Tektronix®
COMMITTED TO EXCELLENCE

607A STORAGE MONITOR
WITH OPTIONS

INSTRUCTION MANUAL

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INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number _____

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WARRANTY

Tektronix warrants that this product is free from defects in materials and workmanship. The warranty period is one (1) year from the date of shipment. Tektronix will, at its option, repair or replace the product if Tektronix determines it is defective within the warranty period and if it is returned, freight prepaid, to a service center designated by Tektronix.

Tektronix is not obligated to furnish service under this warranty:

a. to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair, or service the product;
b. to repair damage resulting from improper use or from connecting the product to incompatible equipment;
c. if personnel other than Tektronix representatives modify the hardware or software.

There is no implied warranty of fitness for a particular purpose. Tektronix is not liable for consequential damages.

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WARNING

This equipment generates, uses, and can radiate radio frequency energy and may cause interference to radio communications if not installed and used in accordance with the instruction manual. It has been tested and found to comply with the limits for Class B computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when this equipment is operated in a commercial environment. Operation in a residential area is likely to cause interference in which case the users at their own expense must take whatever measures may be required to correct the interference.

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WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

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NOTE

The following illustrations are located on pull-out pages near the rear of the manual.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

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

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

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual


This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment


DANGER — High voltage.


Protective ground (earth) terminal.


ATTENTION — refer to manual.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.
Use only a power cord that is in good condition.

For detailed information on power cords and connectors, see the service sections in this manual.

Refer cord and connector changes to qualified service personnel.

Medical-Dental Applications

For medical-dental applications (to ensure grounding integrity) the hospital-grade plug must be inserted only into a mating hospital-grade receptacle with a grounding contact.

Do not use the amplifer 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". Also refer to NFPA 70-1978, **National Electrical Code,** paragraphs 517-120 through 517-122.

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

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Remove Instrument Covers

Instruments with Option 6, 23, or 28 are equipped with protective cabinet panels. To avoid electric-shock hazard, operating personnel must not remove the cabinet panels. Instruments without cabinet panels that are mounted in a rack or other enclosure should be operated only within the enclosure. Component replacement and internal adjustments must be made by qualified service personnel only.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

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

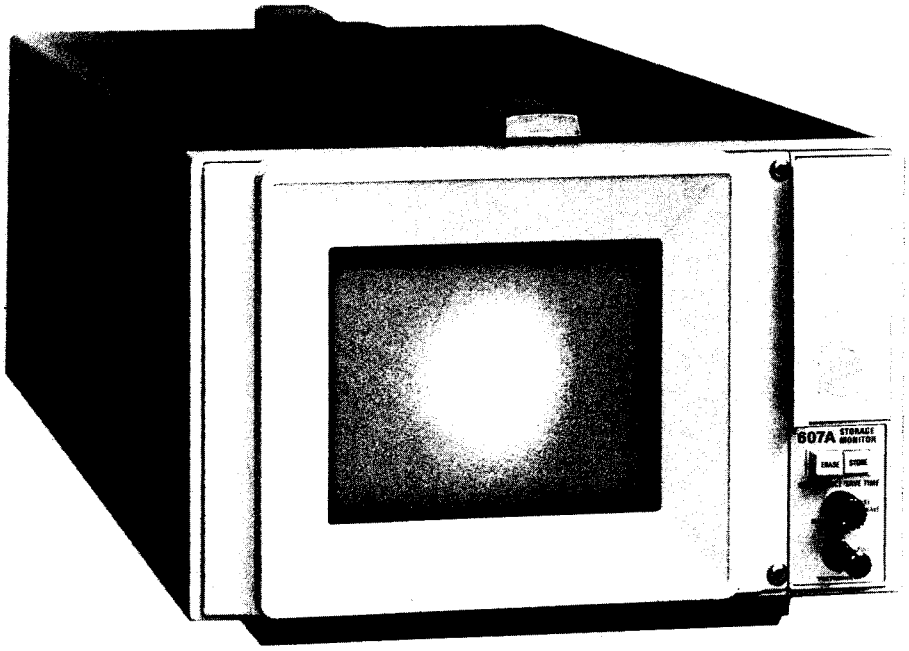
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



2509-01

607A Storage Monitor, shown with Option 23 (includes handle, feet, and protective cabinet panels).

PART I
OPERATING INFORMATION

GENERAL INFORMATION

Introduction

The Operators Manual contains information necessary to effectively operate the 607A Storage Monitor, and is divided into four sections. Section 1 provides a basic description of the 607A and information on repackaging the instrument for shipment. Section 2 contains operating information for the instrument, including a functional check procedure that serves to familiarize the user with operating techniques. Operating information for the various available options is also included. The instrument specification is in Section 3 of this manual.

The 607A Instruction Manual provides both operating and servicing information for the 607A Storage Monitor. Part I of the instruction manual includes operating information for both the user and service personnel. Part II is intended for use by qualified service personnel only. Factory-installed options are described in Section 8 of this Instruction Manual.

Description

The 607A Storage Monitor provides a bright, variable-persistence X-Y display of analog data on a 7.2 X 9 centimeter (2.8 X 3.5 inch) viewing area. The 607A is well-suited for many display applications in ultrasonic detection, electron microscope, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume and vibration analysis, and medical and biophysical systems. The 607A may also be used to provide stored displays of alphanumeric and graphic information from measurement systems, computers, and other data-transmission systems. The storage crt allows a display to be stored in excess of five minutes (longer display times are possible in the Save mode).

The 607A offers a high degree of adaptability to various application areas through the selection of a broad variety of factory-installed options. A description of available options is included in Section 8 of this manual.

The compact size of the 607A Storage Monitor permits mounting two instruments side-by-side in a standard 19-inch instrument rack; it requires only 5-1/4 inches of vertical rack space. The instrument can be operated from either a 120-volt or a 220-volt (nominal) line-voltage source. Power-transformer primary taps permit operation over a broad range of line voltages to either side of the center nominal range.

Damage Inspection

When unpacking the instrument, carefully remove the instrument from the shipping carton and inspect for any possible damage incurred during shipment. Report any damage or shortage to the carrier as soon as possible.

Save the shipping carton and packing in case it is needed to repackage the instrument for subsequent shipment.

Repackaging For Shipment

If this 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 that can be contacted, complete instrument type and serial number, and a description of the service required.

Save and re-use the carton and packing in which your 607A Storage Monitor was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. The carton test strength for this instrument is 275 pounds.

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

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 operating limits, allow the chassis temperature to return to within the operating limits before applying power. Other environments and mounting configurations, such as mounting in consoles or instrument racks, may require additional cooling measures. (Refer qualified service personnel to the servicing information sections of this manual.) Allowing the monitor to operate at an ambient temperature substantially higher than that specified may result in poor reliability as well as inaccurate performance.

OPERATING POWER INFORMATION

The instrument can be operated from either a 120-volt or 220-volt nominal line-voltage source, and over a line-frequency range of 48 to 440 Hz. 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. If the indicated line voltage is set for a different range than the ac line that you intend to use, refer qualified service personnel to the Installation section of this manual.

CONTROLS AND CONNECTORS

Controls and connectors necessary for normal operation of the 607A Storage Display Monitor are located on the front and rear panels of the instrument. (Some switches to control functions of various instrument options are located internally. Refer a qualified service technician to the servicing sections for information.) 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 in Fig. 2-1. The rear-panel controls and connectors are shown in Fig. 2-2. Some external controls

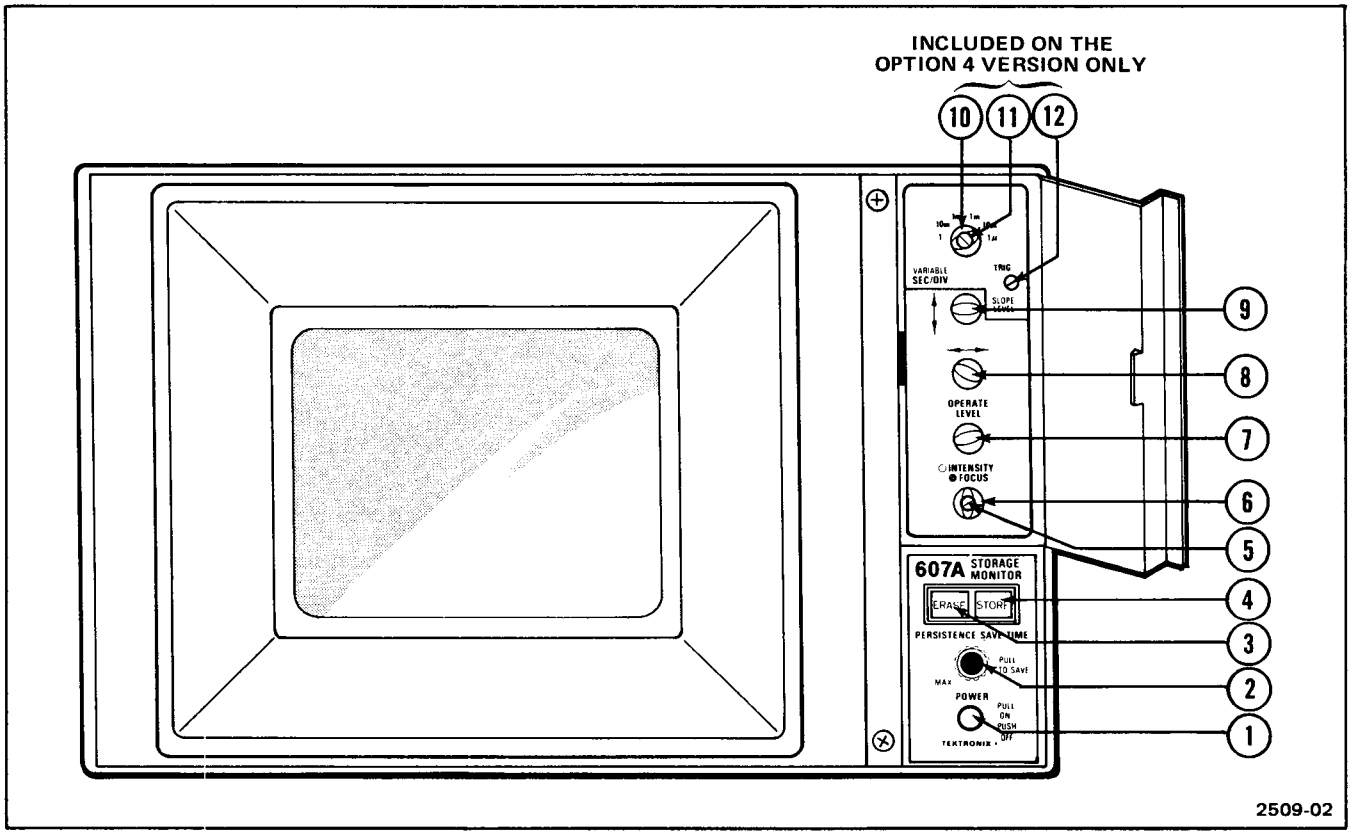


Fig. 2-1. Front-panel controls (includes Option 4).

