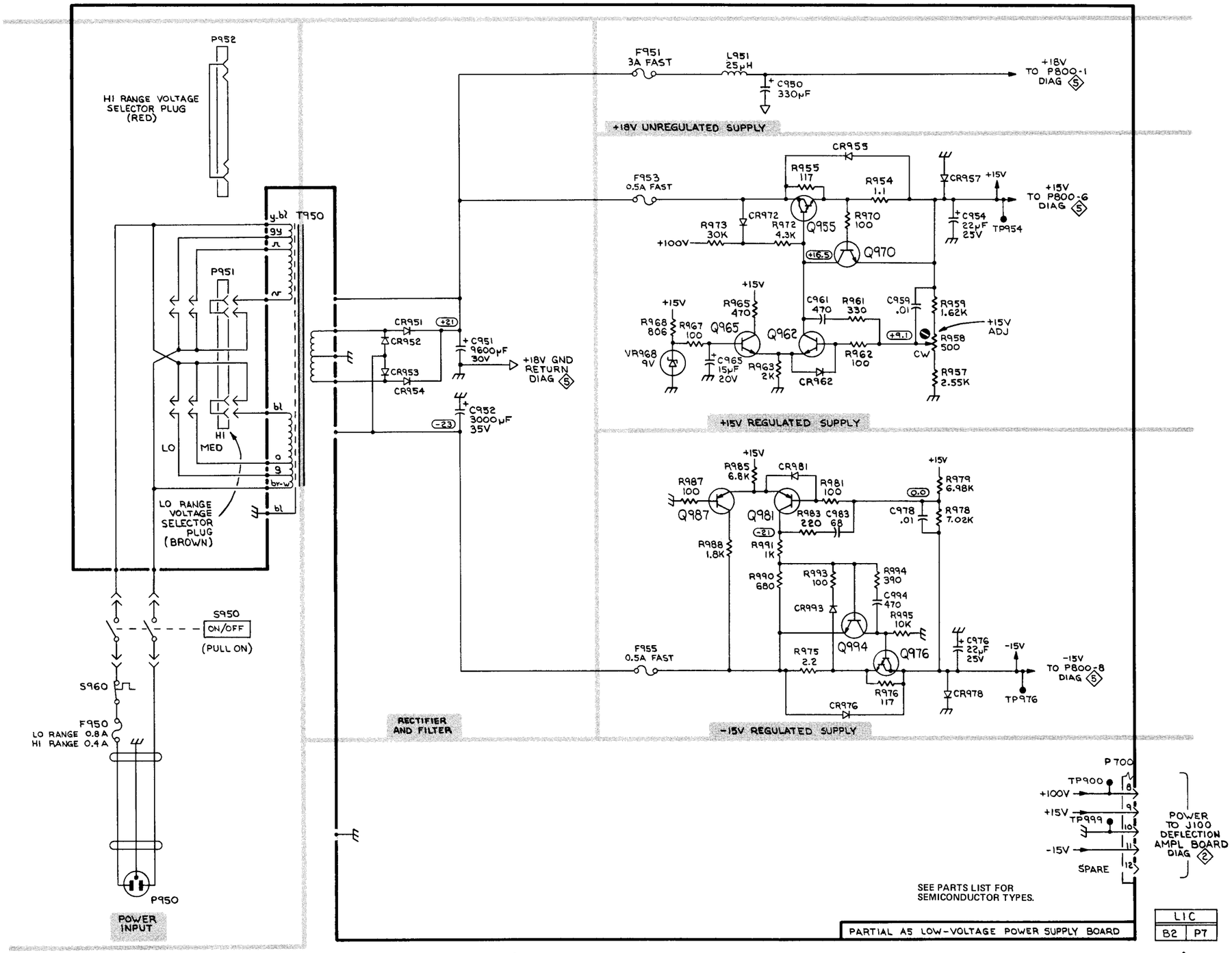


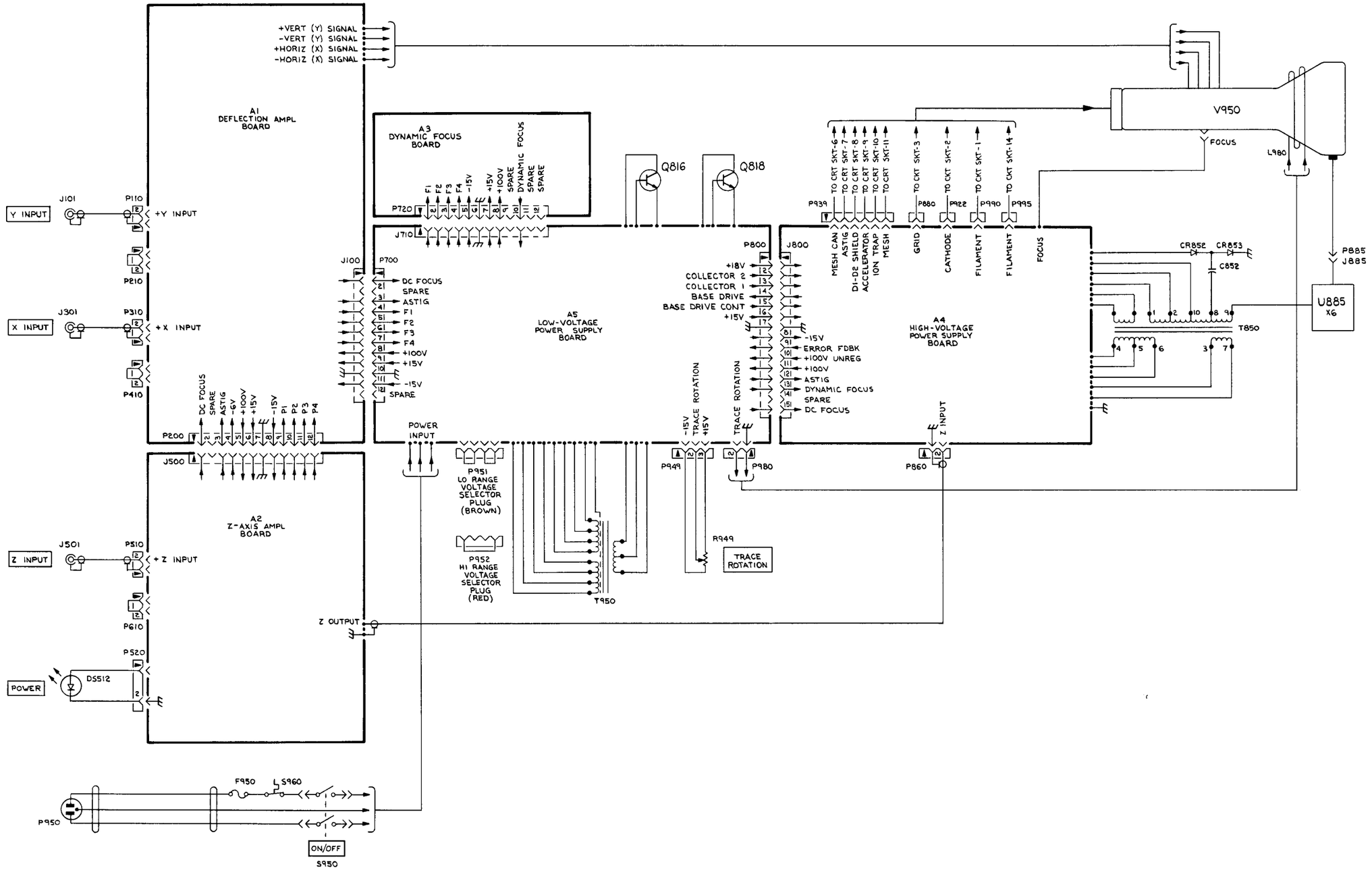
VOLTAGE CONDITIONS

NOTE

The test equipment used to obtain the voltages is listed in Table 6-1, Test Equipment.

Voltage Conditions. The dc voltages indicated on the schematic diagrams were obtained with a digital multimeter and with no test signal input. The 608 INTENSITY and Position controls were set for a barely visible spot positioned at near center screen.


P952
HI RANGE VOLTAGE SELECTOR PLUG (RED)
y-bl T950
gy
r
P951
w
bl
HI
MED
LO
o
g
br-w
bl
LO RANGE VOLTAGE SELECTOR PLUG (BROWN)
S950
ON/OFF
(PULL ON)
S960
F950
LO RANGE 0.8A
HI RANGE 0.4A
P950
POWER INPUT
CR951
+21
CR952
CR953
CR954
C951 9600μF 30V
+18V GND RETURN DIAG 5
C952 3000μF 35V
-23
RECTIFIER AND FILTER
F951 3A FAST
L951 25μH
C950 330μF
+18V TO P800-1 DIAG 5
+18V UNREGULATED SUPPLY
F953 0.5A FAST
CR955
R955 117
R954 1.1
CR957
+15V
+15V TO P800-6 DIAG 5
C954 22μF 25V
TP954
CR972
R973 30K
R972 4.3K
+100V
Q955
R970 100
+16.5
Q970
+15V
R965 470
R968 806
R967 100
Q965
Q962
C961 470
R961 330
C959 .01
R959 1.62K
+15V ADJ
+9.1
R958 500
CW
VR968 9V
C965 15μF 20V
R963 2K
CR962
R962 100
R957 2.55K
+15V REGULATED SUPPLY
R985 6.8K
CR981
R987 100
Q987
Q981
R981 100
R983 220
C983 68
-21
R988 1.8K
R991 1K
R979 6.98K
C978 .01
R978 7.02K
R990 680
R993 100
R994 390
C994 470
CR993
R995 10K
Q994
Q976
R975 2.2
R976 117
CR976
F955 0.5A FAST
C976 22μF 25V
-15V
-15V TO P800-8 DIAG 5
CR978
TP976
-15V REGULATED SUPPLY
P700
TP900
+100V
+15V
TP999
-15V
SPARE
8
9
10
11
12
POWER TO J100 DEFLECTION AMPL BOARD DIAG 2
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
PARTIAL A5 LOW-VOLTAGE POWER SUPPLY BOARD
LIC
B2
P7


+VERT (Y) SIGNAL
-VERT (Y) SIGNAL
+HORIZ (X) SIGNAL
-HORIZ (X) SIGNAL
A1
DEFLECTION AMPL
BOARD
A3
DYNAMIC FOCUS
BOARD
F1 F2 F3 F4 -15V +15V +100V SPARE DYNAMIC FOCUS SPARE SPARE
P720
J710
Q816
Q818
V950
FOCUS
L980
P939
TO CRT SKT-6
TO CRT SKT-7
TO CRT SKT-8
TO CRT SKT-9
TO CRT SKT-10
TO CRT SKT-11
TO CKT SKT-3
TO CKT SKT-2
TO CKT SKT-1
TO CKT SKT-14
P880
P922
P990
P995
MESH CAN
ASTIG
DI-D2 SHIELD
ACCELERATOR
ION TRAP
MESH
GRID
CATHODE
FILAMENT
FILAMENT
FOCUS
CR852
CR853
C852
T850
P885
J885
U885
X6
J101
P110
Y INPUT
+Y INPUT
P810
J301
P310
X INPUT
+X INPUT
P410
J100
P700
DC FOCUS
SPARE
ASTIG
F1
F2
F3
F4
+100V
+15V
-15V
SPARE
A5
LOW-VOLTAGE
POWER SUPPLY
BOARD
P800
J800
+18V
COLLECTOR 2
COLLECTOR 1
BASE DRIVE
BASE DRIVE CONT
+15V
-15V
ERROR FDBK
+100V UNREG
+100V
ASTIG
DYNAMIC FOCUS
SPARE
DC FOCUS
A4
HIGH-VOLTAGE
POWER SUPPLY
BOARD
Z INPUT
P860
P200
DC FOCUS
SPARE
ASTIG
-6V
+100V
+15V
-15V
P1
P2
P3
P4
J500
A2
Z-AXIS AMPL
BOARD
POWER
INPUT
P951
LO RANGE
VOLTAGE
SELECTOR
PLUG
(BROWN)
P952
HI RANGE
VOLTAGE
SELECTOR
PLUG
(RED)
-15V
TRACE ROTATION
+15V
TRACE ROTATION
P949
P980
R949
TRACE
ROTATION
T950
J501
P510
Z INPUT
+Z INPUT
P610
Z OUTPUT
P520
POWER
DS512
P950
F950
S960
ON/OFF
S950

TROUBLESHOOTING CHART INSTRUCTIONS

1. Beginning at the top left block of the chart proceed to the right until the 608 does not perform as indicated.

2. Then follow the dashed line as the symptom indicates until a malfunction is located. Each shaded block in this chart indicates a circuit or stage which may be the cause of the malfunction, and corresponds directly to the circuit or stage names given on the schematic diagrams.

3. Refer to the numbered schematic diagram indicated in the shaded box. Important voltages and numbered waveform test points are given on the schematics to aid in troubleshooting. Typical waveforms, and the conditions under which the voltages and waveforms were taken, are located adjacent to the schematic. Located on the back of the foldout page facing the schematic is an illustration of the 608 showing the location of the board which the circuit is on. In addition, an illustration of that circuit board is included here, identifying the physical location of the circuit components and waveform test points.

4. If additional understanding of the circuit or stage is required, refer to the Theory of Operation, section 4. The circuit or stage names given in this chart and on the schematic diagrams are repeated as sub-headings in section 4, where they are discussed in detail.

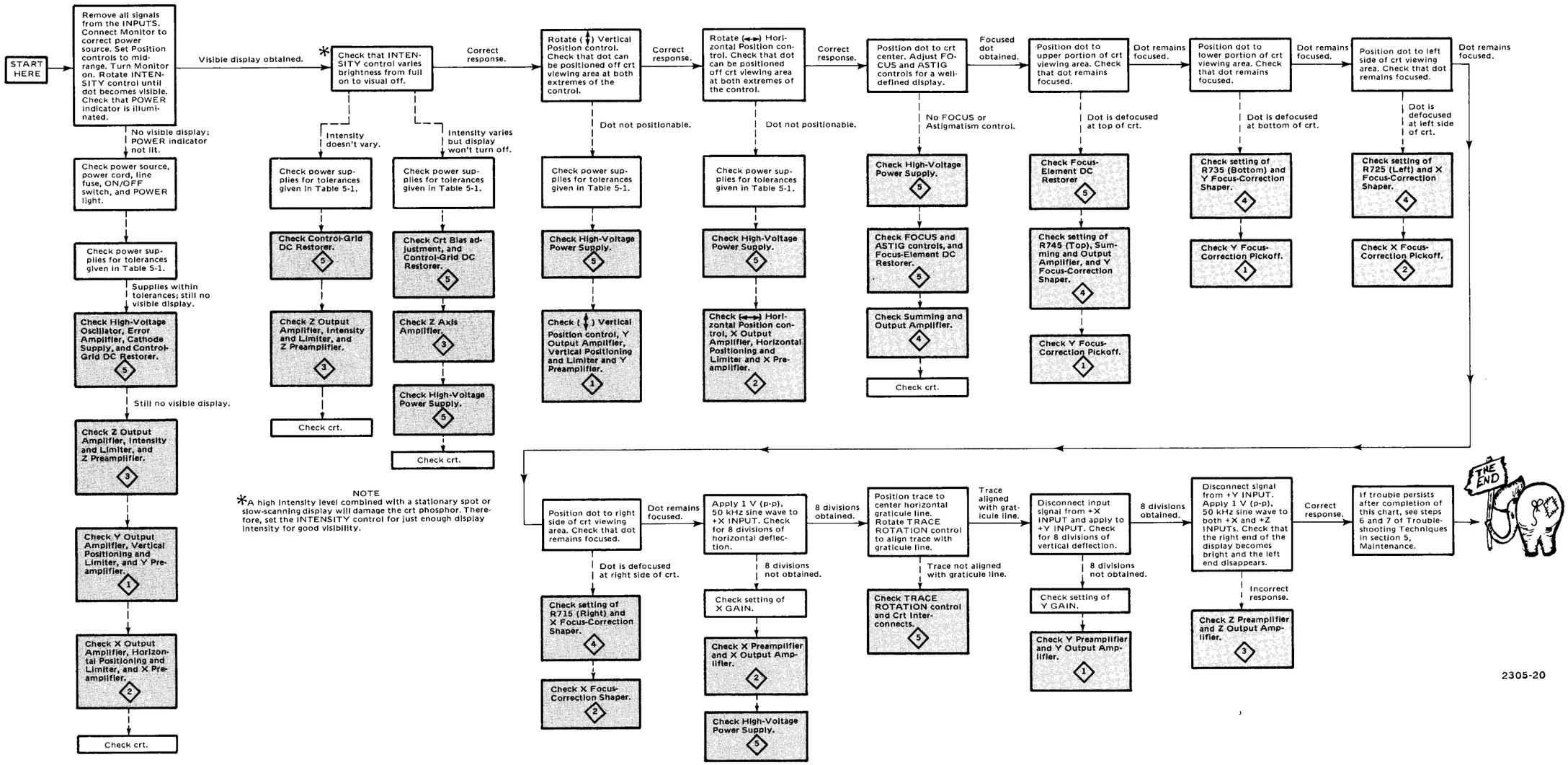


Figure 8-9. 608 Troubleshooting Chart.

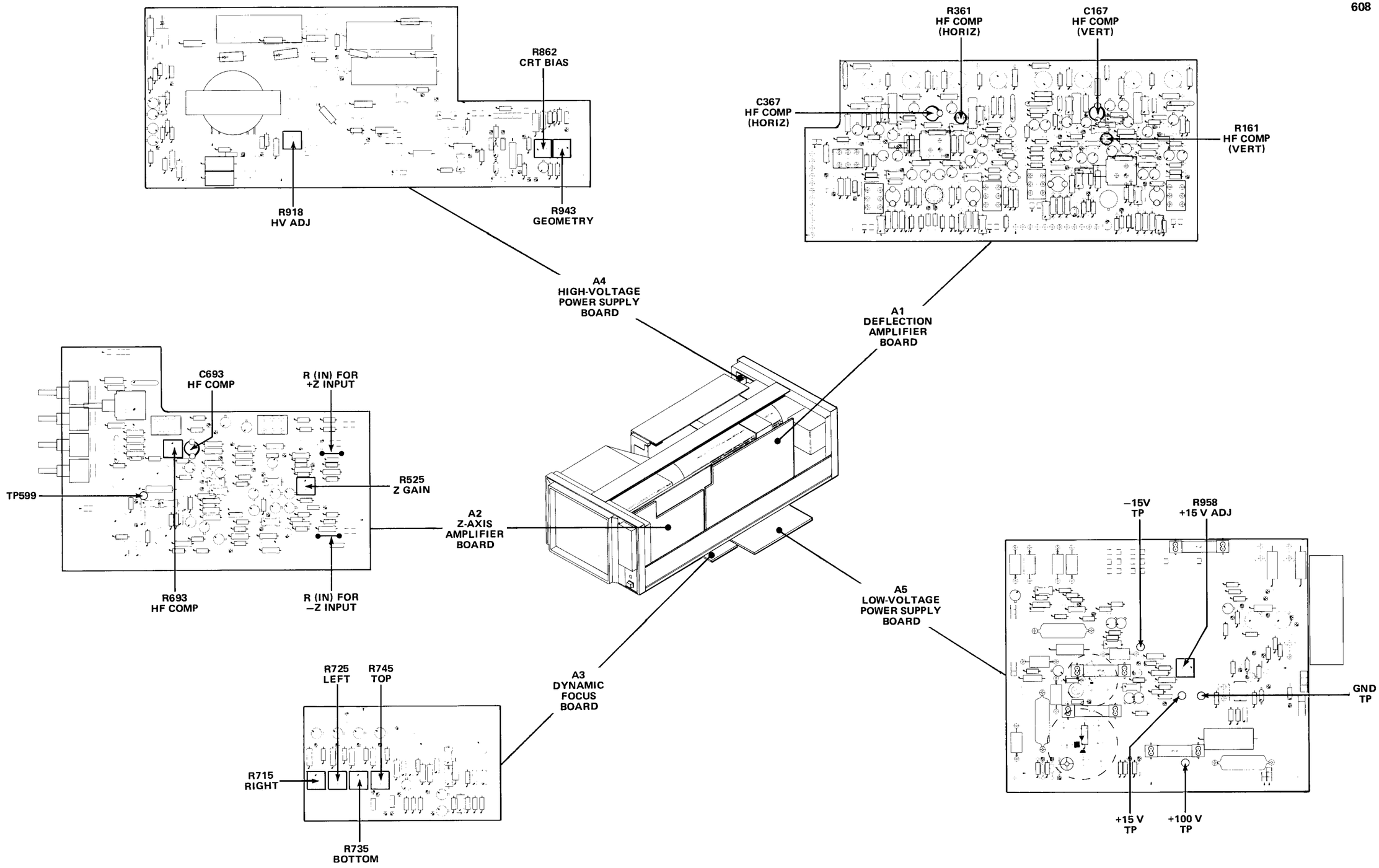
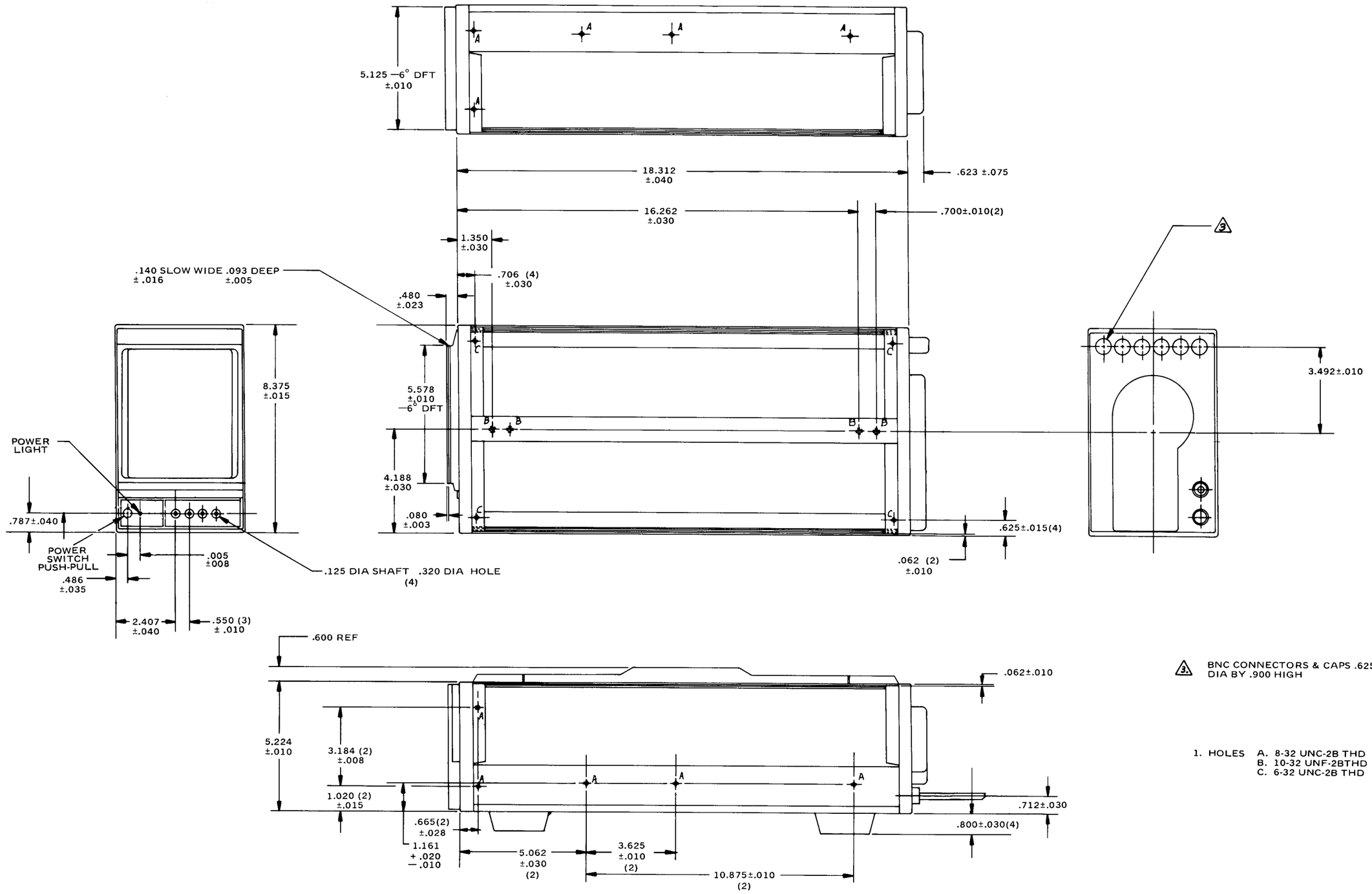


Figure 8-10. Location of test points and adjustments.

2305-21

English To Metric Conversion

Inches	Centimeters	Inches	Centimeters
0.003	0.008	0.600	1.524
0.005	0.013	0.623	1.582
0.008	0.020	0.625	1.588
0.010	0.025		
0.015	0.038	0.665	1.689
		0.700	1.778
0.016	0.041	0.706	1.793
0.020	0.051	0.712	1.809
0.023	0.058	0.787	1.999
0.028	0.071	0.800	2.032
0.030	0.076	.900	2.286
		1.020	2.591
0.035	0.089	1.161	2.949
0.040	0.102	1.350	3.429
0.062	0.158	1.500	3.810
0.075	0.191		
0.080	0.203	1.548	3.932
		2.407	6.116
0.093	0.236	3.187	8.087
0.125	0.318	3.492	8.870
0.140	0.356	3.625	9.208
0.197	0.500		
0.320	0.813	4.188	10.638
		5.062	12.858
0.339	0.861	5.125	13.018
0.394	1.001	5.224	13.269
0.480	1.219	5.578	14.168
0.486	1.234		
0.531	1.349	8.325	21.273
		10.875	27.623
0.550	1.397	16.262	41.306
0.572	1.453	18.312	46.513



3. BNC CONNECTORS & CAPS .625 MAX DIA BY .900 HIGH

1. HOLES A. 8-32 UNC-2B THD
B. 10-32 UNF-2BTHD
C. 6-32 UNC-2B THD

(2091-38) 2305-22

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Figure 8-11. Detailed dimensional drawing.

INSTRUMENT OPTIONS

Your instrument may be equipped with one or more instrument options. A brief description of each available option is given in the following discussion. Refer to Table 9-1 for location of option information. For further information on instrument options, see your Tektronix Catalog or contact your Tektronix Field Office.

OPTION 1

An internal, unlighted graticule of 8 X 10 divisions is included on the crt faceplate.

OPTION 21

Includes differential INPUT connectors on the rear panel for the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers.

OPTION 22

Includes internal 1:1 or 5:1 switchable input attenuators in the Horizontal (X), and Vertical (Y) Amplifiers.

OPTION 23

Includes a carrying handle, protective cabinet panels, and feet. (Cannot be ordered with Option 28.)

OPTION 24

Modifies the Z-Axis Amplifier for gamma correction.

OPTION 25

Modifies the Z-Axis Amplifier and the rear panel for external TTL unblanking input.

OPTION 26

Modifies the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers to 50-ohms input impedance.

OPTION 27

Removes the X GAIN and Y GAIN controls from the front panel and provides them as internal adjustments.

OPTION 28

Includes protective cabinet panels. (Cannot be ordered with Option 23.)

OPTION 30

Includes a full crt magnetic shield.

OPTION 74

Uses P4 phosphor in the crt.

OPTION 76

Uses P7 phosphor in the crt.

OPTION 78

Uses P11 phosphor in the crt.

TABLE 9-1
Option Information Locator

Instrument Option	Manual Section	Location of Information
Option 21 (Differential Inputs)	9 Instrument Options	All information is contained in this section.
Option 22 (Switchable Input Attenuators)	9 Instrument Options	All information is contained in this section.
Option 23 (Includes Panels, Feet, and Handle)	9 Instrument Options	All information is contained in this section.
Option 25 (Includes TTL Blanking Input)	9 Instrument Options	All information is contained in this section.
Option 30 (Includes Full Crt Shield)	9 Instrument Options	All information is contained in this section.

OPTION 21

GENERAL INFORMATION

SPECIFICATION

Option 21 provides differential INPUT connectors on the rear-panel of the Monitor for the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers. The following electrical specifications, in addition to those given in Section 1, General Information, apply to the Option 21 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 21—TABLE 1
Option 21 Electrical Specifications

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Polarity	
-Y INPUT	Positive signal applied deflects beam down; negative signal deflects beam up.
-X INPUT	Positive signal applied deflects beam to the left; negative signal deflects beam to the right.
Common-Mode Rejection	
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)
Z-AXIS AMPLIFIER	
Useful Input Voltage Range (-Z INPUT)	Adjustable from -1 V, or less, to at least -5 V for full intensity when INTENSITY control is set to midrange.
Common-Mode Rejection	
DC to 100 kHz	At least 100:1 cmr ratio with input signals of ±5 V or less, at any setting of Z-Axis Gain.
100 kHz to 1 MHz	At least 50:1 cmr ratio with input signals of ±5 V or less, at any setting of Z-Axis Gain.

OPERATING INSTRUCTIONS

OPTION 21 CONNECTORS

Brief descriptions of the Option 21 rear-panel connectors are given in Option 21—Figure 1. (No controls have been added to the 608 front panel for this option.)

DETAILED OPERATING INFORMATION

BNC connectors are provided at the rear of the instrument for application of input signals to the Horizontal (X) and Vertical (Y) Amplifiers for display on the crt, and to the Z-Axis Amplifier to control display intensity. Each amplifier in the Option 21 instrument is designed for either single-ended or differential operation. The instrument is shipped from the factory prepared for single-ended operation with a grounding cap connected to the - INPUT of each axis. For differential operation, remove the grounding cap and apply the input signals to the BNC connectors of the appropriate axis. For additional information, see Detailed Operating Information in Section 2, Operating Instructions.

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions, can be altered to check all functions of the Option 21 instrument by replacing the Deflection and Z-Axis Functions with the following:

1. Perform the Preliminary Set Up procedure.

2. Set the function generator for a 2-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

4. Center the display with the Horizontal Position control and check that the X GAIN control will adjust for 8 divisions of horizontal deflection.

5. Remove the grounding cap from the -X INPUT connector. Disconnect the signal from the +X INPUT and apply to the -X INPUT. Place the grounding cap on the +X INPUT.

6. Center the display with the Horizontal Position control and check that the X GAIN will adjust for 8 divisions of horizontal deflection.

7. Disconnect the signal from the -X INPUT and apply to the +Y INPUT.

8. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

9. Remove the grounding cap from the -Y INPUT connector. Disconnect the signal from the +Y INPUT and apply to the -Y INPUT. Place the grounding cap on the +Y INPUT.

10. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

11. Adjust the INTENSITY control for a barely-visible display.

12. Move the grounding cap from the +X INPUT to the -X INPUT. Disconnect the signal from the -Y INPUT and apply it to the +X and +Z INPUTs via the 50-ohm termination, 42-inch cable, BNC T connector, and the 18-inch cable.

13. Notice that the right end of the crt display becomes bright, and that the left end disappears.

14. Remove the grounding cap from the -Z INPUT. Disconnect the signal from the +Z INPUT and apply to the -Z INPUT. Place the grounding cap on the +Z INPUT.

15. Notice that the left end of the crt display becomes bright, and that the right end disappears.

16. Disconnect the function generator.

This completes the Functional Check procedure for the Option 21 instrument.

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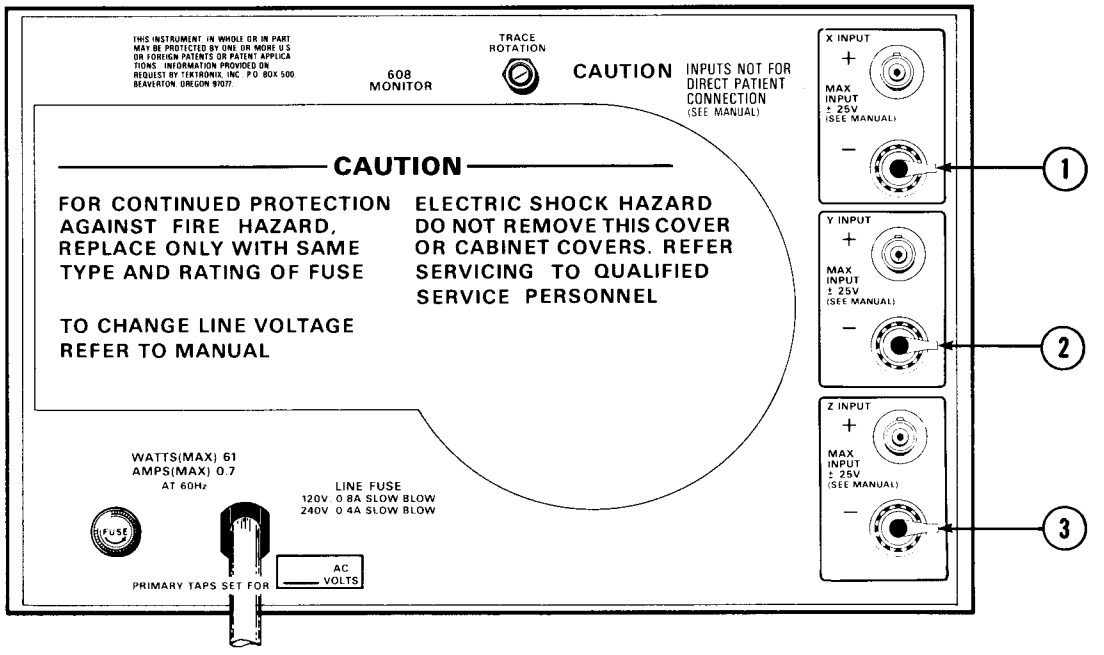

(1) **-X INPUT**—BNC input connector to allow application of input signals. A positive signal applied deflects beam to the left; a negative signal deflects beam to the right.