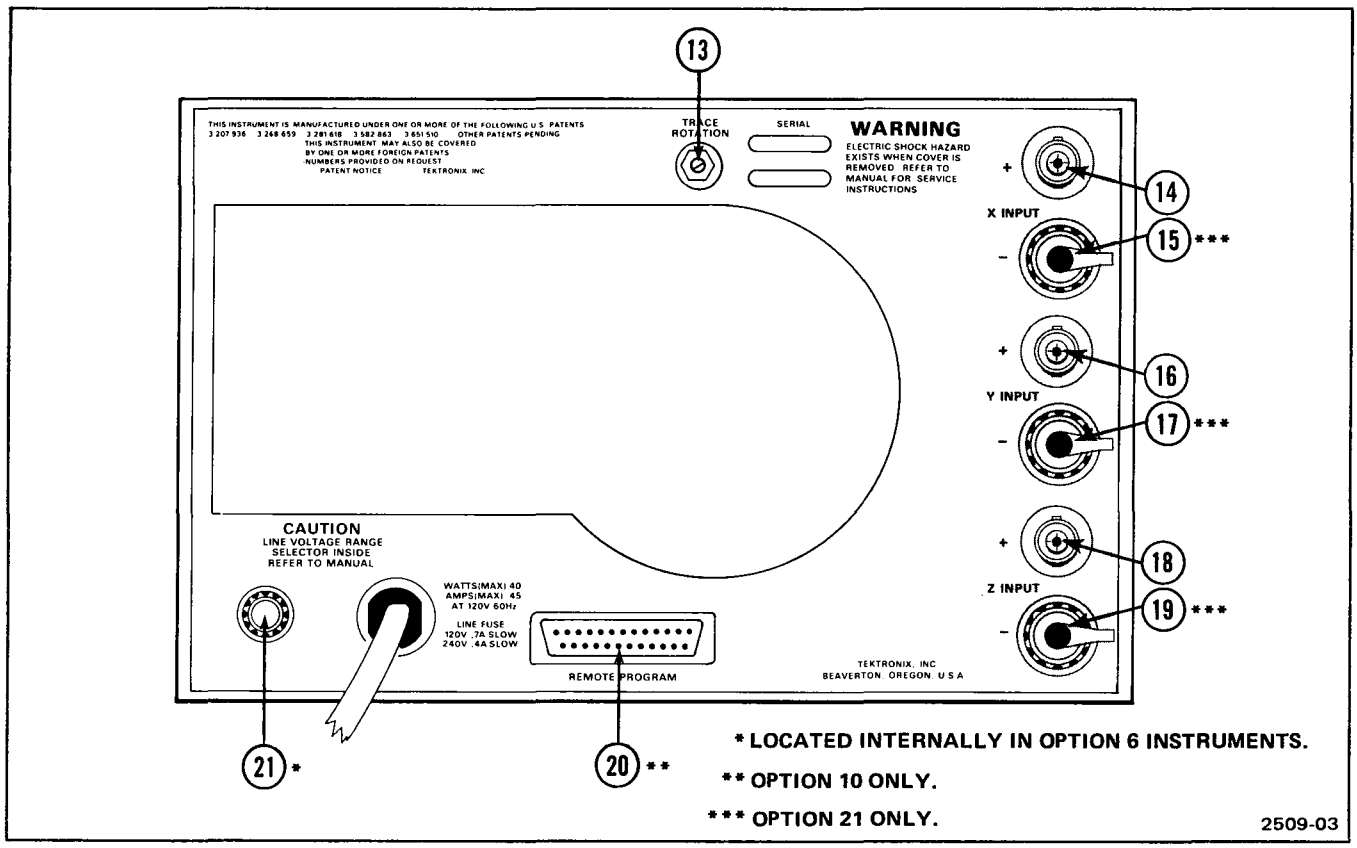


Fig. 2-2. Rear-panel controls and connectors (includes Options 10 and 21).

and connectors shown relate to available instrument options for the 607A, and may be included in your instrument. Options are indicated in the following text by option number. These option numbers correspond to the option numbers on the rear of your display unit.

Front-Panel Controls

This is a brief description of the function or operation of the front-panel controls. See Fig. 2-1.

(1) POWER — Turns instrument power on when pulled out and off when pushed in.

(2) PERSISTENCE/ SAVE TIME — Varies the persistence of the crt screen from a fraction of a second with the knob pushed in and turned fully clockwise to maximum store time in the fully counterclockwise (MAX) position (maximum store time depends on the setting of the OPERATE LEVEL control). With the knob pulled out, the monitor is in the Save mode which extends the store time beyond that available with the knob pushed in. In the Save mode (knob pulled out), the display controls are disabled to prevent accidentally erasing or changing the stored display. To view the stored display, the knob must be pushed in or turned clockwise.

(3) ERASE — Erases the stored display when pushed in.

(4) STORE — Selects storage operation when pushed in and non-storage operation when in the out position.

(5) FOCUS — Screwdriver adjustment concentric with the INTENSITY control that provides a well-defined display.

(6) INTENSITY — Varies the brightness of a non-stored display.

(7) OPERATE LEVEL — Varies the writing speed and contrast of a stored display.

(8) Horizontal Position — Moves writing beam or display to the right or left.

(9) Vertical Position — Moves writing beam or display up or down.

(10) SEC/DIV (Option 4 only) — Selects from six calibrated sweep rates from 0.1 second/division to 1 microsecond/division in decade steps. (VARIABLE control must be fully clockwise for indicated sweep rate.)

(11) VARIABLE SEC/DIV (Option 4 only) — Screwdriver adjustment concentric with the SEC/DIV switch. Provides uncalibrated, continuously variable sweep rates between calibrated steps. Extends the slowest sweep-rate range to at least 1 second/division.

(12) TRIG SLOPE/LEVEL (Option 4 only) — Screwdriver adjustment that selects the slope and level of the vertical signal from which the sweep is triggered.

Rear-Panel Controls and Connectors

All signal connections to the 607A Storage Monitor are made through bnc coaxial connectors located on the rear panel of the instrument. (See Fig. 2-2.)

Option 10. If your instrument includes Option 10, a rear-panel REMOTE PROGRAM connector is provided to permit single-ended X, Y, and Z input signals to be coupled from a remote location directly in to the +X, +Y, and +Z Input Amplifiers. Storage operation can also be controlled via this connector. See Operating Information for Options for additional details.

(13) TRACE ROTATION — Screwdriver adjustment to align the trace with the crt horizontal axis.

X INPUT Connectors

(14) +X — Bnc input connector. A positive signal applied deflects the beam to the right; a negative signal deflects the beam to the left.

(15) −X (Option 21) — Bnc input connector. A positive signal applied deflects the beam to the left; a negative signal deflects the beam to the right. Used in conjunction with the +X INPUT for differential operation.

Y INPUT Connectors

(16) +Y — Bnc input connector. A positive signal applied deflects the beam up; a negative signal deflects the beam down.

(17) −Y (Option 21) — Bnc input connector. A positive signal applied deflects the beam down; a negative signal deflects the beam up. Used in conjunction with the +Y INPUT for differential operation.

Z INPUT Connectors

(18) +Z — Bnc input connector. Provides a linear function to control display brightness. A positive signal applied increases display brightness; a negative signal decreases display brightness.

(19) −Z (Option 21) — Bnc input connector. Provides a linear function to control display brightness. A positive signal applied decreases display brightness; a negative signal increases display brightness. Used in conjunction with the +Z INPUT for differential operation.

(20) REMOTE PROGRAM (Option 10) — Twenty-five pin connector that provides remote inputs and outputs. See Operating Information for Options for additional details.

(21) Fuse Holder (Located inside the instrument for Option 6.)[1] — Contains the line-voltage fuse to protect the instrument from excessive line-voltage surges or shorts within the instrument.

[1] **Refer qualified service personnel to the servicing information sections of this manual for further information.**

DETAILED OPERATING INFORMATION

Signal Connectors

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. The standard instrument is designed for single-ended operation (inputs to the +X, +Y, and +Z connectors). For instruments equipped with Option 21 (differential inputs), −X, −Y, and −Z input connectors are provided. When the instrument is shipped from the factory, Option 21 instruments are prepared for single-ended operation, with a grounding cap connected to the −input (inverting) of each axis. For differential operation, remove the grounding cap and apply the input signals to the bnc connectors of the appropriate axis. Option 10 instruments are equipped with a Remote Program connector on the rear panel. This connector permits coupling of single-ended inputs to the +X, +Y, and +Z axes. Remote control of storage operation can also be accomplished via this connector.

Input Signal Requirements

The vertical (Y) and horizontal (X) 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 vertical and horizontal deflection factors of your particular instrument meet those set at the factory, as stated above.

WARNING

Electrical-shock hazard is present within the instrument. Only qualified service personnel should change the input signal requirements. Refer them to the servicing information sections of this manual.

The best transient response is achieved when the input signal amplitude to the vertical and horizontal inputs 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 connectors, the intensity of the display is controlled only by the front-panel INTENSITY control. The intensity range provided by this control is from no visual intensity (crt beam off) to full bright.

To control the intensity with an externally-applied signal, set the INTENSITY control to about midrange. An internal gain control permits the Z-axis input requirement for full intensity control to be adjustable from +1 volt or less to +5 volts or more, depending on the exact setting of the INTENSITY control. A zero-volt input cuts off visual intensity when the INTENSITY control is at about midrange. The best transient response of the Z-Axis Amplifier is achieved when the input signal amplitude is the minimum required to provide the desired intensity change.

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. In any case, do not apply a Z-axis input signal with amplitudes exceeding 100 volts.

Care of Storage Screen

The following precautions will prolong the useful storage life of the crt used in this instrument:

1. Use the minimum beam intensity required to produce a clear, well-defined display. Excessive beam intensity may permanently damage the crt, particularly if a bright spot is allowed to remain stationary on the display area.

2. Avoid repeated use of the same area of the crt. If a particular display is being stored repeatedly, change the vertical position occasionally to use other portions of the display area.

3. Do not leave a stored display on the crt when it is no longer needed.

4. Operate the instrument in the non-store mode unless storage is required.

Storage Operation

The storage crt allows a display to be retained for a selectable perioc of time. When the STORE button is out, the instrument operates as a conventional monitor. When the STORE button is in, the instrument operates in the storage mode. Two modes of storage are available: Variable persistence, where the persistence of the crt is electrically controlled by the PERSISTENCE/SAVE TIME control; and the conventional storage mode, which allows longer retention of the displayed information. When the PULL TO SAVE switch is pulled out, the length of time that the stored image can be retained is greatly extended. A lockout function prevents accidental erasure of the stored display in the save mode.

A stored display is erased by pressing the ERASE button. In the save mode, the erase function is disabled.

NOTE

Crt image contrast and resolution can be improved slightly, at the sacrifice of some background uniformity, by a minor modification to the storage circuit. Refer to qualified service personnel for details.

FUNCTIONAL CHECK

The following procedures are provided to aid in obtaining a display on the 607A Storage Monitor, and may be used as a check of basic instrument operation. The procedures 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.

The first of these procedures is intended for use in checking the standard 607A, without instrument options.

The second procedure checks operation of instruments equipped with Option 4 (Internal Sweep) and Option 21 (Differential Inputs). Use of other options is described under Operating Information for Options.

Test Equipment Required

The following test equipment was used as a basis to write the Functional Check procedures. Other test equipment, which meets these requirements, may be substituted. When other equipment is used, the control settings or setup 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, 1 Hz to 50 kHz; output amplitude, 1 V p-p into 50 Ω; waveform output, sine wave and square wave.

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

3. Cables (3 Required)

Description: Length, 42 inches; connectors, bnc.

Type Used: Type RG-58/U, 50-ohm coaxial, Tektronix Part No. 012-0057-01.

4. Dual-Input Coupler

Description: Dual outputs from a single input; connectors, bnc.

Type Used: Tektronix Part No. 067-0525-01 Calibration Fixture.

5. 50-ohm Termination

Description: Impedance, 50 ohms; connectors, bnc. (Not required if your instrument includes Option 26, 50 Ω inputs.)

Type Used: Tektronix Part No. 011-0049-01.

6. External Graticule (Not required if your instrument has Option 1 Internal Graticule).

Description: Graticule ruled in eight vertical divisions and ten horizontal divisions.

Type Used: Tektronix Part No. 331-0391-00 (supplied as a standard accessory with the 607A).

Preliminary Setup

1. Install the internal graticule on the faceplate of the 607A crt.

NOTE

If your instrument includes Option 1, Internal Graticule, skip this step.

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

3. Connect the 607A power cord to a suitable ac 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 this Instruction Manual.

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

SEC/DIV (Option 4 only)	10 μ
Vertical & Horizontal Positions	Midrange
OPERATE LEVEL	Fully clockwise
INTENSITY	Fully counterclockwise
FOCUS	Midrange
STORE	Non Store (button out)
PERSISTENCE/SAVE TIME	Midrange and knob pushed in
POWER	On (button out)

5. Allow at least five minutes for the instrument to warm up.

6. Proceed to the appropriate Functional Check procedure for your instrument.

NOTE

Your instrument may contain any of several available factory-installed optional additions or changes (Options). Refer qualified service personnel to the servicing information sections of this Instruction Manual to determine if your instrument includes Option 22 (internal, switchable 1:1 or 5:1 attenuators). If included, the attenuators should be set at 1X by the service person.

If your instrument includes Option 4 (internal sweep), S220 (Int Swp) and S735 (Int Blank), located within the instrument, must be set for X-Y mode of operation for Procedure 1 or to Y-T mode if Procedure 2 is to be performed. The switch settings should be checked by qualified service personnel only.

Procedure 1 (Standard Instrument, without Option 4, Internal Sweep, Option 21, Differential Inputs, and Option 22, Internal Switchable Attenuators)

Display Functions

1. Perform the Preliminary Setup 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. Set the FOCUS control 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 Position controls.

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

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

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

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

Deflection and Z-Axis Functions

1. Perform the Preliminary Setup procedure.

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

3. Connect the function generator output to the rear-panel +X INPUT connector via the 42-inch cable and the 50-ohm termination. (Termination is not required if your instrument includes Option 26, 50 Ω inputs.)

4. Center the display with the Horizontal Position control, and check for eight 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 on the crt with the Vertical Position control, and check for eight divisions of vertical deflection.

7. Set 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 42-inch cable, 50-ohm termination, and the dual-input coupler. (Termination is not required with Option 26 instruments.)

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

10. Disconnect the function generator.

Storage Functions

1. Perform the Preliminary Setup procedure.

2. Press the STORE button and notice that the crt floods with light momentarily.

3. Set the INTENSITY control for a visible spot on the crt.

NOTE

If the crt blooms around the displayed spot, reduce the INTENSITY control setting.

4. Slowly move the displayed spot with the Vertical Position control and notice that the spot leaves a visible trail on the crt.

5. Turn the PERSISTENCE/SAVE TIME control clockwise and repeat step 4. Notice that the trail persists for a shorter time and the background brightens as the PERSISTENCE/SAVE TIME control is turned clockwise.

6. Set the PERSISTENCE/SAVE TIME control to the fully counterclockwise detent (MAX) position.

7. Move the displayed spot with the Vertical Position control to obtain a stored trace. If necessary, increase the INTENSITY control setting.

8. Turn the OPERATE LEVEL control fully counterclockwise and notice that the trace intensity decreases (or disappears entirely depending on the INTENSITY control setting).

9. Move the displayed spot with either Position control to again obtain a stored trace.

10. Press and release the ERASE button and notice that the crt floods with light, then erases the trace.

11. Move the displayed spot with either Position control to obtain a stored trace.

12. Pull the PERSISTENCE/SAVE TIME knob out to the PULL TO SAVE position and notice that the trace disappears.

13. Turn the PERSISTENCE/SAVE TIME control clockwise and notice that the trace reappears.

14. Turn the Position and INTENSITY controls and notice that they have no effect on the display.

15. Turn the PERSISTENCE/SAVE TIME control fully counterclockwise to the detent (MAX) position and notice that the trace disappears.

16. Press the PERSISTENCE/SAVE TIME knob in and notice that the trace reappears.

17. Turn the PERSISTENCE/SAVE TIME control fully clockwise and notice that the crt brightens and the trace disappears.

This completes the Functional Check procedure for the standard 607A (without Options 4, 21, and 22).

Procedure 2 (Instruments with Option 4, Internal Sweep and Option 21, Differential Inputs).

NOTE

The following procedure applies to the Option 4 version of the 607A Storage Monitor that has been properly set for internal sweep operation. Refer qualified service personnel to the servicing information sections of this Instruction Manula to determine if the internal sweep of your instrument has been employed.

Display Functions

1. Perform the Preliminary Setup procedure.

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

3. Set the FOCUS control for a sharp, well-defined trace.

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

5. Center the display with the Horizontal Position control. Set the trace on the center horizontal graticule line with the Vertical Position control.

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

Deflection and Z-Axis Functions

1. Perform the Preliminary Setup procedure.

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

3. Connect the function generator output to the rear-panel +Y INPUT connector via the 42-inch cable and the 50-ohm termination. (Termination not required with Option 26 instruments.)

4. Center the display with the Vertical Position control. If necessary, adjust the TRIG SLOPE/LEVEL control for a stable display.

5. Check for eight divisions of vertical deflection.

6. (Option 21 only—Steps 6 through 11.) Remove the grounding cap from the −Y INPUT connector.

7. Disconnect the signal from the +Y INPUT connector and connect it to the −Y INPUT connector.

8. Place the grounding cap on the +Y INPUT connector.

9. Center the display with the Vertical Position control. If necessary, adjust the TRIG SLOPE/LEVEL control for a stable display.

10. Check for eight divisions of vertical deflection.

11. Remove the grounding cap from the +Y INPUT connector. Disconnect the signal from the −Y INPUT connector.

12. Connect the function generator output to the +Y INPUT and the +Z INPUT connectors via the 42-inch cable, 50-ohm termination, and the dual-input coupler. (See note in step 3.)

13. (Option 21 only.) Place grounding caps on the −Y INPUT and the −Z INPUT connectors.

14. Notice that only the top portion of the display is visible.

15. (Option 21 only—Steps 15 through 20.) Remove the grounding cap from the −Z INPUT connector.

16. Disconnect the signal from the +Z INPUT connector and connect it to the −Z INPUT connector.

17. Place the grounding cap on the +Z INPUT connector.

18. Notice that only the bottom portion of the display is visible.

19. Disconnect the function generator.

20. Replace the grounding caps on the −X INPUT, −Y INPUT, and −Z INPUT connectors.

This completes the Functional Check procedure for the 607A Monitor with Option 4 and Option 21.

Storage Functions

1. Perform the Preliminary Setup procedure.

2. Press the STORE button and notice that the crt floods with light momentarily.

3. Set the INTENSITY control for a bright trace on the crt.

NOTE

If the crt blooms around the displayed trace, reduce the INTENSITY control setting.

4. Slowly move the displayed trace with the Vertical Position control and notice that the trace leaves a visible trail on the crt.

5. Turn the PERSISTENCE/SAVE TIME control clockwise and repeat step 4. Notice that the trail persists for a shorter time and the background brightens as the PERSISTENCE/SAVE TIME control is turned clockwise.