(2) **-Y INPUT**—BNC input connector. A positive signal applied deflects beam down; a negative signal deflects beam up.

(3) **-Z INPUT**—BNC input connector. A positive signal applied provides a linear function to decrease crt brightness; a negative signal increases crt brightness.

2305-60

Option 21—Figure 1. Option 21 rear-panel connectors.

THEORY OF OPERATION

The following information provides a brief description of the Option 21 circuitry and is intended to supplement the circuit operation description for the standard instrument as given in Section 4, Theory of Operation. The Option 21 circuitry is shown on the Option 21 schematic diagram at the rear of this section. Refer to this schematic diagram throughout the following discussion for specific electrical relationships.

Option 21 consists primarily of three added BNC connectors (J201, J401, and J601) to permit application of differential input signals to the Vertical (Y), Horizontal (X), and Z-Axis Amplifiers, respectively. The instrument is shipped from the factory prepared for single-ended operation with a grounding cap (P201, P401, and P601) connected to the -INPUT of each amplifier.

PERFORMANCE CHECK AND ADJUSTMENT

The following information is intended to supplement the Performance Check and Adjustment procedures given in Section 6 of this manual.

OPTION 21—TABLE 2
Option 21 Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
HORIZONTAL (X) AMPLIFIER			
Polarity (-X INPUT)	Positive signal applied deflects beam to the left; negative signal deflects beam to the right.	Satisfactory operation is substantiated by other tests.	
Common-Mode Rejection			Check Horizontal Common-Mode Rejection.
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)	A 100-kHz, 10 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal trace is checked.	
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)	A 1-MHz, 10 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal trace is checked.	
VERTICAL (Y) AMPLIFIER			
Polarity (-Y INPUT)	Positive signal applied deflects beam down; negative signal deflects beam up.	Satisfactory operation is substantiated by other tests.	
Common-Mode Rejection			Check Vertical Common-Mode Rejection.
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)	A 100-kHz, 10 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical trace is checked.	
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)	A 1-MHz, 10 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical trace is checked.	
Z-AXIS AMPLIFIER			
Common-Mode Rejection			Check Z-Axis Amplifier Common-Mode Rejection.
DC to 100 kHz	At least 100:1 cmr ratio with input signals of ±5 V or less, at any setting of Z-Axis Gain.	A +10 μs ramp is applied to the +X INPUT. A 100-kHz, 10-V (p-p) sine wave is applied to both the +Z and -Z INPUTS. A test oscilloscope is connected to TP599 and the amplitude of the Z-Axis output signal is checked.	
100 kHz to 1 MHz	At least 50:1 cmr ratio with input signals of ±5 V or less at any setting of Z-Axis Gain.	A +10 μs ramp is applied to the +X INPUT. A 1-MHz, 10 V (p-p) sine wave is applied to both the +Z and -Z INPUTS. A test oscilloscope is connected to TP599 and the amplitude of the Z-Axis output signal is checked.	

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OPTION 21—TABLE 3
Option 21 Additional Test Equipment

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Function generator	Frequency range, 100 kHz to 1 MHz; amplitude, 10 V (p-p).	Check common-mode rejection of the vertical, horizontal, and Z-Axis amplifiers in the Option 21 instrument.	1. TEKTRONIX FG 503 Function Generator (operates in TM 500-series power module).

C. HORIZONTAL (X) AMPLIFIER—OPTION 21

Additional Equipment Required:

1. Function generator
2. Dual-input coupler

C3. CHECK HORIZONTAL COMMON-MODE REJECTION

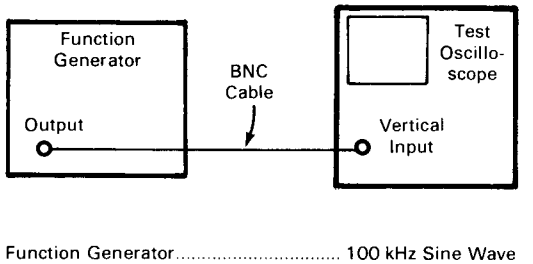
NOTE

For a complete procedure, perform this step following step C2 (Check/Adjust X GAIN) of Section 6, Performance Check and Adjustment. X GAIN must be set for 8 divisions of deflection per volt of input signal when checking Horizontal Common-Mode Rejection.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings given in section 6, then proceed with the following instructions.



Function Generator ..... 100 kHz Sine Wave
Test Oscilloscope ..... 2 V/division

a. Set the function-generator amplitude for a 10 V (p-p) sine wave as indicated on the test oscilloscope.

b. Disconnect the sine wave from the test oscilloscope and connect it (using the dual-input coupler) to both the +X and -X INPUTS of the 608.

c. **CHECK**—Crt display for 0.8 division, or less, of free-running horizontal display (position as necessary).

d. Set the function generator output frequency to 1 megahertz.

e. **CHECK**—Crt display for 1.6 division, or less, of free-running horizontal display (position as necessary).

D. VERTICAL (Y) AMPLIFIER—OPTION 21

Additional Equipment Required:

1. Function generator

D4. CHECK VERTICAL COMMON-MODE REJECTION

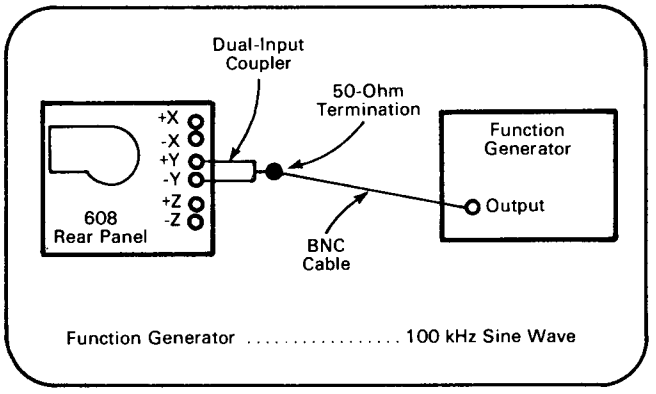
NOTE

For a complete procedure, perform this step following step D3 (Check/Adjust Y GAIN) of Section 6, Performance Check and Adjustment. Y GAIN must be set for 8 divisions of deflection per volt of input signal when checking Vertical Common-Mode Rejection.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. Set the function generator amplitude for a 10 V (p-p) sine wave as indicated on the test oscilloscope.

b. Disconnect the sine wave from the test oscilloscope and connect it (using the dual-input coupler) to both the +Y and -Y INPUTS of the 608.

c. **CHECK**—Crt display for 0.8 division, or less, of free-running vertical display (position as necessary).

d. Set the function generator output frequency to 1 megahertz.

e. **CHECK**—Crt display for 1.6 division, or less, of free-running vertical display (position as necessary).

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E. Z-AXIS AMPLIFIER—OPTION 21

Additional Equipment Required:

1. Function generator
2. Dual-input coupler

E4. CHECK Z-AXIS AMPLIFIER COMMON-MODE REJECTION

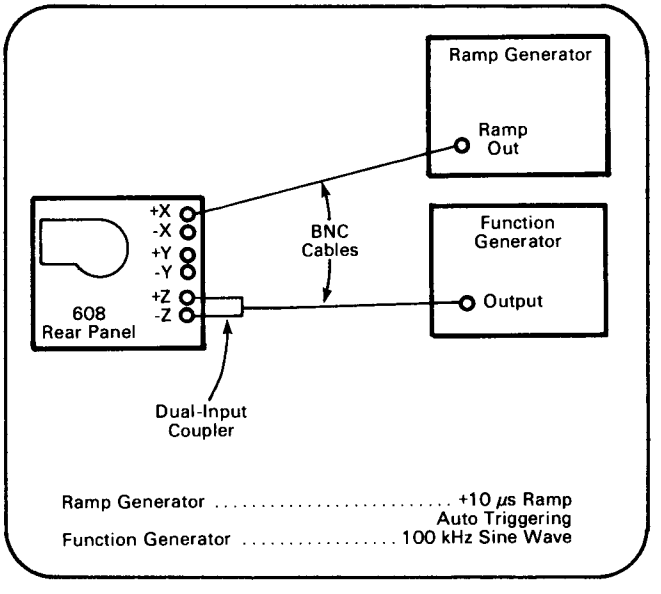
NOTE

For a complete procedure, perform this step following step E3 (Check Z-Axis Amplifier Bandwidth) of Section 6, Performance Check and Adjustment. Z Gain must be set for 1 volt = full intensity when performing this step.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Z-Axis Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. Set the function-generator amplitude for 10 volts (peak-to-peak).

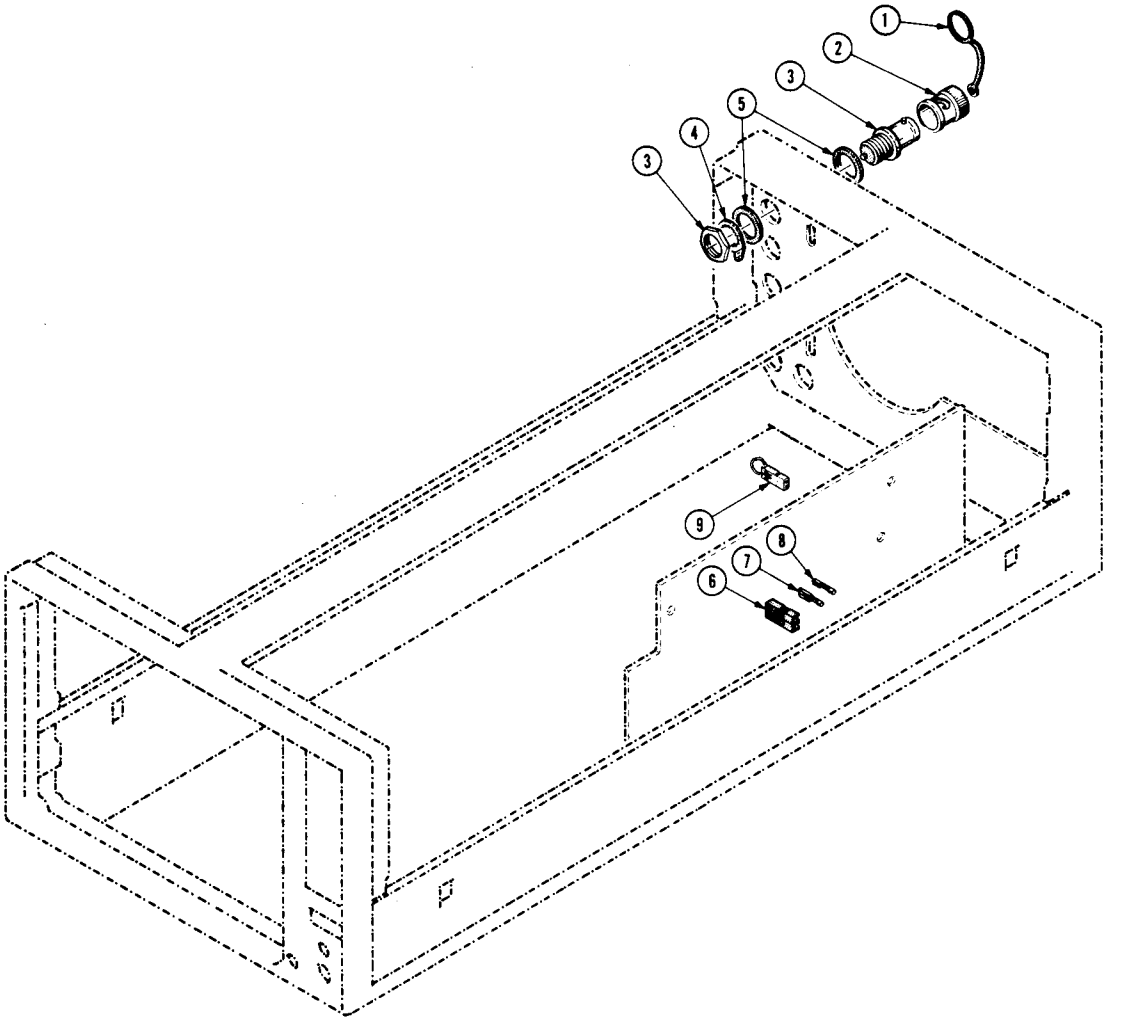
b. Connect a 10X probe from the test oscilloscope vertical input to TP599. Set the test oscilloscope for ac input coupling and the deflection factor to 1 volt/division (with 10X probe).

c. **CHECK**—Test oscilloscope display for 7 divisions (7 volts) or less.

d. Set the function generator output frequency to 1 megahertz and the test oscilloscope vertical deflection factor to 2 V/div (with 10X probe).

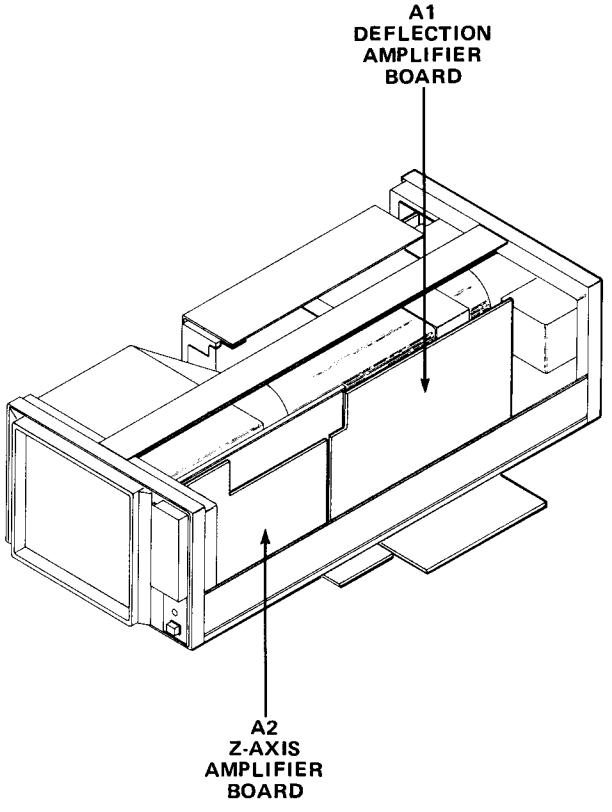
e. **CHECK**—Test oscilloscope display for 7 divisions (14 volts) or less.

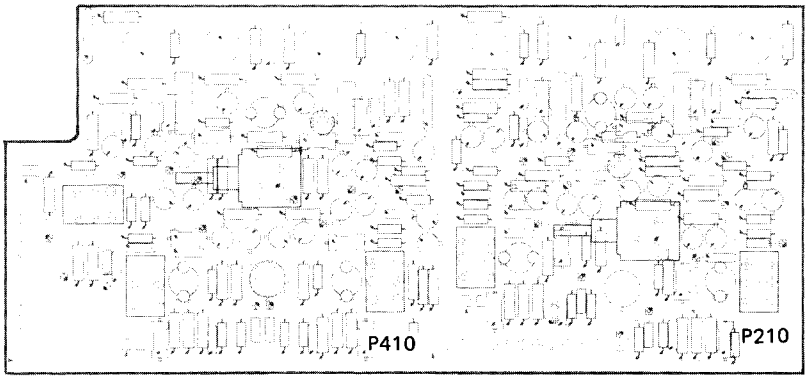
OPTION 21



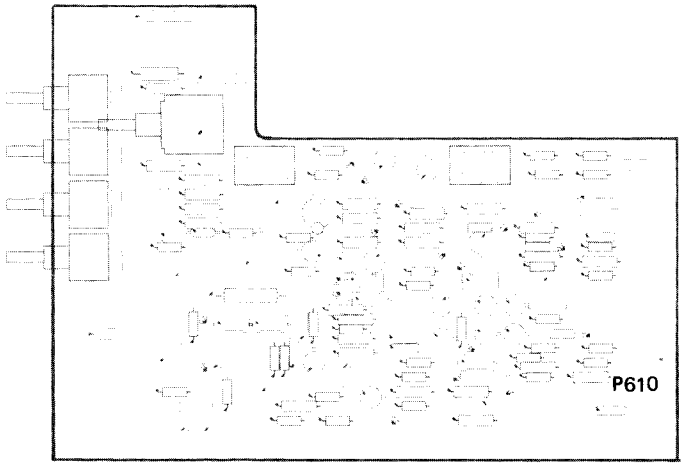
MECHANICAL

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	346-0045-00			3		STRAP,CONN COV:PLASTIC	80009	346-0045-00
-2	200-0991-00			3		COV,ELEC CONN:BNC ,W/CTR GND	77820	2096-5
-3	131-0955-00			3		CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
-4	210-0255-00			3		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-5	342-0117-00			6		INSULATOR,BSHG:	80009	342-0117-00
	198-3780-00			1		WIRE SET,ELEC:	80009	198-3780-00
-6	352-0198-00			3		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0198-00
-7	131-0792-00			3		. CONTACT,ELEC:0.577"L,18-20 AWG WIRE	22526	46221
-8	131-0621-00			3		. CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46233

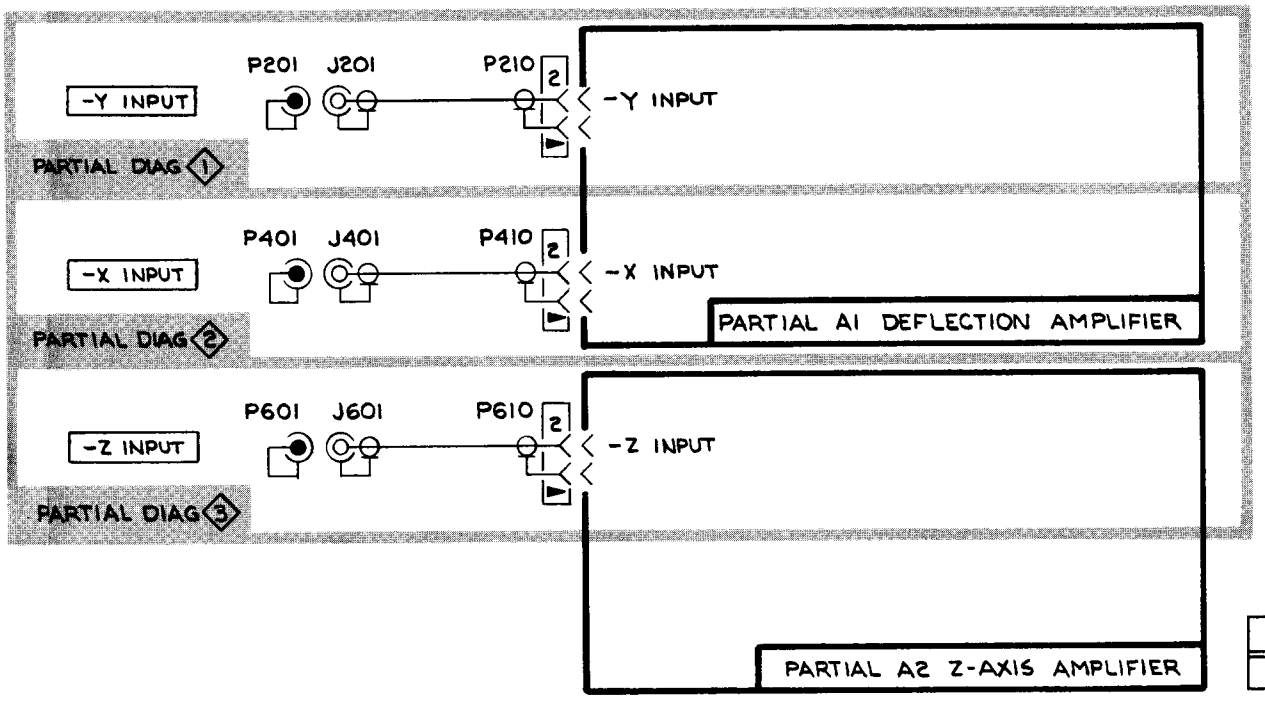

A1
DEFLECTION
AMPLIFIER
BOARD
A2
Z-AXIS
AMPLIFIER
BOARD



Option 21-Figure 2. Partial A1—Deflection Amplifier circuit board.



Option 21-Figure 3. Partial A2—Z-Axis Amplifier circuit board.



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OPTION 21

DIFFERENTIAL INPUTS FOR X, Y, AND Z-AXIS AMPLIFIERS

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OPTION 22

GENERAL INFORMATION

SPECIFICATION

Option 22 provides internal switchable 1:1 or 5:1 input attenuators for the Horizontal (X) and Vertical (Y) Amplifiers. The following electrical specifications, in addition to those given in Section 1, General Information, apply to the Option 22 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 22—TABLE 1
Option 22 Electrical Specifications

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor	
Vertical (Y)	Internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Horizontal (X)	Internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Attenuators	Deflection factor reduced five times, within 3%.
Common-Mode Rejection (With Option 21 Only)	
DC to 100 kHz	At least 50:1 cmr ratio for signals of ±25 V or less. (5X attenuation.)
100 kHz to 1 MHz	At least 20:1 cmr ratio for signals of ±25 V or less. (5X attenuation.)

OPERATING INSTRUCTIONS

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions, can be altered to check the functions of the Option 22 instrument as follows:

1. Have a qualified service person determine which input attenuators are set in the 5X position.

2. When applying a signal to any INPUT with the attenuator set at 5X, always set the function generator for a 10-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Perform the indicated check.

INSTALLATION

X AND Y INPUT ATTENUATION SELECTION

WARNING

To avoid electric shock hazard, always turn the instrument OFF before changing the settings of the X or Y Input Attenuators.

The selectable 1:1 and 5:1 step attenuators included in the Option 22 Horizontal (X) and Vertical (Y) Amplifiers extend the deflection factor range of the appropriate amplifier to at least 12.5 volts for full-screen signal deflection. To maintain proper response of the amplifier, always change both the + and - attenuators to the same setting. Refer to the Option 22 Component Locator illustration at the rear of this section for the position settings and locations of the attenuator switches.

THEORY OF OPERATION

The following information provides a description of the Option 22 circuitry and is intended to supplement the circuit operation description for the standard instrument as given in Section 4, Theory of Operation. The Option 22 circuitry is described with reference to the Option 22 schematic diagram given at the rear of this section. Refer to this schematic diagram throughout the following discussion for specific electrical values and relationships.

PARTIAL VERTICAL (Y) DEFLECTION AMPLIFIER

An internal switch (S110, S210) for each input (with Option 21) allows either 1X or 5X attenuation of the input signal before it is applied to the Y Preamplifier stage shown on Diagram 1 in section 8 of this manual. The 5X position of each attenuator is a frequency-compensated voltage divider. These step attenuators are set in the 1X position when shipped from the factory. For optimum response of the amplifier, both attenuators should be set in the same position.

PARTIAL HORIZONTAL (X) DEFLECTION AMPLIFIER

An internal switch (S310, S410) for each input (with Option 21) allows either 1X or 5X attenuation of the input signal before it is applied to the X Preamplifier stage shown on Diagram 2 in section 8 of this manual. The 5X position of each attenuator is a frequency-compensated voltage divider. These step attenuators are set in the 1X position when shipped from the factory. For optimum response of the amplifier, both attenuators should be set in the same position.

PERFORMANCE CHECK AND ADJUSTMENT

The following information is intended to supplement the Performance Check and Adjustment procedures given in section 6 of this manual.

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OPTION 22—TABLE 2
Option 22 Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
HORIZONTAL (X) AMPLIFIER			
Common-Mode Rejection (With Option 21)			Check Horizontal Common-Mode Rejection.
1X Attenuation			
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less.	A 100-kHz, 10 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal display is checked.	
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less.	A 1-MHz, 10 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal display is checked.	
5X Attenuation			
DC to 100 kHz	At least 50:1 cmr ratio for signals of ±25 V or less.	A 100-kHz, 20 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal display is checked.	
100 kHz to 1 MHz	At least 20:1 cmr ratio for signals of ±25 V or less.	A 1-MHz, 20 V (p-p) sine wave is applied to both the +X and -X INPUTS. Length of horizontal display is checked.	
VERTICAL (Y) AMPLIFIER			
Common-Mode Rejection (With Option 21)			Check Vertical Common-Mode Rejection.
1X Attenuation			
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less.	A 100-kHz, 10 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical display is checked.	
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less.	A 1-MHz, 10 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical display is checked.	
5X Attenuation			
DC to 100 kHz	At least 50:1 cmr ratio for signals of ±25 V or less.	A 100-kHz, 20 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical display is checked.	
100 kHz to 1 MHz	At least 20:1 cmr ratio for signals of ±25 V or less.	A 1-MHz, 20 V (p-p) sine wave is applied to both the +Y and -Y INPUTS. Length of vertical display is checked.	

OPTION 22—TABLE 3
Option 22 Additional Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
1. Function Generator	Frequency range, 100 kHz to 1 MHz; amplitude, 20 V (p-p) into an open circuit.	Check common-mode rejection of the vertical, horizontal, and Z-Axis amplifiers in the Option 22 instrument.	1. TEKTRONIX FG 503 Function Generator (operates in TM 500-series power module).

C. HORIZONTAL (X) AMPLIFIER—OPTION 22

Additional Equipment Required:

1. Dual-input coupler
2. Function generator (for instruments also equipped with Option 21)

C0. ADJUST HORIZONTAL ATTENUATION COMPENSATION (C310 and C410)

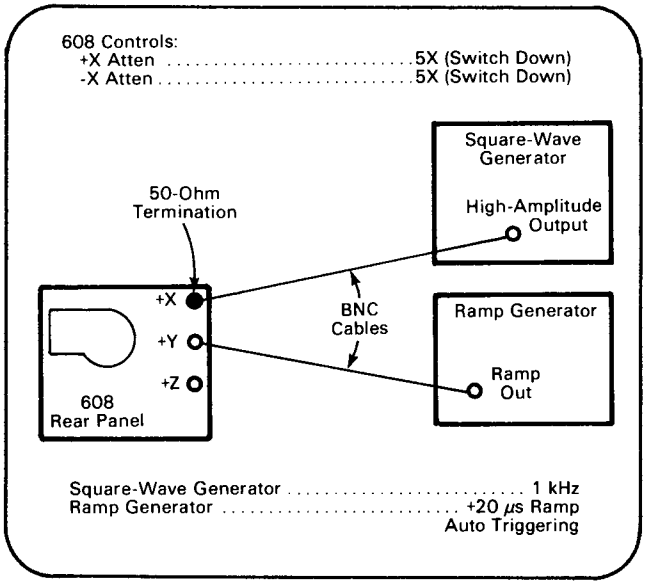
NOTE

For a complete procedure, perform this step prior to step C1 (Check/Adjust Horizontal Compensation) of Section 6, Performance Check and Adjustment.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. Set the ramp-generator amplitude to display about 3 cycles of square-wave display (position as necessary).

b. Set the square-wave generator amplitude for an 8-division display (position as necessary).

c. **EXAMINE**—The display for optimum square corner.

d. **ADJUST**—C310 (+X Atten Comp) for optimum square corner using a low-capacitance screwdriver.

NOTE

Perform the remaining parts of this step only if your instrument is equipped with both Option 21 and Option 22.

e. Disconnect the square-wave generator from the +X INPUT and connect it to the -X INPUT. Place the grounding cap on the +X INPUT.

f. **EXAMINE**—The display for optimum square corner.

g. **ADJUST**—C410 (-X Atten Comp) for optimum square corner using a low-capacitance screwdriver.

C3. CHECK HORIZONTAL COMMON-MODE REJECTION

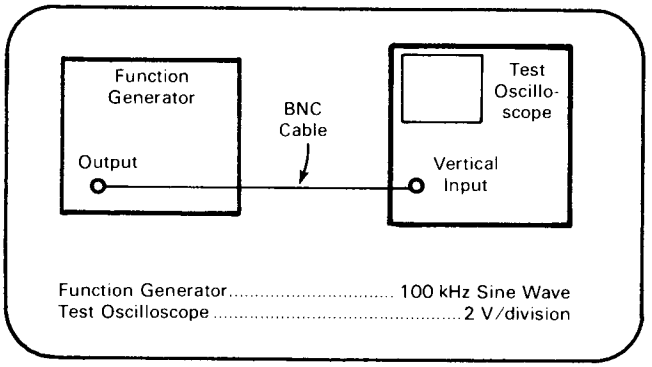
NOTE

For a complete procedure of those instruments equipped with both Option 21 and Option 22, perform this step following step C2 (Check/Adjust X GAIN) of Section 6, Performance Check and Adjustment. X GAIN must be set for 8 divisions of deflection per volt of input signal when checking Horizontal Common-Mode Rejection.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Horizontal Preliminary Control Settings given in section 6, then proceed with the following instructions.



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a. Set the function-generator amplitude for 10 volts (p-p).

b. **CHECK**—Crt display for 0.8 division, or less, of free-running horizontal display (position as necessary).

c. Set the function generator output frequency to 1 megahertz.

d. **CHECK**—Crt display for 1.6 division, or less, of free-running horizontal display (position as necessary).

e. Turn OFF power to the 608. Then, set S310 (+X Atten) and S410 (-X Atten) to the 5X position (switches down). Press front-panel ON/OFF push-button to apply power to the 608.

f. Set the function-generator amplitude for 20 volts (p-p).

g. **CHECK**—Crt display for 0.3 division, or less, of free-running horizontal display (position as necessary).

h. Set the function generator output frequency to 100 kHz.

i. **CHECK**—Crt display for 0.8 division, or less, of free-running horizontal display (position as necessary).

D. VERTICAL (Y) AMPLIFIER—OPTION 22

Additional Equipment Required:

1. Function generator (for instruments also equipped with Option 21)

D0. ADJUST VERTICAL ATTENUATION COMPENSATION (C110 and C210)

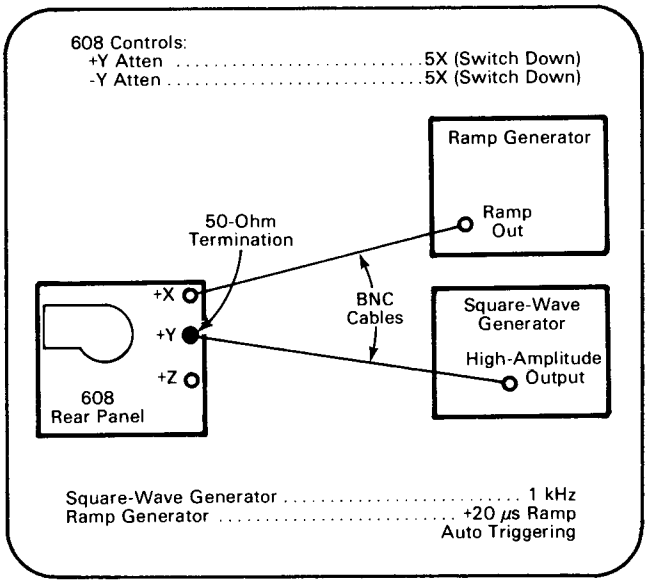
NOTE

For a complete procedure, perform this step prior to step D1 (Check/Adjust Vertical Compensation) of Section 6, Performance Check and Adjustment.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. Set the ramp-generator amplitude to display about 2 cycles of square-wave display (position as necessary.)

b. Set the square-wave generator amplitude for a 6-division display (position as necessary).

c. **EXAMINE**—The display for optimum square corner.

d. **ADJUST**—C110 (+Y Atten Comp) for optimum square corner using a low-capacitance screwdriver.

NOTE

Perform the remaining parts of this step only if your instrument is equipped with both Option 21 and Option 22.

e. Disconnect the square-wave generator from the +Y INPUT and connect it to the -Y INPUT. Place the grounding cap on the +Y INPUT.

f. **EXAMINE**—The display for optimum square corner.

g. **ADJUST**—C210 (-Y Atten Comp) for optimum square corner using a low-capacitance screwdriver.