6. Set the PERSISTENCE/SAVE TIME control to the fully counterclockwise detent (MAX) position.

7. Move the displayed trace with the Vertical Position control to obtain a display of stored lines. If necessary, decrease the INTENSITY control setting.

8. Turn the OPERATE LEVEL control fully counterclockwise and notice that the trace intensity decreases (or disappears entirely depending on the INTENSITY control setting).

9. Move the displayed trace with the Vertical Position control to again obtain a display of stored lines.

10. Press and release the ERASE button and notice that the crt floods with light, then erases the stored lines.

11. Move the displayed trace with the Vertical Position control to again obtain a display of stored lines.

12. Pull the PERSISTENCE/SAVE TIME knob out to the PULL TO SAVE position and notice that the display disappears.

13. Turn the PERSISTENCE/SAVE TIME control clockwise and notice that the display reappears.

14. Turn the Position and INTENSITY controls and notice that they have no effect on the display.

15. Turn the PERSISTENCE/SAVE TIME control fully counterclockwise to the detent (MAX) position and notice that the display disappears.

16. Press the PERSISTENCE/SAVE TIME knob in and notice that the display reappears.

17. Turn the PERSISTENCE/SAVE TIME control fully clockwise and notice that the crt brightens and the display disappears.

This completes the Functional Check procedure for the 607A with Option 4 and Option 21.

OPERATING INFORMATION FOR OPTIONS

Option 4 Internal Time Base

Option 4 includes a circuit board that contains triggering, sweep generating, and unblanking circuitry. It also includes a front-panel switch to set the calibrated sweep rate, and an uncalibrated variable control to vary the sweep rate between calibrated ranges, and a screwdriver adjustment to select the slope and level of the triggering signal that initiates the sweep.

Internally-located switches must be set for Y-T mode before using the internal time base.

NOTE

Refer all internal switch settings required to qualified service personnel. Instructions on changing from X-Y to Y-T mode are located in the servicing information sections of this Instruction Manual.

In addition to internal switching changes as described, an internal switch (Trig Mode, S1109) is provided to allow flexibility in triggering operation. This switch has two positions (Norm and Auto), that function as follows:

Norm (normal mode). In this mode, the sweep is held off until a triggering signal occurs. When the triggering signal (a sample of the Y input signal) reaches the slope and level selected by the front-panel TRIG SLOPE/LEVEL control, a sweep is initiated. Unblanking is initiated concurrently with the sweep sawtooth. This mode is normally necessary when viewing signals with a repetition rate slower than approximately 20 Hz.

Auto (automatic mode). This mode provides a base-line trace (free-running) in the absence of a triggering signal. This is useful for setting positioning, intensity, and focus of the trace. For any triggering signal above a 20 Hz repetition rate, the sweep is initiated when the input signal passes through the slope and level selected by the front-panel TRIG SLOPE/LEVEL control.

The front-panel SEC/DIV switch provides six calibrated sweep rates from 0.1 s to 1 μs/div in decade steps (VARIABLE control in the fully clockwise position). The VARIABLE control provides uncalibrated sweep rates between the calibrated settings of the SEC/DIV switch, and extends the slowest sweep rate to at least 1 s/div.

When making time measurements using the graticule, the area between the second and tenth vertical lines provides the most linear measurement. (See Fig. 2-3.) Therefore, the first and last divisions of the display should not be used for making accurate time measurements. Position the start of the display to be measured to the second vertical line. Then, set the SEC/DIV switch so that the end of the display measurement section falls between the second and tenth vertical line.

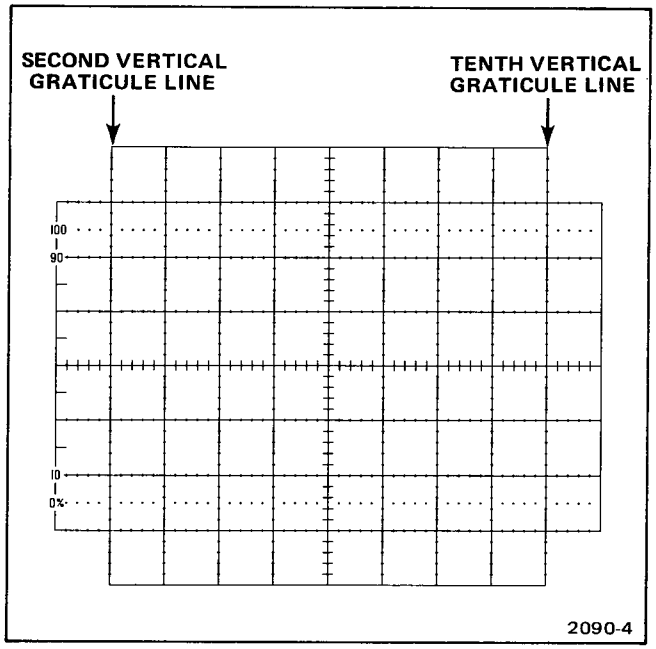


Fig. 2-3. Measurement lines on the 607A graticule (Option 1).

Option 10 Remote Program Connector

Option 10 adds a REMOTE PROGRAM connector to the rear panel of the 607A to provide direct connections to the + inputs of the Horizontal (X), Vertical (Y), and Z-Axis amplifiers from a remote location. Also, erase, non-store, and save-storage operation can be controlled from a remote location; however, the front-panel controls of the instrument override the remote inputs. All inputs and outputs are TTL compatible.

NOTE

Wiring details for the REMOTE PROGRAM connector are located in the servicing information sections of this Instruction Manual. Refer qualified service personnel to these sections for wiring instructions or maintenance problems relating to this connector.

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NOTE

Normal remote input requires a logical 0 level of +0.48 volt or less. This level should be satisfied by the TTL output levels, provided the loading rules of the TTL output device are observed.

If low logic levels above +0.48 volt (i.e., between +0.48 and +0.8 volt) are to be applied to the 607A REMOTE PROGRAM connector inputs, internal circuit modifications may be required. Refer qualified service personnel to the servicing information sections of this Instruction Manual for instructions.

The following storage functions can be remotely controlled via the REMOTE PROGRAM connector:

Remote Erase. Stored display will be erased when a remote contact is closed to ground, or logical 0 (TTL) is applied.

Remote Non-Store. Grounding the remote contact or applying a logical 0 (TTL) allows the storage crt to operate in the non-store mode.

Remote Save. Grounding the remote contact or applying a logical 0 (TTL) places the 607A in the save mode. The front-panel PERSISTENCE/SAVE TIME control sets the save time.

Erase Interval. During the erase interval, a negative-going pulse, logical 0 (TTL), is present at this contact. This pulse can be used to notify associated equipment that information stored on the 607A crt is being erased.

Option 21 Full Differential Inputs

Option 21 adds −X, −Y, and −Z INPUT connectors to the 607A Storage Monitor rear panel, to work in conjunction with the existing +X, +Y, and +Z INPUT's and thus provide differential input operation.

With differential operation, the X, Y, and Z output amplifier stages see only the difference between the signals applied to the + and − inputs (+X and −X, +Y and −Y, or +Z and −Z INPUT's).

This mode of operation has several useful applications. For example, if a signal to be displayed has, in addition to the desired signal, a relatively large hum component (for instance, a desired signal of 0.5-volt amplitude, with a superimposed hum signal of 1-volt amplitude), viewing and measurement of the desired signal becomes difficult, if not impossible.

The hum component can be practically eliminated with differential operation. First, the desired signal (with hum) is applied to one of the inputs; for example, the +Y INPUT. Then, the hum signal only (from some appropriate point in your circuitry) is applied to the −Y INPUT. (The hum components to both inputs must be in phase with each other, and should be as close to equal amplitudes as possible.) If your device employs balanced (push-pull) circuitry, each side of the push-pull output stage can be connected (with hum component) to an input, improving results even more.

The common-mode rejection ratio (cmrr) for signals up to 500 kHz is 100:1. This refers to the ability of the differential amplifier to reject unwanted (common-mode) signals. In the example above, the 1-volt hum signal in differential operation becomes the equivalent of 10 mV in amplitude, and there is no reduction in amplitude of the desired signal. (1 V÷100 = 0.01, or 10 mV).

The equivalent 10 mV hum becomes much less objectionable than with single-ended operation.

NOTE

For the common-mode rejection ratio (cmrr) of 100:1 to apply, the hum component at both input connectors must be identical in amplitude and phase.

For all common-mode differential applications, the common-mode dynamic range limitations must be considered. Exceeding the dynamic range limitations will result in a sharp decline in common-mode rejection ratio. The common-mode dynamic range for non-attenuated signals is +3 V or −3 V peak or less. If your instrument includes Option 22 (switchable 1:1 or 5:1 attenuators), the common-mode dynamic range (for X and Y axes) with 5:1 attenuation is +15 V or −15 V peak or less. Cmrr non-attenuated is 100:1 to 500 kHz, and 40:1 with 5X attenuation.

Another use for differential mode of operation is in nullifying the effects of a dc component which may be present along with the signal of interest. For relatively high frequencies, the dc component can be blocked by coupling the input signal through a capacitor of appropriate value. However, for very low-frequency signals, this is frequently impractical. Signal amplitude losses due to the increasing reactance of the capacitor at low frequencies plus significant phase shift, make calibrated measurements impossible.

The effect of the dc component can be eliminated by applying a matching dc level to the other differential input (the one not used for the input signal to be measured). This is easily accomplished by connecting a relatively high-resistance potentiometer (e.g., 100 kΩ) across a dc supply, such as a battery or regulated dc supply, and connecting the potentiometer center arm to the other input. The potentiometer can then be set to position the display on the screen. The dc source should be somewhat higher in level than the signal dc level to provide sufficient adjustment range. However, the source should never be higher than a few volts over the common-mode dynamic range, as described above.

WARNING

Making connection to dc supplies, especially within the monitor or other electronic equipment, involves exposure to dangerous electrical shock. This type of connection or any other procedure requiring access to the interior of the instrument, should be referred to qualified service personnel.

A variation of the technique just described can be used to measure or observe low-amplitude phenomena occurring on a higher-amplitude waveform. This particular application is commonly referred to as differential comparator operation.