D4. CHECK VERTICAL COMMON-MODE REJECTION

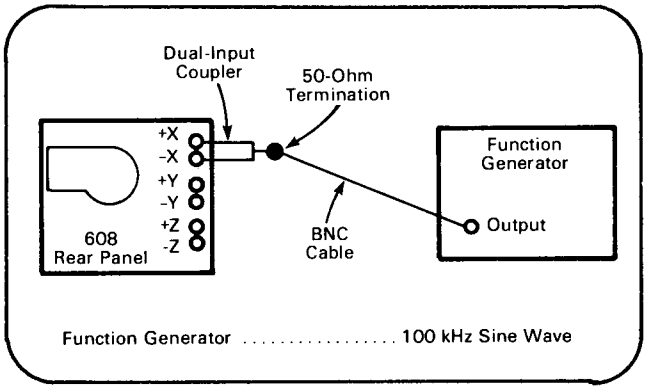
NOTE

For a complete procedure of those instruments equipped with both Option 21 and Option 22, perform this step following step D3 (Check/Adjust Y GAIN) of Section 6, Performance Check and Adjustment. Y GAIN must be set for 8 divisions of deflection per volt of input signal when checking Vertical Common-Mode Rejection.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Vertical Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. Set the function-generator amplitude for 10 volts (p-p).

b. **CHECK**—Crt display for 0.8 division, or less, of free-running vertical display (position as necessary).

c. Set the function generator output frequency to 1 megahertz.

d. **CHECK**—Crt display for 1.6 division, or less, of free-running vertical display (position as necessary).

e. Turn OFF power to the 608. Then, set S110 (+Y Atten) and S210 (-Y Atten) to the 5X position (switches down). Press front-panel ON/OFF pushbutton to apply power to the 608.

f. Set the function-generator amplitude for 20 volts (p-p).

g. **CHECK**—Crt display for 0.3 divisions, or less, of free-running vertical display (position as necessary).

h. Set the function generator output frequency to 100 kHz.

i. **CHECK**—Crt display for 0.8 division, or less, of free-running vertical display (position as necessary).

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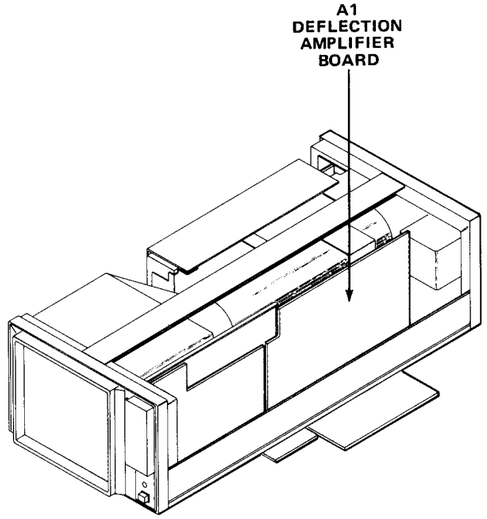
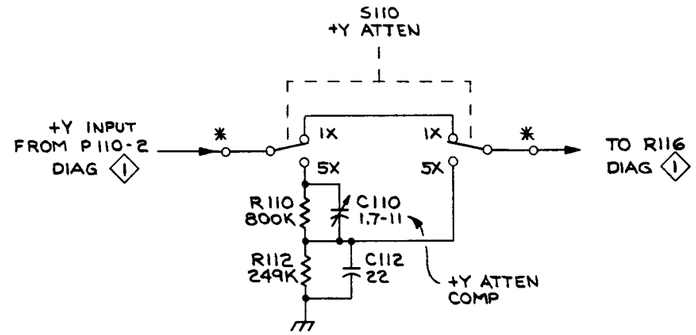
OPTION 22

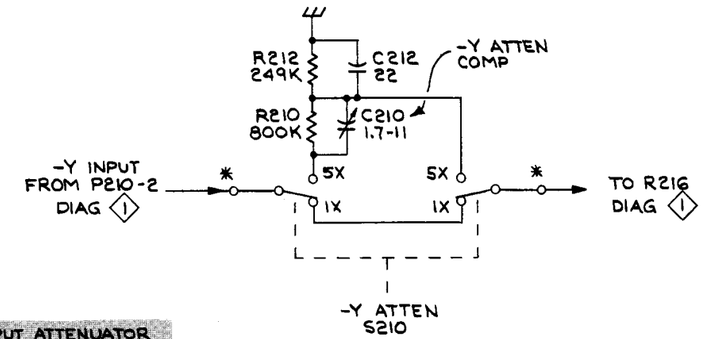
ELECTRICAL

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-5477-00			CKT BOARD ASSY:DEFLECTION	80009	670-5477-00
C110	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C112	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C210	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C212	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C310	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C312	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C410	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C412	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
R110	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R112	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R210	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R212	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R310	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R312	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R410	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R412	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
S110	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S210	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S310	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028
S410	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028



Option 22-Figure 1. Partial A1—Deflection Amplifier circuit board.

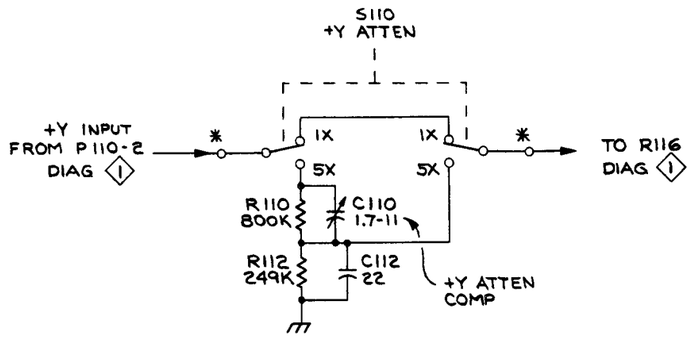


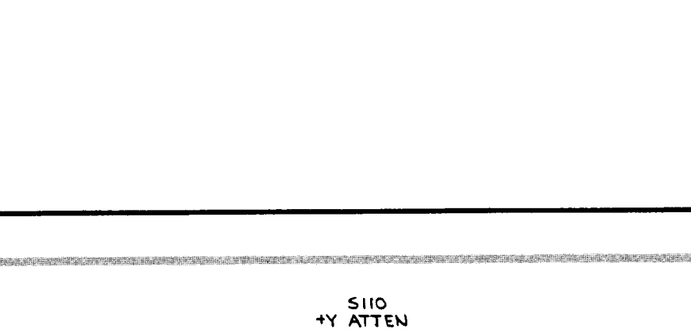


Y INPUT ATTENUATOR
PARTIAL DIAG 1

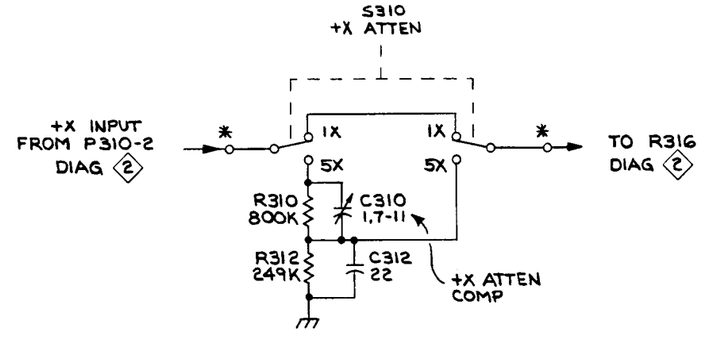
NOTES:
* M
M

PARTIAL A1 DEFLECTION AMPLIF



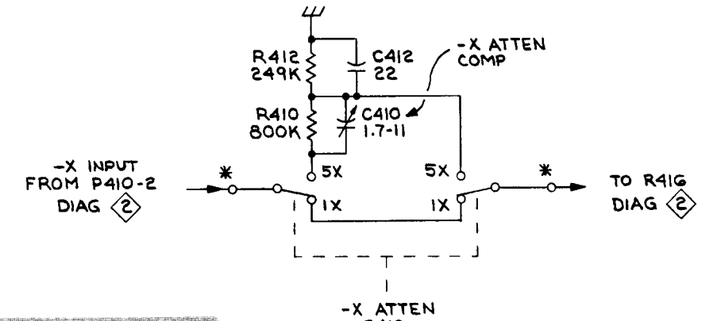


Y INPUT ATTENUATOR
PARTIAL DIAG 1



NOTES:

* MOD CONNECTION TO ECB MADE AT THIS SOLDER POINT.



X INPUT ATTENUATOR
PARTIAL DIAG 2

PARTIAL A1 DEFLECTION AMPLIFIER BOARD

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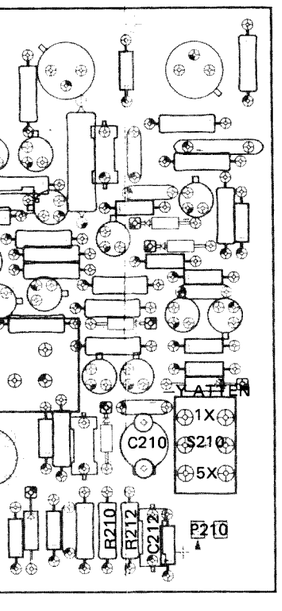


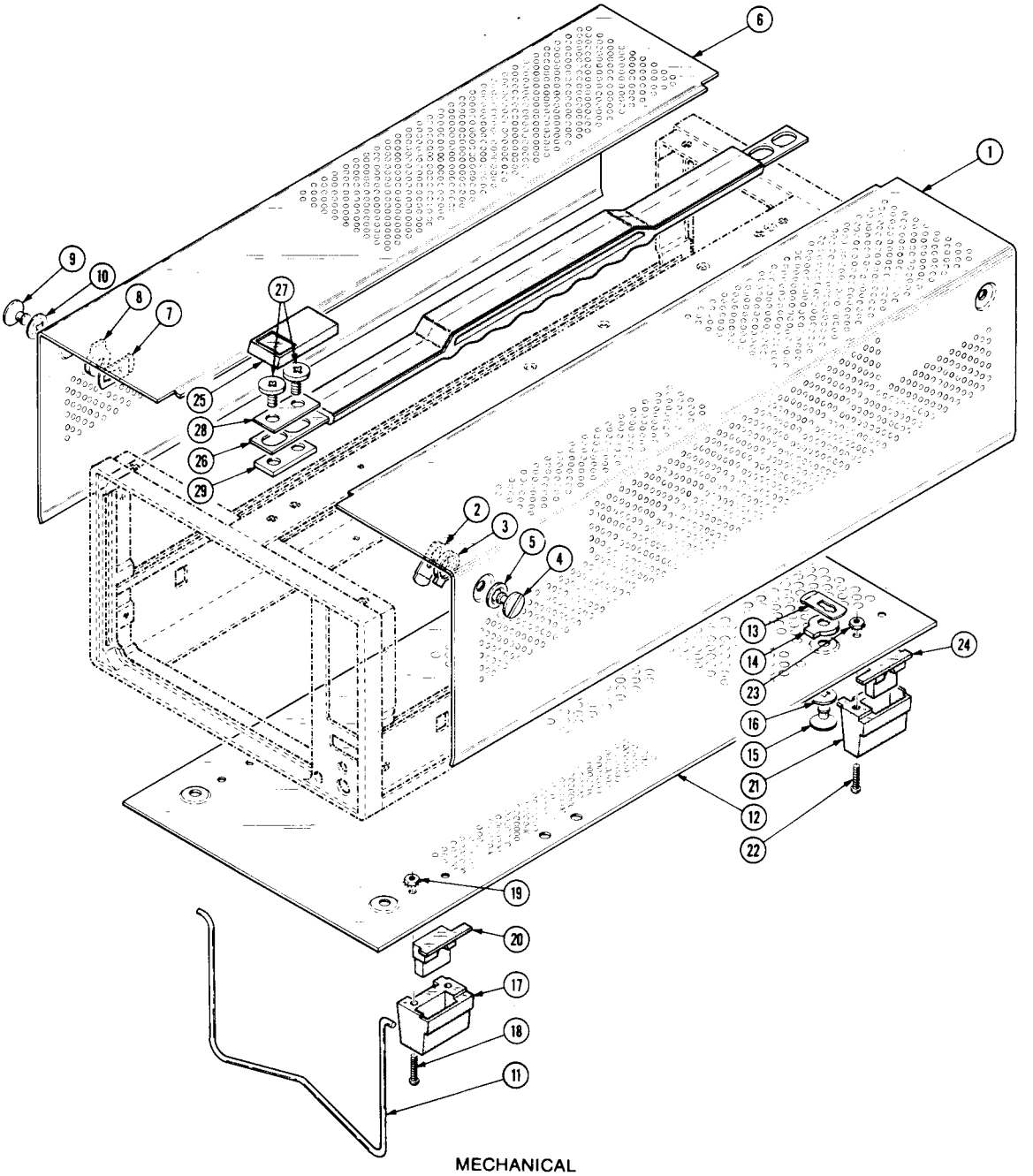
OPTION 22

INTERNAL 1:1 OR 5:1 SWITCHABLE INPUT ATTENUATORS

OPTION 23

Instrument includes a carrying handle, protective cabinet panels, and feet. This option cannot be ordered with Option 28.

OPTION 23



MECHANICAL

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	390-0270-00			1		COVER,MONITOR:LEFT	80009	390-0270-00
	214-0812-00			2		. FASTENER,PAWL:	80009	214-0812-00
-2	386-0226-00			2		. . PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-3	386-0227-00			2		. . PL,LATCH INDEX:	80009	386-0227-00
-4	214-0603-01			2		. . PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-5	214-0604-00			2		. . WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-6	390-0244-00			1		COVER,MONITOR:RIGHT	80009	390-0244-00
	214-0812-00			2		. FASTENER,PAWL:	80009	214-0812-00
-7	386-0226-00			2		. . PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-8	386-0227-00			2		. . PL,LATCH INDEX:	80009	386-0227-00
-9	214-0603-01			2		. . PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-10	214-0604-00			2		. . WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00

OPTION 23

MECHANICAL

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-11	348-0275-00			1		FLIPSTAND,CAB.:	80009	348-0275-00
-12	390-0280-00			1		COVER,SCOPE:BOTTOM	80009	390-0280-00
	214-0812-00			4		. FASTENER,PAWL:	80009	214-0812-00
-13	386-0226-00			4		. . PL,LATCH LKG:FOR 0.080 INCH THICKNESS	80009	386-0226-00
-14	386-0227-00			4		. . PL,LATCH INDEX:	80009	386-0227-00
-15	214-0603-01			4		. . PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-16	214-0604-00			4		. . WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-17	348-0074-00			2		. SPT PIVOT,FLIP:RIGHT FRONT AND LEFT REAR	80009	348-0074-00
						(ATTACHING PARTS FOR EACH)		
-18	211-0532-00			2		. SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL	83385	OBD
-19	210-0457-00			2		. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-20	348-0207-00			2		. FOOT,CABINET:RIGHT FRONT AND LEFT REAR	80009	348-0207-00
						(ATTACHING PARTS FOR EACH)		
-21	348-0037-00			2		. FOOT:RUBBER	70485	1059
-22	211-0532-00			2		. SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL	83385	OBD
-23	210-0457-00			2		. NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-24	348-0208-00			2		. FOOT,CABINET:LEFT FRONT AND RIGHT REAR	80009	348-0208-00
-25	200-0728-00			2		COV,HANDLE END:	80009	200-0728-00
-26	367-0116-00			1		HANDLE,CARRYING:	80009	367-0116-00
						(ATTACHING PARTS)		
-27	212-0597-00			4		SCREW,MACHINE:10-32 X 0.50 INCH,STL	83385	OBD
-28	386-1624-00			2		PL,RET.,HANDLE:	80009	386-1624-00
-29	386-1283-00			2		PLATE,HDL MTG:PLASTIC	80009	386-1283-00
						- - - * - - -		

OPTION 25

GENERAL INFORMATION

SPECIFICATION

Option 25 provides a TTL input connector on the rear panel for application of signals to unblank the crt. The following electrical specifications for the Z-Axis Amplifier, in addition to those given in Section 1, General Information, apply to the Option 25 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 25—TABLE 1
Option 25 Electrical Specifications

Characteristic	Performance Requirement
TTL Input Voltage	
HI	+2.4 V to +5 V.
LO	0 V to +0.8 V.
Unblanking	Input voltage level to produce unblanking is internally selectable by switch S550. With S550 in minus (-) position, a LO input produces unblanking. With S550 in positive (+) position, a HI input produces unblanking.

OPERATING INSTRUCTIONS

OPTION 25 CONNECTOR

A brief description of the Option 25 rear-panel connector is given in Option 25—Figure 1. (No controls have been added to the 608 front panel for this option.)

DETAILED OPERATING INFORMATION

A BNC connector is provided at the rear of the instrument for application of TTL-compatible input voltages to either blank or unblank the crt display. (Crt unblanking = visual display.) With the internal Blanking Level Selector in the positive (+) position, a LO input voltage applied to the TTL Z INPUT connector will blank the display. A HI input voltage, or no applied voltage, will return control of the display intensity to the front-panel INTENSITY control and the +Z INPUT (and -Z INPUT with Option 21) connector(s). With the Blanking Level Selector in the minus (-) position, a HI input voltage, or no applied voltage, will blank the display.

INSTALLATION

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions, can be altered to check the functions of the Option 25 instrument by adding the following steps to the Deflection and Z-Axis procedure.

11. Set the INTENSITY and FOCUS controls for a moderately bright, defocused dot.

12. Set the function generator for a +5-volt, 1-hertz square-wave output.

13. Connect the function generator output to the rear-panel TTL Z INPUT connector via the 42-inch cable.

14. Check that the defocused dot periodically disappears.

15. Turn off the 608 Monitor and change the setting of the internal Blanking Level Selector, S550. Refer to the Option 25 component locator illustration at the rear of this section for the location of S550.

16. Turn ON the 608 Monitor and check that the defocused dot periodically disappears.

17. Disconnect the function generator.

This completes the Functional Check procedure for the Option 25 instrument.

THEORY OF OPERATION

The following information provides a description of the Option 25 circuitry and is intended to supplement the circuit operation description for the standard instrument as given in Section 4, Theory of Operation. The Option 25 circuitry is described with reference to the Option 25 schematic diagram given at the rear of this section and the Z-Axis Amplifier, Diagram 3, in section 8 of this manual. Refer to these schematic diagrams throughout the following discussion for specific electrical values and relationships.

TTL UNBLANKING

Input signals applied to the rear-panel TTL Z INPUT connector may be either a TTL LO level (0 to +0.8 volt) or a TTL HI level (+2.4 to +5 volts). Determination of the TTL level necessary to provide unblanking of the crt is made by internal switch S550, Blanking Level Selector. With S550 in the positive (+) position, a TTL LO level will blank the display; with S550 in the minus (-) position, a HI level will blank the display. With no signal applied to the TTL Z INPUT connector, an internal pull-up circuit consisting of R550 will pull the input to a TTL HI level.

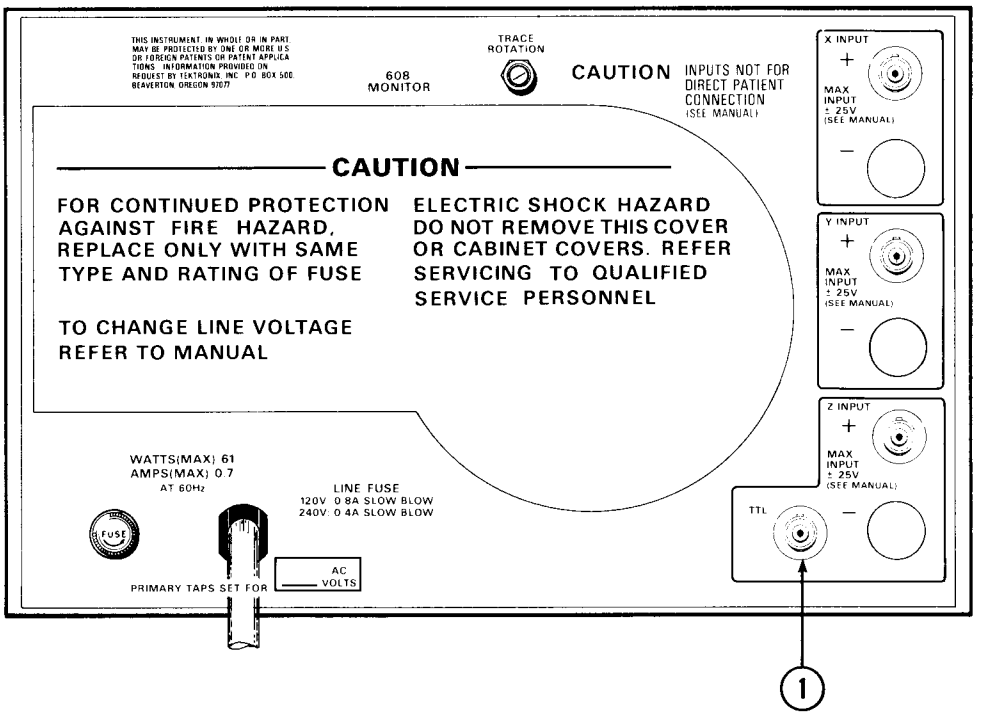
Transistors Q550-Q650 are connected as a voltage comparator. The reference voltage for the comparator, developed between R650 and R651, is about +1.5 volts. With the Blanking Level Selector S550 in the minus (-) position, the reference voltage is applied to the base of Q550 and the TTL input signal is applied to the base of Q650. If the TTL input signal is LO, the voltage at the base of Q650 is less than the reference voltage at the base of Q550. This turns off Q550 and turns on Q650. With Q650 conducting, the voltage at the base of Q658 is at about -5 volts. Since the collector of Q634 on Diagram 3 is nominally -7.5 volts, Q658 is turned off. Thus, the TTL unblanking circuit has no effect on the operating level of the Z-Axis Amplifier and the display is unblanked.

If the TTL input signal is HI, with S550 in the minus (-) position, the voltage at the base of Q650 is more than the reference voltage at the base of Q550. This turns off Q650 and turns on Q550. With Q650 turned off, R654 and R656 form a voltage divider to set the base of Q658 at about -10 volts. Transistor Q658 turns on, and CR565 on Diagram 3 becomes forward biased. Thus, the TTL Unblanking stage overrides the signal from the Z Preamplifier and clamps the output of the Z-Axis Amplifier to about zero volts to blank the crt display.

PERFORMANCE CHECK AND ADJUSTMENT

The following information is intended to supplement the Performance Check and Adjustment procedures given in section 6 of this manual.

@



(1) **TTL**—BNC input connector to allow application of TTL-compatible voltages to unblank the crt display.

2305-61

Option 25—Figure 1. Option 25 rear-panel connector.

OPTION 25—TABLE 2
Option 25 Performance Check Summary

Characteristic	Performance Requirement	Test Method	Procedure Title
Z-AXIS AMPLIFIER			
Unblanking	Input voltage level to produce unblanking is internally selectable by switch S550. With S550 in the minus (-) position, a LO input produces unblanking. With S550 in positive (+) position, a HI input produces unblanking.	A 1-Hz, +5-V square wave is applied to the TTL Z INPUT. Periodic unblanking of the display is checked for in both positions of S550.	Check Z-Axis Unblanking.

OPTION 25—TABLE 3
Option 25 Additional Test Equipment

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Function generator	Frequency: 1 Hz; amplitude: +5 V (peak) into an open circuit.	Check Z-Axis unblanking in the Option 25 instrument.	1. TEKTRONIX FG 503 Function Generator (operates in TM 500-series power module).

E. Z-AXIS AMPLIFIER—OPTION 25

Additional Equipment Required:

1. Function generator

E4. CHECK Z-AXIS UNBLANKING

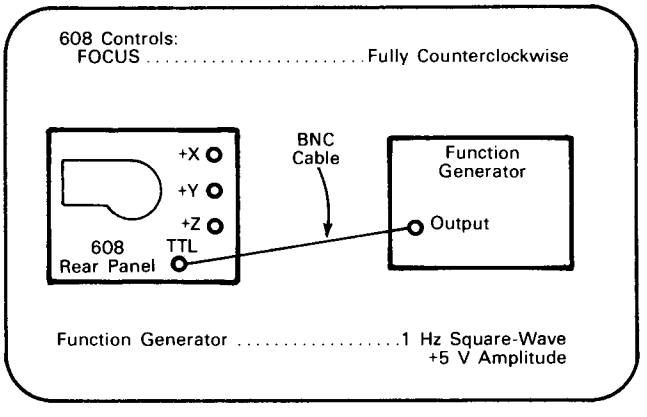
NOTE

For a complete procedure, perform this step following E3 (Check Z-Axis Amplifier Bandwidth) of Section 6, Performance Check and Adjustment.

SETUP CONDITIONS

NOTE

For a partial procedure, first perform the Z-Axis Preliminary Control Settings given in section 6, then proceed with the following instructions.



a. **CHECK**—That the defocused dot periodically disappears.

b. Release the front-panel ON/OFF pushbutton. Change the setting of S550 and turn the 608 ON.

c. **CHECK**—That the defocused dot periodically disappears.

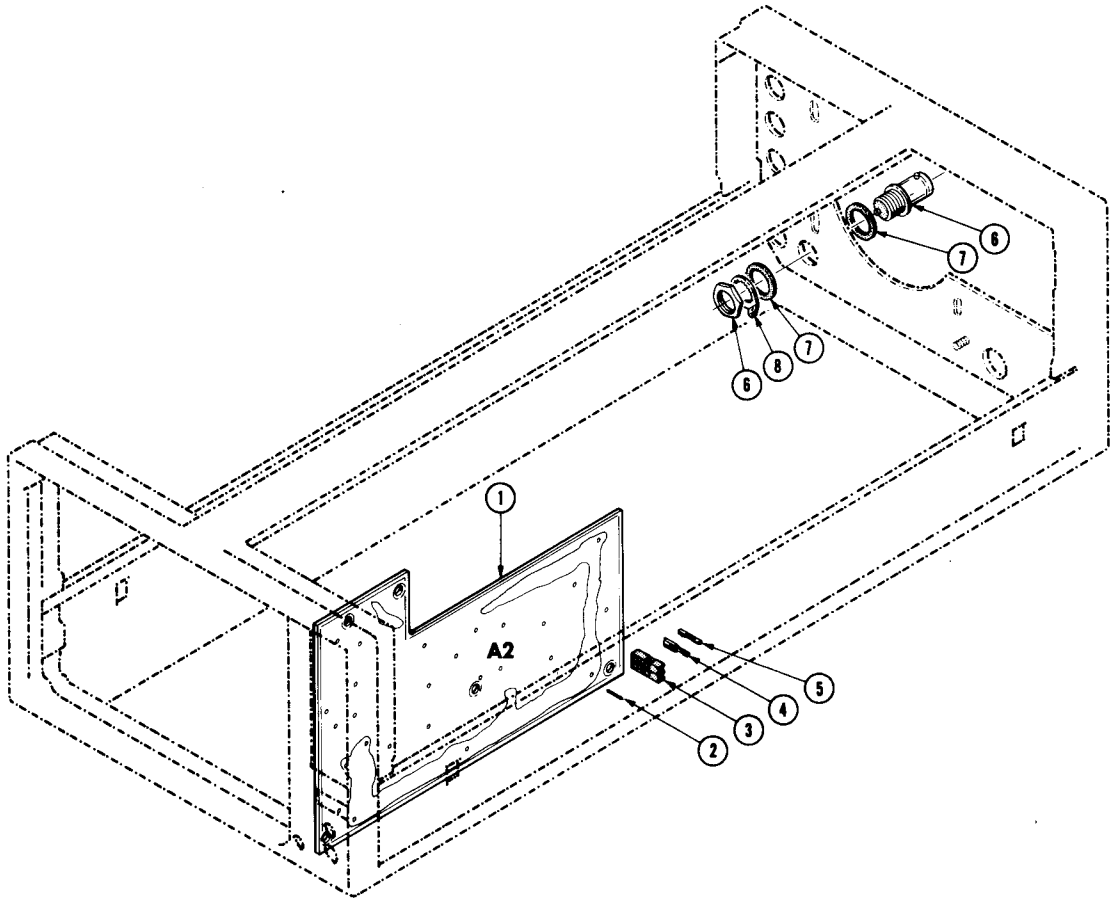
@

OPTION 25

ELECTRICAL

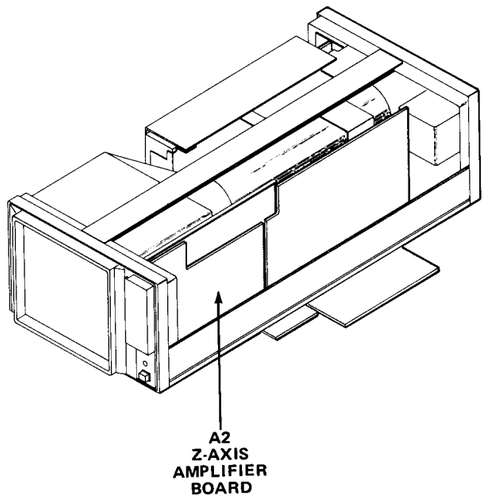
Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-5478-00			CKT BOARD ASSY:Z AXIS TTL UNBLANKING	80009	670-5478-00
CR550	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR650	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
Q550	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q650	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
Q658	151-0188-00			TRANSISTOR:SILICON,PNP	01295	2N3906
R550	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R552	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R555	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
R650	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R651	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R654	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R656	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R658	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
S550	260-0723-00			SWITCH,SLIDE:DPDT,0.5A,125VAC	79727	GF126-0028