For this application, the deflection factor is normally set to the most sensitive level. (A qualified service person can make an internal adjustment to set the deflection factor of the horizontal, X, axis to 50 mV/div, or the vertical, Y, axis to 62.5 mV/div.) Then, the signal to be checked, which may be as great as +3 V or −3 V (equivalent to 60 horizontal or 48 vertical divisions of deflection), is applied to one of the differential inputs. A dc level from the center arm of a potentiometer (connected across a stable dc supply as described above) is applied to the other differential input. An accurate dc voltmeter should be connected between the center arm of the potentiometer and ground.

To make the measurement, proceed as follows:

Set the potentiometer so that some reference point on the waveform is on the graticule centerline. This point is usually the zero-signal level point. If the waveform has no dc level (dc level is 0 V), or a very low-level dc component, the best procedure is to set the potentiometer to 0 V output, and use the monitor's position control to set the zero-signal to graticule center. Then, adjust the potentiometer to the level that places the point of interest on the waveform onto the graticule centerline. The amplitude at which this phenomenon occurs can now be read directly from the dc voltmeter. Also, considerable magnification of the area being observed has occurred, permitting detailed study of the phenomenon.

Differential inputs can also be used to double the sensitivity for measuring the output of equipment with push-pull (positive and negative) outputs. The deflection factors for vertical (Y) and horizontal (X) amplifiers, as stated in Specification, Section 3 of this manual, refers to single-ended operation. For single-ended inputs, the amplifiers are internally adjustable for a deflection factor of 0.5 V or less, full screen, to 2.5 V or more, full screen. With balanced push-pull input signals, the range becomes 0.25 V or less to 1.25 V or more, full screen.

Option 22 X and Y Switchable Input Attenuators

Option 22 adds internal 1:1 or 5:1 (switchable) attenuators to the Vertical (Y) and Horizontal (X) input amplifiers.

The attenuators extend the signal range over which the instrument may be used to at least 12.5 V full screen. Range in common-mode operation is also extended to permit rejection of common-mode signals as great as +15 V or −15 V peak. Attenuation is selected by the positions of internally-located switches.

WARNING

Changing of the positions of the X and Y attenuator switches necessitates working within the instrument with protective cabinet panels (if included) removed. To avoid dangerous electrical shock, refer all internal changes to qualified service personnel.

SPECIFICATION

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

Items listed in the Performance Requirement column of the Electrical Characteristics are verified by completing the Performance Check in the servicing information sections of this Instruction Manual. Items listed in the Supplemental Information column are not verified in the Performance Check; they are either explanatory notes, performance characteristics for which no limits are specified, or characteristics that are impractical to check in routine maintenance.

Table 3-1

ELECTRICAL CHARACTERISTICS

VERTICAL AND HORIZONTAL AMPLIFIERS

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
Deflection Factor			
Vertical (Y)	Adjustable from 0.5 V, or less, to at least 2.5 V full screen.	Nominally set for 1 V full screen. Range of at least 62.5 mV/div to 312.5 mV/div.	D1
Horizontal (X)	Adjustable from 0.5 V, or less, to at least 2.5 V full screen.	Nominally set for 1 V for 8 div deflection. Range of at least 50 mV/div to 250 mV/div.	C1
Attenuators (Option 22)	Internal 1X-5X step attenuators extend deflection factor range to at least 12.5 V full screen.		C2, D2
Polarity			
+Y INPUT	Positive signal applied deflects beam up; negative signal deflects beam down.		
−Y INPUT (Option 21)	Positive signal applied deflects beam down; negative signal deflects beam up.		
+X INPUT	Positive signal applied deflects beam to the right; negative signal deflects beam to the left.	Substantiated by other checks.	
−X INPUT (Option 21)	Positive signal applied deflects beam to the left; negative signal deflects beam to the right.		
Bandwidth (80% Full-Screen Reference Signal)	Dc to at least 3 MHz at −3 dB point.		C5, D5
Risetime		116 ns or less (10-90%).	
Settling Time	Spot must reach new writing position to within 1 spot diameter within 1 μs from any on-screen position.		C3, D3

Table 3-1 (cont)

VERTICAL AND HORIZONTAL AMPLIFIERS (cont)

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
Common-Mode Rejection (Option 21)			
Attenuator at 1X	At least 100:1 cmr ratio to 500 kHz for input signals of +3 V or −3 V peak, or less.		C4, D4
Attenuator at 5X (Option 22)	At least 40:1 cmr ratio to 500 kHz for input signals of +15 V or −15 V peak, or less.		C4, D4
Phase Difference (Dc to 500 kHz)	1° or less between X and Y amplifiers. X and Y amplifier gain (V/div) must be set for the same deflection factor.		C7
Input R and C (both inputs)		1 MΩ, within 1%, paralleled by 47 pF or less.	
Option 26		50 Ω.	
Maximum Nondestructive Input Voltage (Fault Condition Only)		+100 V or −100 V (dc plus peak ac).	
Position Range (With No Input Signal Applied)	Front-panel controls allow spot to be set anywhere within the viewing area.		C6, D6
Position Stability		0.1 div or less per hour, after 20-minute warmup with covers installed; less than 0.2 div in 24 hours.	
Z-AXIS AMPLIFIER			
Bandwidth	Dc to at least 5 MHz at −3 dB point.		E2
Risetime		70 ns or less (10-90%).	
Common-Mode Rejection (Option 21)	At least 100:1 cmr ratio to 100 kHz for input signals to 5 V peak-to-peak at any setting of the Z-axis gain.		E3
Input R and C		1 MΩ, within 1%, paralleled by 47 pF or less.	
Option 26		50 Ω.	
Maximum Nondestructive Input Voltage (Fault Condition Only)		+100 V or −100 V (dc plus peak ac) with crt beam positioned off screen.	
Useful Input Voltage			
+Z INPUT	Adjustable from +1 V or less to at least +5 V for full intensity when INTENSITY control is set to mid-range. 0 V input cuts off visible intensity.		E1
−Z INPUT (Option 21)	Adjustable from −1 V or less to at least −5 V for full intensity when INTENSITY control is set to mid-range. 0 V input cuts off visible intensity.		E1

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Table 3-1 (cont)

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
REMOTE PROGRAM Connector (Option 10)			
Remote Inputs		+0.52 V or less provides active low. Open input or at least +2.5 V is high logic level.	
Erase Interval Output		Active low logic is +0.4 V or less. High logic level is at least +2.5 V.	
CATHODE-RAY TUBE DISPLAY			
Display Size		8 div vertically, 10 div horizontally (0.9 cm/div).	
Geometry	Bowing or tilt is 0.1 div, or less, full screen.		B5
Orthogonality (Within Graticule Area)	90° within 0.7°.		B4
Halftone Luminance (Within 6 X 8 Div Quality Area)		At least 200 footlamberts.	
Stored Dot Writing Time (Within 6 X 8 Div Quality Area)	A stationary dot written in 500 ns or less can be viewed for at least 15 seconds. With a black background, a stationary dot written in 1 μs or less can be viewed for at least 3 minutes.		F4
Stored Linear Writing Speed (Within 6 X 8 Div Quality Area)	At least 0.8 μs/div, viewable for 1 minute.		F5
Option 8		At least 200 ns/div.	
Halftone Resolution (Within 6 X 8 Div Quality Area)		At least 18 dots/div.	
Option 8		At least 10 dots/div.	
Erase Time		Approximately 0.5 s.	
Deflection		Electrostatic.	
Acceleration Potential		12 kV.	
Graticule		External 8 X 10 div (0.9 cm/div) graticule is standard accessory.	
Option 1		Internal 8 X 10 div (0.9 cm/div) non-illuminated graticule with orange lines.	

Table 3-1 (cont)

Characteristic	Performance Requirement	Supplemental Information	Perf. Ch. Step No.
POWER SOURCE			
Line Voltage (ac, rms)			
120 Vac Nominal			
Low		90 to 110 Vac.	
Med		99 to 121 Vac.	
High		108 to 132 Vac.	
220 Vac Nominal			
Low		180 to 220 Vac.	
Med		198 to 242 Vac.	
High		216 to 250 Vac.	
Line Frequency		48 to 440 Hz.	
Maximum Power Consumption		53 W, 0.62 A at 120 Vac, 60 Hz.	
Line Fuse Data			
120 Vac (Nominal)		0.7 A, 3AG, Slow-blow type.	
220 Vac (Nominal)		0.4 A, 3AG, Slow-blow type.	
High-Voltage Supply Fuse		2 A, 3AG, Fast-blow type.	
OPTION 4 HORIZONTAL (SWEEP) SYSTEM			
Sweep Range	100 ms/div to 1 μs/div.	6 decade steps.	G3
Sweep Accuracy Over Center 8 Divisions	Within 3%.	VARIABLE fully clockwise.	G3
Linearity of Any 2-Division Portion Within Center 8 Divisions		Within 2%, except for first 5% of total sweep length.	
VARIABLE (Uncalibrated)	Provides continuously variable sweep rates between calibrated settings. Decreases each sweep rate setting by at least 10:1.	Extends slowest rate to at least 1 s/div.	G4
Triggering Sensitivity (Repetitive Signals)	Requires at least 0.5 division vertical deflection from dc to 2 MHz.		G2
Sweep Length	Approximately 10.5 divisions. (Adjustable.)		G1

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Table 3-2

ENVIRONMENTAL CHARACTERISTICS

Characteristic	Information
	NOTE
	This instrument will meet the electrical characteristics given in the Performance Requirement column of Table 3-1 over the following environmental limits.
Temperature	
Operating	0 to +50° C (+32 to +122° F).
Non-operating	−40 to +70° C (−40 to +158° F).
Altitude	
Operating	To 15,000 feet.
Non-operating	To 50,000 feet.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

Table 3-3

PHYSICAL CHARACTERISTICS

Characteristic	Information
Finish	Anodized aluminum panel with gray vinyl-coated frame.
Options 6, 23, or 28	Blue vinyl-coated cabinet.
Net Weight	17.5 lbs. (7.9 kg).
Shipping Weight	Approximately 22.0 lbs (9.9 kg).
Overall Dimensions	See Figure 3-1.
Total Depth of Rack Required for Rackmounting	19 inches (48.3 cm).