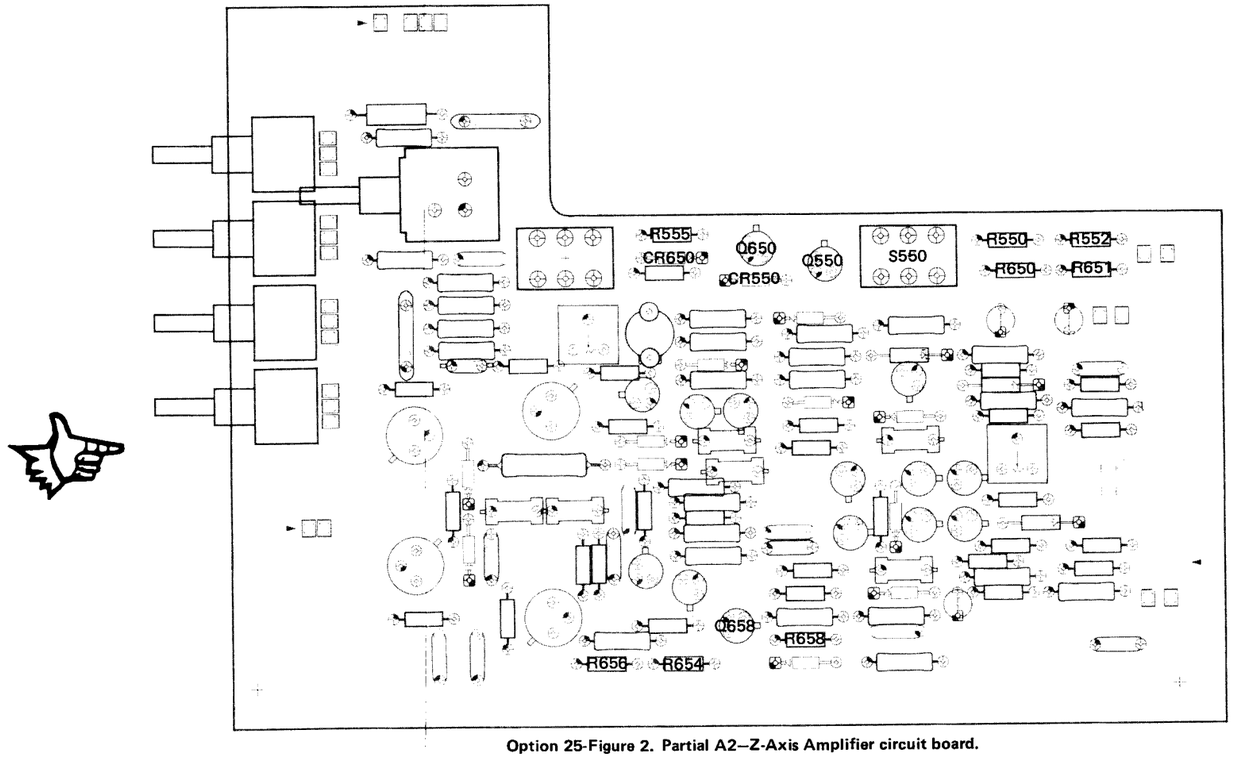
OPTION 25



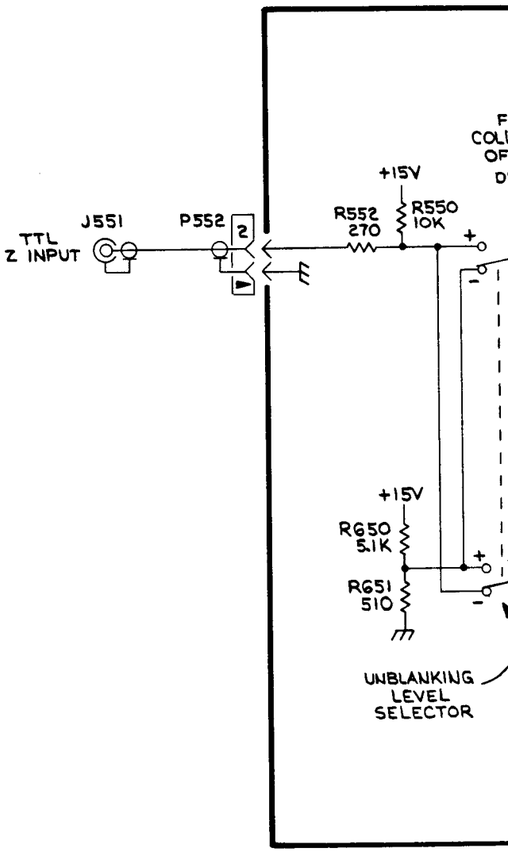
MECHANICAL

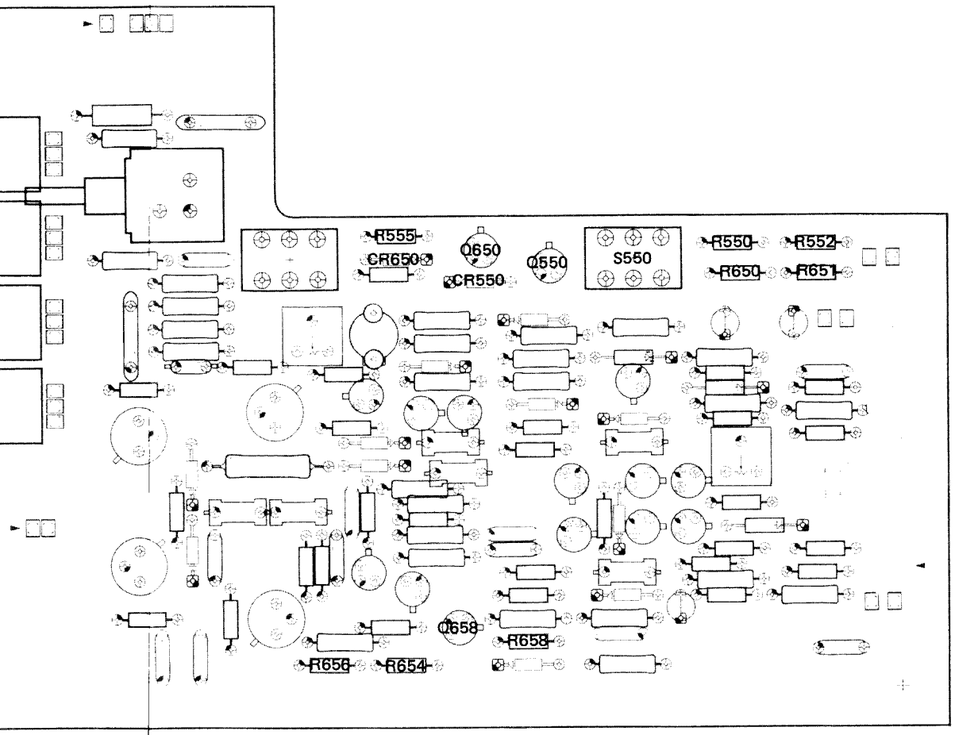
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	----- -----			1		CKT BOARD ASSY:		
-2	131-0589-00			2		. CONTACT,ELEC:0.46 INCH LONG	22526	47350
	198-3781-00			1		WIRE SET,ELEC:	80009	198-3781-00
-3	352-0198-00			1		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0198-00
-4	131-0621-00			2		. CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46233
-5	131-0792-00			2		. CONTACT,ELEC:0.577"L,18-20 AWG WIRE	22526	46221
-6	131-0955-00			1		CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	05091	31-279
-7	342-0117-00			2		INSULATOR,BSHG:	80009	342-0117-00
-8	210-0255-00			1		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00



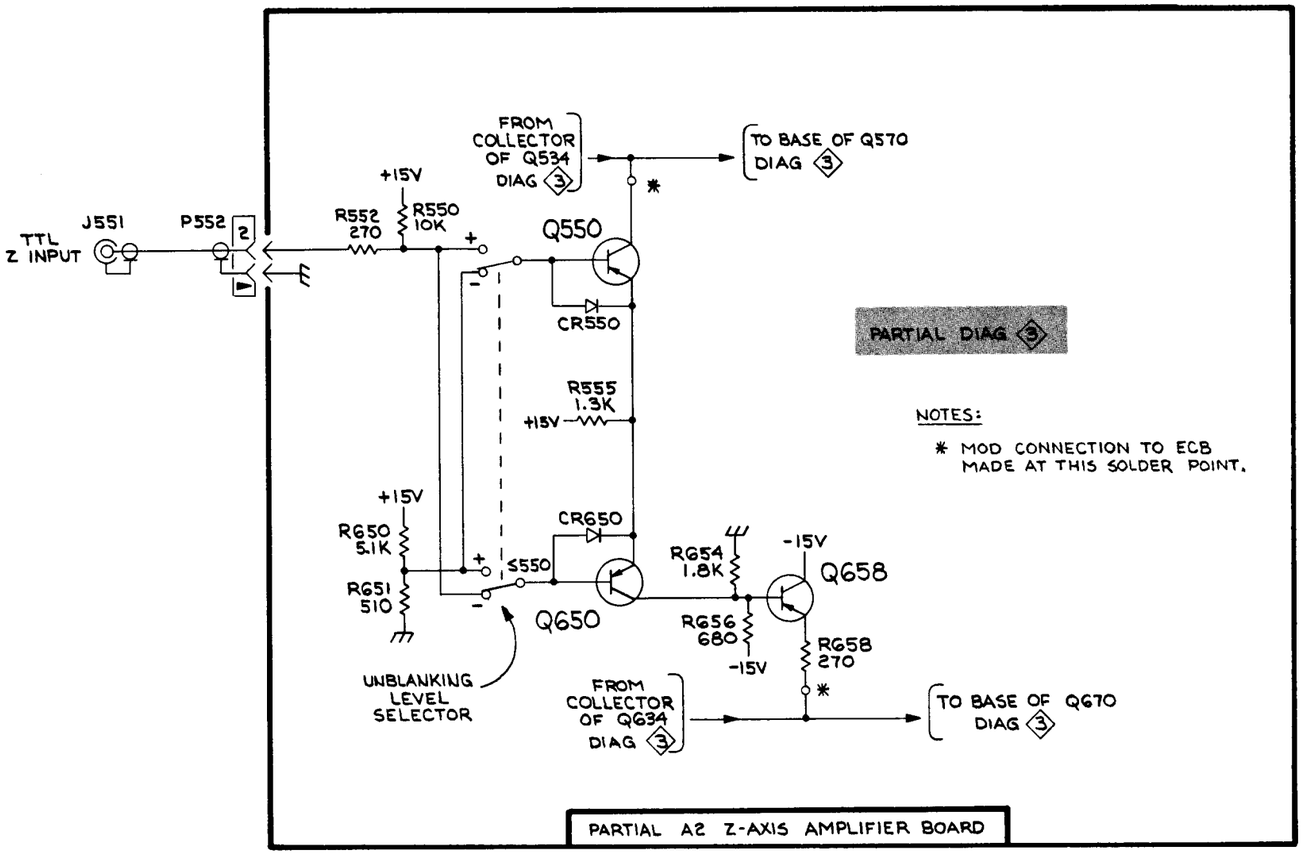


Option 25-Figure 2. Partial A2—Z-Axis Amplifier circuit board.





Option 25-Figure 2. Partial A2—Z-Axis Amplifier circuit board.



SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L1 C
P7

OPTION 25
TTL BLANKING

OPTION 25

EXTERNAL TTL UNBLANKING

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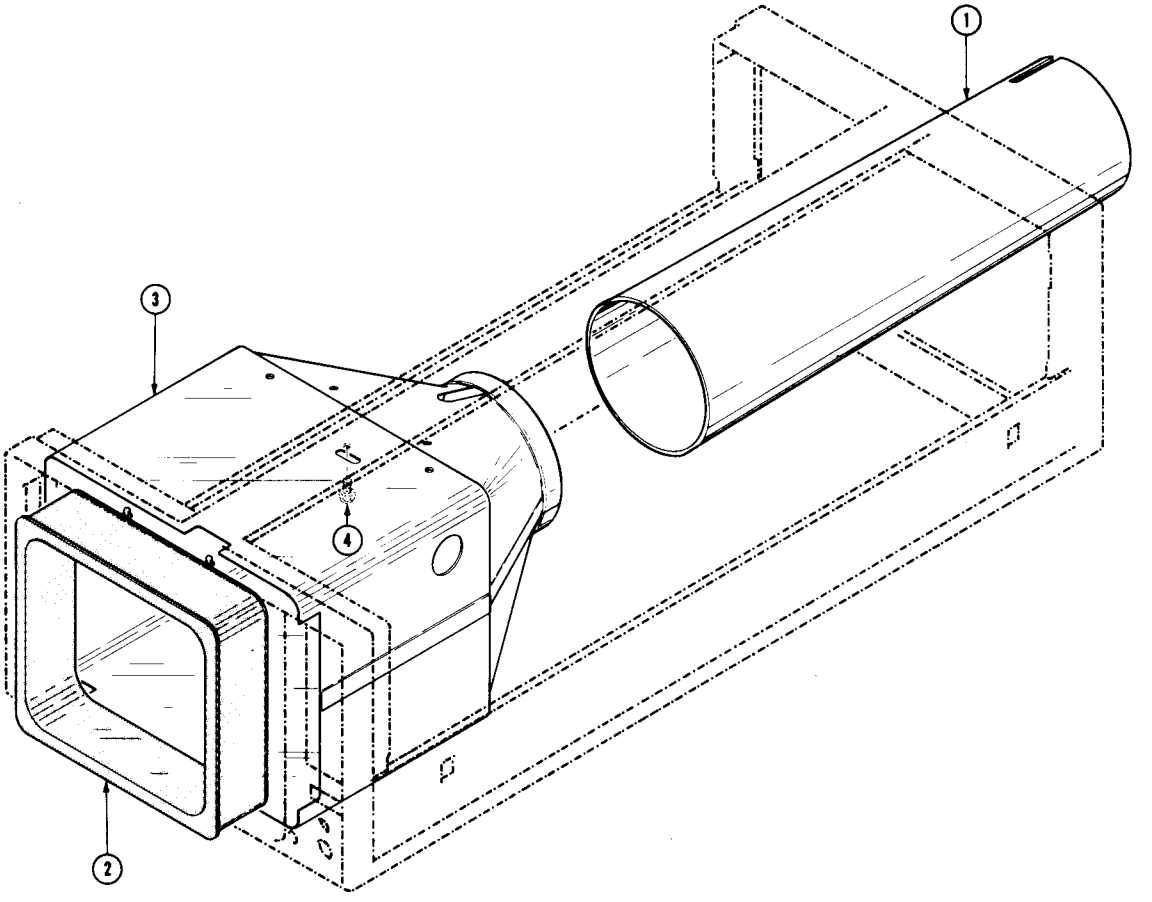
OPTION 30

Instrument includes a full crt magnetic shield.

OPTION 30



MECHANICAL

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	337-2455-00			1		SHIELD SECT,CRT:REAR	80009	337-2455-00
-2	108-0889-00			1		COIL,TUBE DEFLE:TRACE ROTATION	80009	108-0889-00
-3	337-2490-00			1		SHIELD SECT,CRT:FRONT	80009	337-2490-00
						(ATTACHING PARTS)		
-4	210-0589-00			1		NUT,SELF LKG HE:4-40 X 0.250 INCH	13257	22 NM-40

- - - * - - -

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
\- - - * - - -
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
\- - - * - - -
Parts of Detail Part
Attaching parts for Parts of Detail Part
\- - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000CP	AIMSCO	2110 WEST RUFFNER	SEATTLE, WA 98199
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
05091	TRI-ORDINATE CORPORATION	343 SNYDER AVENUE	BERKELEY HEIGHTS, NJ 07922
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
06383	PANDUIT CORPORATION	17301 RIDGELAND	TINLEY PARK, IL 60477
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
13257	AMERACE, LTD.	10 ESNA PARK DRIVE	MARKHAM, ONTARIO, CANADA
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
27264	MOLEX PRODUCTS CO.	5224 KATRINE AVE.	DOWNERS GROVE, IL 60515
28520	HEYMAN MFG. CO.	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
70276	ALLEN MFG. CO.	P. O. DRAWER 570	HARTFORD, CT 06101
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
77820	BENDIX CORP., THE, ELECTRICAL COMPONENTS DIVISION	SHERMAN AVE.	SIDNEY, NY 13838
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	200-1218-00			1		RTNR,CRT SCALE:	80009	200-1218-00
						(ATTACHING PARTS)		
-2	211-0188-00			2		SCREW,MACHINE:4-40 X 0.30 INCH,SST	80009	211-0188-00
						- - - * - - -		
-3	337-2126-01			1		SHIELD IMPLOSION:W/BLACK BORDER	80009	337-2126-01
-4	386-3824-00			2		SUPPORT,CRT:FRONT	80009	386-3824-00
-5	366-1257-00			1		PUSH BUTTON:GRAY PLASTIC	80009	366-1257-00
-6	426-0681-00			1		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-7	333-2347-00			1		PANEL,FRONT:	80009	333-2347-00
						(ATTACHING PARTS)		
-8	210-0586-00			1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
-9	210-0949-00			1		WASHER,FLAT:0.141 ID X 0.50 INCH OD,BRS	12327	OBD
						- - - * - - -		
-10	200-2128-00			1		DOOR,ACCESS PNL:	80009	200-2128-00
-11	333-2334-00			1		PANEL,FRONT:	80009	333-2334-00
						(ATTACHING PARTS)		
-12	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-13	----- -----			1		LAMP,LED:GREEN(SEE DS512 EPL)		
-14	386-2067-02			1		SUBPANEL,FRONT:	80009	386-2067-00
-15	----- -----			1		SWITCH,PUSH:W/BRACKET(SEE S960 EPL)		
						(ATTACHING PARTS)		
-16	211-0022-00			2		SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-17	210-0053-00			2		WASHER,LOCK:INTL,0.092 ID X 0.175"OD,STL	83385	OBD
-18	211-0087-01			2		SCREW,MACHINE:2-56 X 0.188" 82 DEG,FLH,STL	83385	OBD
						- - - * - - -		
-19	361-0861-00			2		SPACER,SLEEVE:0.36 L X 0.09ID,ALUMINUM	80009	361-0861-00
-20	200-1308-01			1		COVER,CRT,REAR:	80009	200-1308-01
						(ATTACHING PARTS)		
-21	211-0097-00			5		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-22	----- -----			1		TRANSFORMER:(SEE T950 EPL)		
						(ATTACHING PARTS)		
-23	212-0100-00			4		SCREW,MACHINE:8-32 X 0.625 INCH,HEX.HD,STL	83385	OBD
-24	210-0804-00			4		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
-25	210-0458-00			4		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
						- - - * - - -		
-26	407-2017-00			2		BRACKET,XFMR:ALUMINUM	80009	407-2017-00
-27	342-0028-00			2		INSULATOR,PLATE:0.600 W X 1.700 INCH LONG	80009	342-0028-00
-28	161-0017-09			1		CABLE ASSY,PWR:3,18 AWG,125V,96.0 L	80009	161-0017-09
-29	358-0529-00			1		BSHG,STRAIN RLF:FOR 0.3-0.36 OD CABLE,STR	28520	SR-63P-4
-30	352-0076-00			1		FUSEHOLDER:W/HARDWARE	75915	342012
-31	214-2076-00			1		. NUT,PLAIN,HEX.:HEX	75915	903012
-32	210-0873-00			1		. WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
-33	----- -----			3		CONN,RCPT,:(SEE J101,301 & 501 EPL)		
-34	342-0117-00			6		INSULATOR,BSHG:	80009	342-0117-00
-35	210-0255-00			3		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-36	214-2668-00			4		PLUG,HOLE:0.497 DIA,PLASTIC	80009	214-2668-00
-37	----- -----			1		RES.,VAR,NONWIR:(SEE R949 EPL)		
						(ATTACHING PARTS)		
-38	210-0583-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-39	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
						- - - * - - -		
-40	210-0202-00			1		TERMINAL,LUG:SE #6	78189	2104-06-00-2520N
						(ATTACHING PARTS)		
-41	210-0457-00			1		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-42	333-2350-00			1		PANEL,REAR:	80009	333-2350-00
						(ATTACHING PARTS)		
-43	211-0507-00			6		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-44	220-0419-00			2		NUT,PLAIN,SQ:6-32 X 0.312 INCH,STL	83385	OBD
	210-0006-00			2		WASHER,LOCK:INTL,0.146 IDX 0.288 OD,STL	78189	1206-00-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-45	220-0809-00			2		NUT BLOCK:0.85 X 0.95,(1)6-32 THRU	80009	220-0809-00
						(ATTACHING PARTS FOR EACH)		
-46	211-0538-00			1		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-47	343-0659-00			2		CLAMP,LOOP:0.375 DIA,STEEL CAD PLATE	000CP	OBD
						(ATTACHING PARTS FOR EACH)		
-48	211-0538-00			1		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-49	210-0457-00			1		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-50	166-0603-00			1		GND,METAL,RIGID:14.0 L X 0.319 ID,AL	80009	166-0603-00
-51	366-1564-00			4		KNOB:GRAY PLASTIC,PRESS MT	80009	366-1564-00
-52	384-1112-04			1		EXTENSION SHAFT:9.03 L X 0.188 OD,PLASTIC	80009	384-1112-04
-53	376-0029-00			1		CPLG,SHAFT,RGD:0.128 ID X 0.312 OD X 0.5"L	80009	376-0029-00
	213-0075-00			2		. SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	70276	OBD
-54	384-1112-03			1		EXTENSION SHAFT:12.98 L X 0.188 OD,PLASTIC	80009	384-1112-03
-55	376-0029-00			1		CPLG,SHAFT,RGD:0.128 ID X 0.312 OD X 0.5"L	80009	376-0029-00
-56	----- -----			1		CKT BOARD ASSY:Z-AXIS/CONTROL(SEE A2 EPL)		
						(ATTACHING PARTS)		
-57	211-0008-00			4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CIRCUIT BOARD ASSY INCLUDES:		
-58	----- -----			3		. RES.,VAR NONWIR:(SEE R147,347 & 547 EPL)		
						(ATTACHING PARTS FOR EACH)		
	210-0586-00			1		. NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-59	----- -----			1		. RES.,VAR NONWIR:(SEE R844 EPL)		
						(ATTACHING PARTS)		
-60	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-61	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-62	407-1999-00			1		. BRACKET,CMPNT:BRASS	80009	407-1999-00
-63	214-0579-00			9		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-64	131-0608-00			2		. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-65	----- -----			1		. RES.,VAR NONWIR:(SEE R841 EPL)		
						(ATTACHING PARTS)		
-66	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-67	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-68	386-3786-00			1		. PLATE,VAR RES:BRASS	80009	386-3786-00
-69	214-1291-00			4		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
-70	131-0589-00			4		. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-71	131-0566-00			2		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	ERD-18T0
-72	131-1782-00			1		. CONNECTOR,RCPT,:RIGHT ANGLE,12 FEMALE	27264	09-52-3121
-73	----- -----			1		CKT BOARD ASSY:DEFLECTION(SEE A1 EPL)		
						(ATTACHING PARTS)		
-74	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-75	337-2503-00			1		SHIELD,ELEC:CIRCUIT BOARD,REAR	80009	337-2503-00
-76	131-0566-00			9		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	ERD-18T0
-77	136-0237-00			2		. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-78	337-2456-00			1		. SHIELD,ELEC:DEFLECTION	80009	337-2456-00
-79	131-1782-00			1		. CONNECTOR,RCPT,:RIGHT ANGLE,12 FEMALE	27264	09-52-3121
-80	----- -----			1		. RES.,VAR NONWIR:(SEE R125 EPL)		
						(ATTACHING PARTS)		
-81	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-82	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-83	386-3786-00			1		. PLATE,VAR RES:BRASS	80009	386-3786-00
-84	131-2079-00			1		. CONN,RCPT,ELEC:FD.THRU,12 MALE,TIN PLATED	27264	09-67-1124
-85	131-0589-00			8		. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-86	----- -----			1		. RES.,VAR NONWIR:(SEE R325 EPL)		
						(ATTACHING PARTS)		
	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		