OVERALL DIMENSIONS
(MEASURED AT MAXIMUM POINTS)

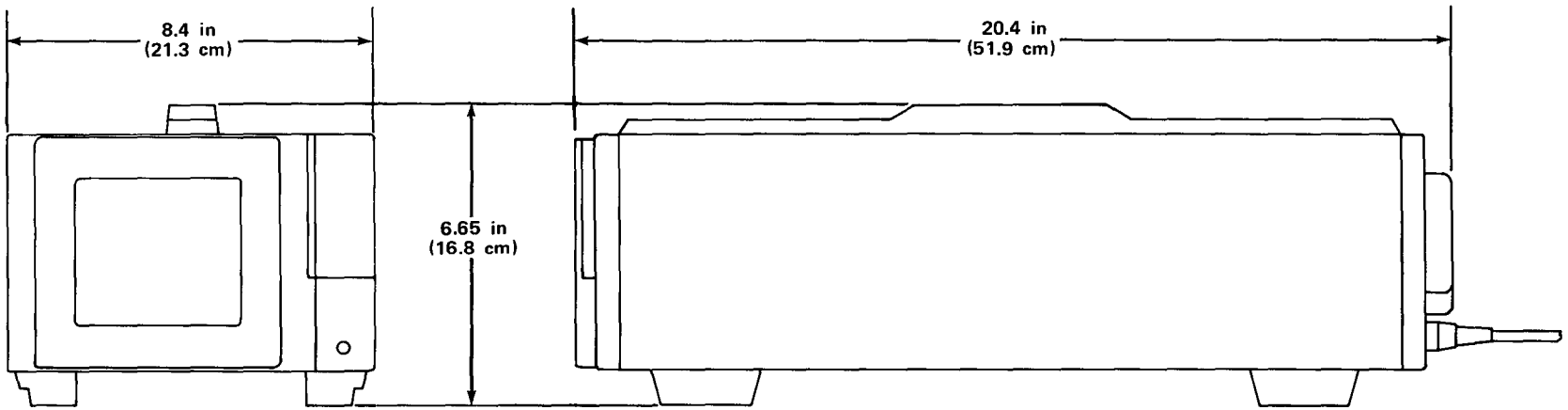

Fig. 3-1. Overall dimensions, with cabinet, feet, and handle.

NOTE: DIMENSIONS ARE GIVEN WITH TOP FIGURE IN INCHES AND BOTTOM FIGURE IN CENTIMETERS.

REFER TO DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS FOR A DETAILED DIMENSIONAL DRAWING.

C2091-22

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

PART II
SERVICE INFORMATION

PERFORMANCE CHECK/ADJUSTMENT

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

Limits given in the procedure are adjustment guides and should not be interpreted as performance requirements unless listed as such in Section 3, Specification. Where possible, instrument performance is checked before an adjustment is made.

PRELIMINARY INFORMATION

Adjustment Interval

To maintain instrument accuracy, check the performance of the 607A every 1000 hours of operation, or every six months if used infrequently. Before performing a complete adjustment procedure, thoroughly clean and inspect this instrument as outlined in Section 7, Maintenance.

Tektronix Field Service

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

Using This Procedure

This Performance Check and Adjustment procedure can be used either for complete adjustment or as a check of instrument performance. The procedures are divided into functional block subsections (e.g., A. Power Supplies; B. Horizontal (X) Amplifier; 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 can be performed independently. Any Step (A1, A2, B1, B2, etc.) within any subsection can also be performed independently, which makes it possible to check any parameter or touch up any adjustment following a repair. Refer to the following discussion for instructions on a complete or partial check and adjustment.

Index

An index listing all steps precedes the procedure to aid in locating Performance Check and Adjustment steps.

Performance Check

Instrument performance can be checked by performing the complete Performance Check and Adjustment procedure, and omitting only the ADJUST parts of the steps.

Adjustment

Completion of each step in the Performance Check and Adjustment procedure ensures that the instrument is correctly adjusted and performing within specified limits. Where possible, instrument performance is checked before an adjustment is made. For best overall performance, make each adjustment to the exact setting indicated when performing the complete adjustment procedure.

Partial Procedures

The following procedure is written to completely check and adjust the 607A Monitor to the Specification in Section 3. If the applications for which the instrument is used do not require the full available performance, the procedure and the required equipment list can be shortened accordingly.

A partial performance check and adjustment may be necessary after replacing components, or to touch up the adjustment of a portion of the instrument for a particular application requirement. To check or adjust only part of the instrument, refer to the Test Equipment Required list and the Performance Check and Adjustment Procedure Index to determine necessary equipment and location of appropriate steps to be performed. Also, when performing each step, note the Equipment Required list that immediately precedes each step. To avoid unnecessary adjustment of other parts of the circuitry, adjust only if the tolerance given in each CHECK part is not met.

The alphabetical instructions under each step (a., b., c., etc.) may contain CHECK, 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. If the parameter checked does not meet or better the indicated limits, an adjustment (or repair) is normally required.

2. ADJUST—describes which adjustment to make and the desired result. It is not recommended that adjustments be made unless a previous CHECK instruction indicates that an adjustment is necessary.

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

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 4-1 is required for a complete performance check and adjustment of this instrument. The specifications given in Table 4-1 for test equipment are the minimum required to check the 607A to the Specification in Section 3. Detailed operating instructions for test equipment are omitted in this procedure. Refer to the test equipment instruction manual if more information is needed.

Test Equipment Alternatives

The test equipment listed in the Examples of Applicable Test Equipment column of Table 4-1, is required to check and adjust this instrument. The Performance Check and Adjustment procedure in this manual was performed using the equipment indicated in this column. If other equipment is substituted, control settings or setups may need to be altered. If the exact item of equipment given as an example is not available, refer to the Minimum Specifications column to determine if other available equipment may be substituted. Then, check the Purpose column. If you determine that your measurement requirements will not be affected, the item and corresponding step(s) can be deleted from your procedure.

Table 4-1

TEST EQUIPMENT

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
Precision Dc Voltmeter	Measurement range, −25 V to +200 V; measurement accuracy, within 0.1%.	Adjust +15 V supply. Check low-voltage supplies. Adjust crt grid bias.	a. TEKTRONIX DM 502 Digital Multi-Meter (operates in TM 500-series power module). b. TEKTRONIX 7D13 Digital Multi-Meter (operates in 7000-series mainframe). c. TEKTRONIX DM 501 Digital Multi-Meter (operates in TM 500-series power module).
Dc Voltmeter	Measurement range, −1470 V to −1530 V; accuracy, within 3%.	Adjust high-voltage supply.	a. Triplett Model 630-NA. b. Simpson Model 262.
Ramp Generators (2 required)	Ramp duration, 5 ms to 10 μs within 3%; ramp amplitude, +1 to +3 V into 50 Ω; 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. Check vertical and horizontal positioning. Adjust TRACE ROTATION, geometry, and astigmatism. Check dot writing time, stored linear writing speed.	a. TEKTRONIX RG 501 Ramp Generator (operates in TM 500-series power module).

Table 4-1 (cont)

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
Square-wave Generator	Amplitude Calibrator Mode: Frequency, approx. 1 kHz; amplitude, 0.5 V to 5 V into 1 MΩ; accuracy, within 0.25%. Pulse Mode: High-Amplitude Output; Frequency, 1 kHz to 100 kHz; amplitude, 0.5 V to 5 V into 50 Ω; risetime, 50 ns or less into 50 Ω.	Adjust gain and compensation of the vertical, horizontal, and Z-axis amplifiers. Check vertical and horizontal settling time. Check and adjust vertical and horizontal input attenuators (Option 22). Adjust astigmatism.	a. TEKTRONIX PG 506 Calibration Generator (operates in TM 500-series power module).
Sine-wave Generator	Frequency range, 500 kHz to at least 10 MHz; reference frequency, 50 kHz; amplitude, 0.5 V to 5 V into 50 Ω; amplitude accuracy, constant within 5% of reference as output frequency changes.	Check common-mode rejection (Option 21) and bandwidth of the horizontal (X), vertical (Y), and Z-Axis amplifiers. Check and adjust sweep generator (Option 4 only).	a. TEKTRONIX SG 503 Leveled Sine-Wave Generator (operates in TM 500-series power module).
Function Generator	Sine-wave output, 100 kHz and 500 kHz; amplitude, 3 to 15 V p-p into 1 MΩ; trigger output, compatible with ramp generator trigger input.	Check horizontal (X), vertical (Y), and Z-axis common-mode rejection (Options 21 and 22).	a. TEKTRONIX FG 503 Function Generator (operates in TM 500-series power module).
Test Oscilloscope	Bandwidth, dc to at least 8 MHz; deflection factor, 0.1 V to 5 V/div within 2%; sweep rate, 1 s/div to 1 μs/div.	Adjust horizontal (X), vertical (Y), and Z-axis gain and compensation. Check horizontal and vertical phase difference and input attenuation; check horizontal, vertical, and Z-axis bandwidth. Adjust storage levels and pulse height.	a. TEKTRONIX SC 502 80 MHz Oscilloscope and P6105 1-meter 10X probe (operates in TM 500-series power module). b. TEKTRONIX 5440 Oscilloscope with 5A45 Amplifier, 5B40 Time Base, and P6105 1-meter 10X probe. c. TEKTRONIX 7603 Oscilloscope with 7A15A Amplifier, 7B50A Time Base, and P6053B 3.5 foot 10X probe. d. Refer to the current Tektronix catalog for compatible oscilloscope system.
Power Module Mainframe (TM 500-series)	Capable of powering and housing 3 to 6 TM 500-series test instruments.	Provide housing and power for TM 500-series test signal generators and precision dc voltmeter.	a. TEKTRONIX TM 503, TM 504 or TM 506 Power Module.
Pulse Generator	Negative-going pulse. Pulse period, 1 ms; pulse duration, 0.5 and 1 μs; accuracy, within 5%; amplitude, 0.5 to at least 5 V into 50 Ω; rise time, 50 ns or less.	Check dot writing time.	a. TEKTRONIX PG 501 Pulse Generator (operates in TM 500-series power module).

Table 4-1 (cont)

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
Dual-input Coupler	Connectors, bnc.	Check horizontal (X), vertical (Y), and Z-axis common-mode rejection. Check and adjust horizontal and vertical phasing.	a. TEKTRONIX 067-0525-01 Calibration Fixture.
Bnc Tee Connector	Connectors, bnc.	Adjust horizontal (X), vertical (Y), and Z-axis gain.	a. Tektronix Part No. 103-0030-00.
50-ohm Termination	Impedance, 50 Ω within 2%; connectors, bnc.	Check common-mode rejection and bandwidth of the horizontal (X), vertical (Y), and Z-axis amplifiers. Check and adjust phasing. Check and adjust sweep timing. (Option 4 only). Check dot writing time.	a. Tektronix Part No. 011-0049-01.
50-ohm 5X Attenuator	Impedance, 50 Ω within 2%; attenuation, 5X within 2%; connectors, bnc.	Check and adjust sweep timing. (Option 4 only). Check dot writing time.	a. Tektronix Part No. 011-0060-02.
50-ohm Cables (4 required)	Impedance, 50 Ω; length, 42 inches; connectors, bnc.	Provide signal interconnection.	a. Tektronix Part No. 012-0057-01.
Screwdriver	3-inch shaft, 3/32-inch bit.	Adjust variable resistors.	a. Xcelite R3323.
Low-capacitance Screwdriver	3-3/4-inch shaft.	Adjust variable capacitors.	a. Tektronix Part No. 003-0675-00.

INDEX TO PERFORMANCE CHECK AND ADJUSTMENT PROCEDURE

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PRELIMINARY PROCEDURE

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 +20° to +30° C for specified accuracies.

1. Check that the internal Line Voltage Selector has been set for the correct input line voltage (see Section 5, Installation).

2. Check that the crt has an 8 X 10 division scribed graticule (standard accessory) over the display area.

3. (Options 6, 23, or 28). Remove the cabinet panels (see Section 7, Maintenance) to gain access to the internal controls and test points.

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

NOTE

The 607A Monitor is adjusted for optimum performance at the factory. Instrument performance may exceed that required by the Performance Requirements listed in Table 3-1, Section 3, Specification. Therefore, it may be desirable to check instrument performance without changing the adjustments. Refer to Performance Check in the Preliminary Information portion of this section for instructions.

5. Set the controls as follows:

NOTE

Refer to the Internal Control and Selector Locations pullout page in Section 10, Diagrams and Circuit Board Illustrations, for the locations of the internal switches and selector plugs.

Internal

Int Swp (Option 4 only)	X-Y (down position)
Int Blank (Option 4 only)	X-Y (right position)

WARNING

The black finned transistor heat sinks on the Horizontal (X) Amplifier are elevated to a maximum of +80 volts. To avoid electric shock, always turn the instrument power off before changing the settings of the X Atten switches.

X and Y Atten (all)	1X (up position)

Front Panel

PERSISTENCE/SAVE TIME	Fully counterclockwise (detent) and knob pushed in
STORE	Non-store (button out)
INTENSITY	Fully counterclockwise
FOCUS	Midrange
Horizontal and Vertical Position	Midrange

6. Turn on 607A POWER, apply power to the 607A and all test equipment to be used, and allow at least 20 minutes warm-up time.

NOTE

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

A. POWER SUPPLIES

Equipment Required

1. Precision dc voltmeter (low-voltage supply)
2. Dc voltmeter (high-voltage supply)

BEFORE YOU BEGIN, see **TEST POINT AND ADJUSTMENT LOCATIONS** in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

A1. Check Low-Voltage Power Supplies

a. Connect the precision dc voltmeter between the appropriate voltage test points and ground.

b. CHECK—voltmeter for the output voltage range listed in Table 4-2:

Table 4-2

POWER SUPPLY OUTPUT VOLTAGE

Supply	Test Point	Output Voltage Range
+5 V	TP +5 V	+4.75 V to +5.25 V
+15 V	TP +15 V	+14.92 V to +15.08 V (Adjusted for +15.000 V in step A2)
−30 V	TP −30 V	−29.10 V to −30.90 V
+80 V	TP +80 V	+75 V to +90 V
+170 V	TP +170 V	+160 V to +190 V

A2. Adjust +15-Volt Supply (R40)

a. Connect the precision dc voltmeter between test point TP +15 V and ground.

b. ADJUST—R40 (+15 V) for a voltmeter reading of exactly +15.000 volts.

c. INTERACTION—Any change in the +15-volt supply beyond the limits in Table 4-2 may affect the operation of all circuits in the instrument.

A3. Check/Adjust −1500-Volt Supply (R100)

WARNING

Turn off instrument power when connecting and disconnecting the dc voltmeter. Potentially dangerous electrical shock hazards exist at several points on the High-Voltage Power Supply board and the crt socket.

a. Connect the dc voltmeter (set for at least −1500 volts full scale) between pin 2 of the crt socket and ground. (Remove protective cap over crt socket.)

b. CHECK—voltmeter for reading from −1470 volts to −1530 volts.

c. ADJUST—R100 (HV) for exactly −1500 volts.

d. Turn off the instrument power and disconnect the voltmeter. (Replace protective cap over crt socket.)

B. CRT CIRCUIT

Equipment Required

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

BEFORE YOU BEGIN, see TEST POINT AND ADJUSTMENT LOCATIONS in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

CAUTION

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

B1. Adjust CRT Bias (R192)

a. Set the Position and INTENSITY controls for a visible dot on the crt.

b. Connect the precision dc voltmeter between test point TP720 (Z-Axis Amplifier board) and ground.

c. Set the INTENSITY control for a voltmeter reading of +10 volts. Disconnect the voltmeter.

d. ADJUST—R192 (Cutoff) until the displayed dot just disappears.

e. Set the INTENSITY control for a visible dot.

B2. Adjust Astigmatism (R170)

a. Connect the positive-going, fast-rise output from the calibration generator to the +Y INPUT. Set the calibration generator mode to Fast Rise, and set the Period control to 10 μs (100 kHz).

b. Connect the trigger output of the calibration generator to the ramp generator trigger input. Set the ramp generator for a 50 μs duration, positive-going ramp. Connect the ramp generator output to the +X INPUT.

c. Set the calibration-generator Pulse Amplitude control for a four-division display. Set the ramp-generator triggering controls for a stable display. Vertically position the display near crt center.

d. ADJUST—front-panel FOCUS control and R170 (Astig) for best definition on the front corner of the square-wave display near crt center.

B3. Adjust TRACE ROTATION (R145)

a. Apply a 1-volt positive-going, 5 ms duration ramp signal from the ramp generator to the +X INPUT connector.

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

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

d. ADJUST—R145 (TRACE ROTATION) to align the trace with the graticule horizontal center line.

B4. Adjust Y-Axis Alignment (R173)

a. Disconnect the ramp generator from the +X INPUT connector and connect it to the +Y INPUT connector.

b. Set the ramp generator amplitude for an eight-division vertical trace on the crt.

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

d. ADJUST—R173 (Y-Axis Align) to align the trace with the graticule vertical center line.

B5. Adjust Geometry (R165)

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

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

c. ADJUST—R165 (Geom) for minimum trace bowing at the left and right edge of the graticule.

d. Disconnect the ramp generator from the +Y INPUT connector and connect it to the +X INPUT connector.

e. Position the trace to the top of the graticule, then to the bottom.

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

g. If necessary, readjust R165 (Geom) for minimum trace bowing at the top and bottom of the graticule. Then reconnect the ramp generator to the +Y INPUT connector and repeat this procedure until optimum geometry is achieved.

B6. Check Orthogonality

a. Disconnect the ramp generator from the +X INPUT connector and connect it to the +Y INPUT connector. Check that the ramp-generator amplitude is still set for 8 divisions of vertical deflection.

b. Position the trace to the left edge of the graticule, then to the right edge.

c. CHECK—that the trace aligns with the left and right edge vertical graticule lines within 0.7° (within 0.1 division, measured at the top graticule corners with the bottom end of the trace set to the bottom graticule corners).

d. Disconnect the ramp generator.

C. HORIZONTAL (X) AMPLIFIER

Equipment Required

1. Test Oscilloscope
2. Ramp generator
3. Calibration generator
4. Sine-wave generator
5. Function generator
6. 50-ohm cables (4 required)
7. 50-ohm termination
8. Dual-input coupler
9. Bnc Tee connector

BEFORE YOU BEGIN, see TEST POINT AND ADJUSTMENT LOCATIONS in Section 10, Diagrams and Circuit Board Illustrations.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

C1. Adjust Horizontal (X) Gain (R215) and X HF Compensation (C246)

NOTE

The X gain is normally set to provide eight divisions of deflection, depending upon the input signal amplitude. The following procedure adjusts the X gain so that 1 volt provides eight divisions of deflection. This procedure can be repeated for any input voltage between 0.5 V and 2.5 V for full-scale deflection. If the X gain is changed, the + and − attenuator compensations (Option 22 instruments) may need readjustment for optimum square-wave response (see Step C2).

a. Apply a positive-going, 5 ms duration ramp of approximately 2 volts amplitude from the ramp generator output to the rear-panel +Y INPUT connector.

b. Connect the calibration generator Ampl Output through a bnc Tee connector to the +X INPUT connector. Set the calibration generator mode to Std Ampl (standard amplitude).

c. Connect the other output of the bnc Tee connector at the output of the calibration generator to the ramp generator external triggering input.

d. Set the calibration generator Amplitude control to 1 volt, and check that the Variable Amplitude control is pushed in (calibrated output position).

e. Set the ramp generator triggering controls for a stable display on the 607A Monitor.

f. ADJUST—R215 (X Gain) for an eight-division display on the 607A as shown in Fig. 4-1.