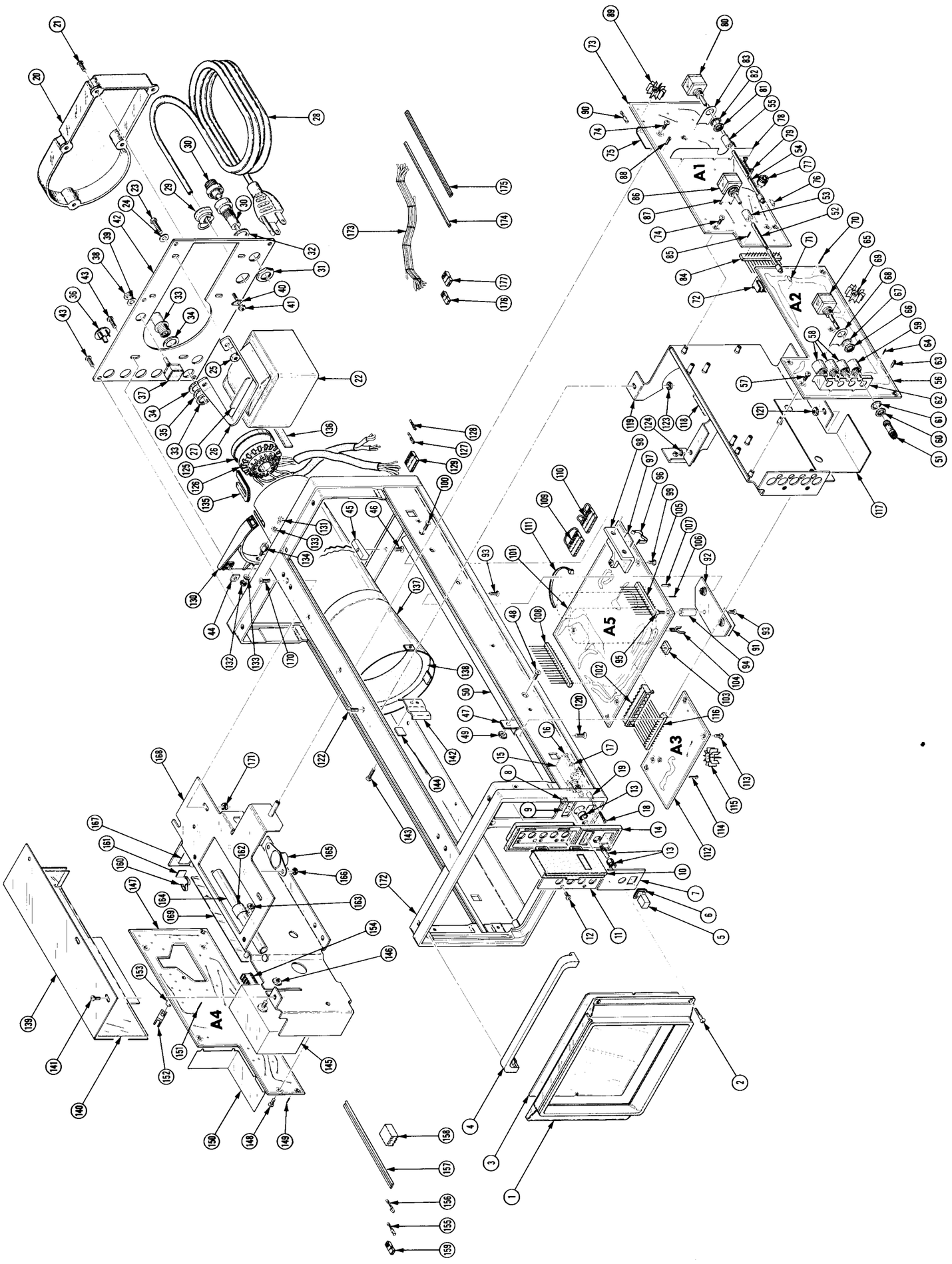
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-87	386-3786-00			1		. PLATE,VAR RES:BRASS	80009	386-3786-00
-88	214-0579-00			4		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-89	214-1291-00			8		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
	198-3715-00			1		. WIRE SET,ELEC:DEFLECTION	80009	198-3715-00
-90	131-1963-00			4		. . TERM.,QIK DISC.:FOR 0.038 DIACRT PIN	00779	42428-9
-91	334-2359-00			1		MARKER,IDENT:WARNING	80009	334-2359-00
-92	386-3837-00			1		SUPPORT,CKT BD:	80009	386-3837-00
						(ATTACHING PARTS)		
-93	211-0101-00			3		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
-94	129-0273-00			1		POST,ELEC-MECH:0.625 X 0.188 INCH OD	80009	129-0273-00
-95	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-96	344-0236-00			2		CLIP,SPR TNSN:	80009	344-0236-00
-97	342-0082-00			2		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
-98	407-2000-00			1		BRACKET,ANGLE:POWER SUPPLY	80009	407-2000-00
						(ATTACHING PARTS)		
-99	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-100	211-0038-00			2		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-101	----- -----			1		CKT BOARD ASSY:LV PWR SPLY(SEE A5 EPL)		
						(ATTACHING PARTS)		
	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		CKT BOARD ASSY INCLUDES:		
-102	131-1782-00			1		. CONNECTOR,RCPT,:RIGHT ANGLE,12 FEMALE	27264	09-52-3121
	131-0566-00			8		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	ERD-18T0
-103	136-0514-00			1		. SOCKET,PLUG IN:MICROCIRCUIT,8 CONTACT	73803	C9308-02
-104	344-0154-00			8		. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00
-105	131-1783-00			1		. CONNECTOR,RCPT,:CONTACT ASSY,EL	27264	09-64-1123
-106	131-0608-00			19		. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-107	214-0579-00			4		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-108	131-2078-00			1		. TERM.,FEED THRU:15 PIN,INSULATED,0.045 RND	27264	09-64-1151
-109	131-1895-00			1		. LINK,TERM. CONN:8,22 AWG,1.5 L	80009	131-1895-00
-110	131-1896-00			1		. LINK,TERM. CONN:8,22 AWG,1.5 L	80009	131-1896-00
-111	346-0120-00			1		. STRAP,ELEC COMP:TIE DOWN,5.5 LG,MIN PLSTC	06383	SST1.5M
-112	----- -----			1		CKT BOARD ASSY:DYN FOC(SEE A3 EPL)		
						(ATTACHING PARTS)		
-113	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-114	214-0579-00			1		. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-115	214-1291-00			2		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
-116	131-2079-00			1		. CONN,RCPT,ELEC:FD.THRU,12 MALE,TIN PLATED	27264	09-67-1124
-117	342-0414-00			1		INSULATOR,SW:POWER	80009	342-0414-00
-118	334-3185-00			2		MARKER,IDENT:MARKED DANGER	80009	334-3185-00
-119	441-1393-00			1		CHASSIS,MONITOR:CONTROL & LOW VOLTAGE POWER	80009	441-1393-00
						(ATTACHING PARTS)		
-120	211-0538-00			2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-121	210-0457-00			2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-122	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
-123	210-0586-00			1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-124	210-0003-00			1		WASHER,LOCK:EXT,0.123 ID X 0.245" OD,STL	78189	1104-00-00-0541C
	211-0038-00			1		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-125	200-0616-01			1		COV,ELECTRON TU:	80009	200-0616-01
	136-0690-00			1		SOCKET ASSY,CRT:	80009	136-0690-00
-126	136-0301-01			1		. SOCKET,PLUG-IN:	80009	136-0301-01
-127	131-0621-00			4		. CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46233
-128	131-0707-00			6		. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	75691-005
-129	352-0164-01			1		. CONN BODY,PL,EL:6 WIRE BROWN	80009	352-0164-01

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-130	407-0931-00			1		BRKT,CRT SHIELD:	80009	407-0931-00
						(ATTACHING PARTS)		
-131	211-0007-00			3		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-132	210-0586-00			3		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
-133	210-0004-00			4		WASHER,LOCK:INTL,0.12 ID X 0.26"OD,STL	78189	1204-00-00-0541C
-134	129-0260-00			3		SPACER,POST:STUD W/COUNTER SINK,4-40 EXT THD	80009	129-0260-00
	210-0802-00			3		WASHER,FLAT:0.15 ID X 0.31 2 INCH OD	12327	OBD
						- - - * - - -		
-135	348-0145-00			1		GROMMET,PLASTIC:U-SHP,1.0 X 0.42 INCH	80009	348-0145-00
-136	348-0090-00			4		CUSHION CRT:	80009	348-0090-00
	334-1379-00			1		LABEL:CRT,ADHESIVE BACK	80009	334-1379-00
-137	337-2521-00			1		SHIELD,CRT:	80009	337-2521-00
-138	[1]			1		COIL		
-139	337-2477-00			1		SHIELD,ELEC:HIGH VOLTAGE	80009	337-2477-00
-140	342-0403-00			1		. INSULATOR,FILM:HV SHIELD	80009	342-0403-00
						(ATTACHING PARTS)		
-141	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-142	343-0521-00			2		CLAMP,XSTR:750 WIDE W(2)4-40 THD HOLE	80009	343-0521-00
						(ATTACHING PARTS FOR EACH)		
-143	211-0102-00			1		SCREW,MACHINE:4-40 X 0.500",FLH,STL	83385	OBD
						- - - * - - -		
-144	342-0082-00			2		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
	334-3186-00			1		MARKER,IDENT:MARKED DANGER UP TO 4.5KV	80009	334-3186-00
-145	----- -----			1		SEMICOND DVC,DI:(SEE U885 EPL)		
						(ATTACHING PARTS)		
-146	210-0458-00			2		NUT,PLAIN,EXT W:8-32 X 0.344 INCH,STL	83385	OBD
						- - - * - - -		
-147	----- -----			1		CKT BOARD ASSY:HV(SEE A4 EPL)		
						(ATTACHING PARTS)		
-148	211-0008-00			4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD INCLUDES:		
-149	131-0608-00			4		. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-150	337-2488-00			1		. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2488-00
-151	131-0589-00			8		. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-152	124-0118-00			1		. TERMINAL BOARD:1 NOTCH	80009	124-0118-00
-153	361-0009-00			1		. SPACER,SLEEVE:0.11 ID X 0.25 OD X 0.41 H	80009	361-0009-00
-154	131-2077-00			1		. TERM.,FEEDTHRU:CKT CARD,RT ANGLE,15 FEMALE	27264	09-52-3151
	198-3716-00			1		. WIRE SET,ELEC:HV BD	80009	198-3716-00
-155	131-1963-00			1		. . TERM.,QIK DISC.:FOR 0.038 DIACRT PIN	00779	42428-9
-156	131-1815-00			1		. . CONTACT,ELEC:22-30 AWG,FEMALE,BRASS	27264	08-56-0110
	131-0621-00			1		. . CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46233
	131-0707-00			2		. . CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	75691-005
-157	175-0862-00			FT		. . WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0862-00
-158	204-0678-00			1		. . CONN BODY,PL,EL:FOR 3 FEMALE CONTACTS	27264	10-17-2032
-159	352-0169-00			1		. . CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-160	344-0236-00			1		CLIP,SPR TNSN:	80009	344-0236-00
-161	342-0082-00			1		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
-162	343-0659-00			1		CLAMP,LOOP:0.375 DIA,STEEL CAD PLATE	000CP	OBD
						(ATTACHING PARTS)		
-163	210-0586-00			1		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						- - - * - - -		
-164	166-0605-00			1		CND,METAL,RIGID:4.4 L X 0.319 ID,ALUMIUM	80009	166-0605-00
-165	----- -----			1		SW,THERMOSTATIC:(SEE S950 EPL)		
						(ATTACHING PARTS)		
-166	210-0586-00			2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						- - - * - - -		
-167	334-3185-00			1		MARKER,IDNET:MARKED DANGER UP TO 100V	80009	334-3185-00
-168	441-1392-00			1		CHASSIS,MONITOR:HIGH VOLTAGE	80009	441-1392-00

[1]Part number not available at this printing.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-169	342-0402-00			1		. INSULATOR,FILM:HIGH VOLTAGE	80009	342-0402-00
						(ATTACHING PARTS)		
-170	211-0025-00			2		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
-171	210-0586-00			2		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	OBD
						- - - * - - -		
-172	426-1441-00			1		FRAME,MONITOR:	80009	426-1441-00
-173	179-2571-00			1		WIRING HARNESS:POWER	80009	179-2571-00
	198-3714-00			1		WIRE SET,ELEC:	80009	198-3714-00
	131-0707-00			2		. CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	75691-005
	131-0621-00			3		. CONTACT,ELEC:0.577"L,22-26 AWG WIRE	22526	46233
	131-0792-00			3		. CONTACT,ELEC:0.577"L,18-20 AWG WIRE	22526	46221
-174	175-0825-00			FT		. WIRE,ELECTRICAL:2 WIRE RIBBON	08261	OBD
-175	175-0826-00			FT		. WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00
-176	352-0169-00			1		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-177	352-0161-00			1		. CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0161-00
	352-0198-00			3		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0198-00

FIG. 1 EXPLODED



STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
	337-2126-02			1		SHLD,IMPLOSION:GRATICULE	80009	337-2126-02
	070-2306-00			1		MANUAL,TECH:OPERATORS	80009	070-2306-00
	070-2305-00			1		MANUAL,TECH:INSTRUCTION	80009	070-2305-00