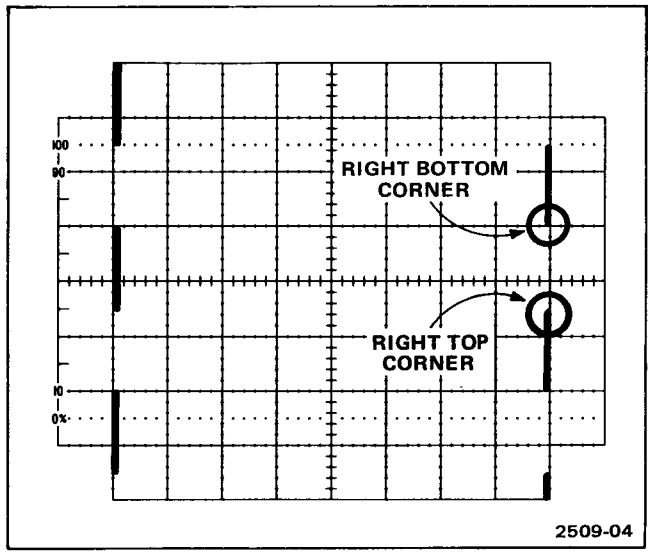

Fig. 4-1. Typical crt display for adjustment of horizontal (X) gain and compensation.

g. Change the bnc Tee connector from the calibration generator Ampl Output connector to the positive-going fast-rise output.

h. Set the ramp generator for a positive-going, 50 μs duration ramp of approximately 2 volts amplitude.

i. Set the calibration generator repetition rate to 100 kHz, and set the Pulse Amplitude for an eight-division display (position as necessary). Set the ramp generator triggering controls for a stable display.

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j. ADJUST—C246 (X HF Comp) for an optimum square right bottom corner on the 607A display (see Fig. 4-1).

C2. Adjust Horizontal (X) Input Attenuation Compensation (C200, C300) and Check Horizontal Input Attenuation (Option 22 only)

WARNING

The black finned transistor heat sinks on the Horizontal (X) Amplifier are elevated to a maximum of +80 volts. To avoid electric shock, always turn the instrument power OFF before changing the settings of the X Atten switches.

a. Set S200 (+X Atten) and S300 (−X Atten) to the 5X (down) position.

b. Move the bnc Tee connector attached to the calibration generator fast-rise output to the Ampl Output connector. (Leave the cables attached to the 607A +X and +Y INPUT connectors and the ramp generator trigger input as in Step C1.)

c. Set the ramp generator for a ramp duration of 5 ms. Set the calibration generator mode to Std Ampl (standard amplitude), and the Amplitude control to 5 volts (check that the Variable Amplitude control is pushed in).

d. CHECK—for an eight-division (within 0.24 division) square-wave display on the 607A. (See Fig. 4-1).

e. ADJUST—C200 (+X Atten Comp) for an optimum square right bottom corner on the 607A display.

f. (Option 21, parts f through j.) Remove the grounding cap from the −X INPUT connector. Disconnect the calibration generator from the +X INPUT, and connect it to the −X INPUT. Place the grounding cap on the +X INPUT.

g. CHECK—for an eight-division (within 0.24 division) square-wave display on the 607A. (See Fig. 4-1).

h. ADJUST—C300 (−X Atten Comp) for an optimum square right top corner on the 607A display.

i. Disconnect the calibration generator from the −X INPUT. Remove the grounding cap from the +X INPUT, and place it on the −X INPUT.

j. Turn off the 607A POWER. Then, set S200 (+X Atten switch) and S300 (−X Atten switch) to the 1X position (switches up). Turn on the instrument POWER.

C3. Check Horizontal Settling Time

a. Connect the ramp generator gate output to the +Z INPUT connector. Check that a grounding cap is on the −Z INPUT connector. (Option 21 only.)

b. Set the ramp generator duration to 10 ms, connect the ramp output to the +Y INPUT, and set the output amplitude for exactly eight divisions of trace height.

c. Connect the calibration generator trigger output to the ramp generator trigger input, and set the ramp generator triggering controls for a triggered output.

d. Connect the calibration generator fast-rise positive-going output to the +X INPUT via a 50-ohm cable and 50-ohm termination. Set the calibration generator mode to Fast Rise, and set the Pulse Amplitude control for 10 divisions of horizontal display. Set the Period control to 10 μs (100 kHz). Then, set the Variable Period control to obtain a display of approximately 1 cycle.

e. CHECK—that the time for the leading edge of the square wave to travel from the zero percent level to the 100 percent level (see Fig. 4-2) is 1 μs (0.8 division) or less, within a trace width.

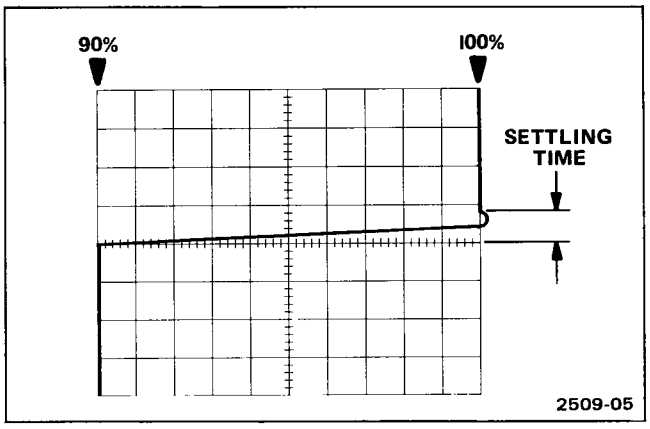


Fig. 4-2. Typical crt display for horizontal (X) settling time measurement (settling time includes corner distortion).

NOTE

Settling time includes any front-corner aberrations.

f. INTERACTION—If the check requirement in part e cannot be met, repeat the adjustment of C246 (X HF Comp) as outlined in Step C1.

C4. Check Horizontal (X) Common-Mode Rejection (Options 21 and 22)

NOTE

The following procedure includes the check for both the Option 21 (differential inputs) and Option 22 (5X attenuators) instruments. If your instrument does not include Option 22, disregard those subparts referring to use of attenuators.

a. Connect the function generator output to the test oscilloscope vertical input via a 50-ohm cable (do not terminate).

b. Set the function generator controls for a 500 kHz, 3-volt (p-p) sine wave as indicated on the test oscilloscope.

c. Disconnect the sine-wave signal from the test oscilloscope and connect it (using the dual-input coupler) to both the +X and −X INPUT connectors on the 607A.

d. With the ramp generator output connected to the +Y INPUT, set the generator controls for a 10 ms duration ramp with an amplitude of approximately 2 volts (to fill the screen vertically).

e. CHECK—for 0.24 division, or less, of free-running horizontal display on the 607A (position as necessary).

f. (Option 22 only, parts f through i.) Turn off the 607A POWER. Set S200 (+X Atten) and S300 (−X Atten) to the 5X (down) position. Turn on the 607A POWER.

g. Connect the function-generator output to the test oscilloscope vertical input via a 50-ohm cable (do not terminate), and set the generator controls for a 15-volt (p-p) sine wave at 500 kHz. Then, reconnect the function-generator output to both the +X and −X INPUT connectors, using the dual-input coupler.

h. CHECK—for 0.6 division, or less, of free-running horizontal display on the 607A (position as necessary).

i. Turn off the 607A POWER. Set S200 and S300 to the 1X (up) position, and disconnect the X and Y INPUT signals. Turn on the 607A POWER.

C5. Check Horizontal (X) Bandwidth

a. Connect the ramp generator to the +Y INPUT, and check that the −Y INPUT has a grounding cap attached. Set the ramp duration to 10 ms, and set the ramp amplitude to approximately 2 volts (to fill the screen vertically).

b. Connect the sine-wave generator output to the +X INPUT (terminate into 50 Ω). Check that the −X INPUT has a grounding cap attached.

c. Set the sine-wave generator frequency to 50 kHz, and set the amplitude for eight divisions of horizontal deflection.

d. Slowly increase the sine-wave generator output frequency until the 607A horizontal display amplitude is 5.7 divisions.

e. CHECK—that the sine-wave generator frequency is at least 3 MHz.

f. INTERACTION—If the check requirement in part e cannot be met, repeat the adjustment of C246 (X HF Comp) as outlined in Step C1.

C6. Check Horizontal (X) Positioning

a. Disconnect the sine-wave generator from the +X INPUT.

b. CHECK—that the vertical trace can be positioned horizontally anywhere in the graticule area when rotating the horizontal Position control.

NOTE

Refer to the Vertical Amplifier portion of this procedure for phasing check.

D. VERTICAL (Y) AMPLIFIER

Equipment Required

1. Test oscilloscope
2. Ramp generator
3. Calibration generator
4. Sine-wave generator
5. Function generator
6. 50-ohm cables (4 required)
7. 50-ohm termination
8. Dual-input coupler
9. Bnc Tee connector

BEFORE YOU BEGIN, see TEST POINT AND ADJUSTMENT LOCATIONS in Section 10, Diagrams and Circuit Board Illustrations.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

D1. Adjust Vertical (Y) Gain (R415) and Y HF Compensation (C446)

NOTE

The Y gain is normally set to provide full-screen deflection (eight divisions), depending upon the input signal amplitude. The following procedure adjusts the Y gain so that 1 volt provides eight divisions of deflection. This procedure can be repeated for any input voltage between 0.5 V and 2.5 V for full-scale deflection. If the Y gain is changed, the + and − attenuator compensations (Option 22 instruments) may need readjustment for optimum square-wave response (see Step D2).

a. Apply a positive-going, 5 ms duration ramp of approximately 2 volts amplitude from the ramp generator output to the rear-panel +X INPUT connector.

b. Connect the calibration generator Ampl Output through a bnc Tee connector to the +Y INPUT connector. Set the calibration generator mode to Std Ampl (standard amplitude).

c. Connect the other output of the bnc Tee connector at the output of the calibration generator to the ramp generator external trigger input.

d. Set the calibration generator Amplitude control to 1 volt, and check that the Variable Amplitude control is pushed in (calibrated output position).

e. Set the ramp generator triggering controls for a stable display on the 607A monitor.

f. ADJUST—R415 (Y Gain) for an eight-division display on the 607A.

g. Change the bnc Tee connector from the calibration generator Ampl Output connector to the positive-going fast-rise output.

h. Set the ramp generator for a positive-going 50 μs duration ramp of approximately 2 volts amplitude.

i. Set the calibration-generator repetition rate to 100 kHz, and set the Pulse Amplitude for a six-division display (position as necessary). Set the ramp generator triggering controls for a stable display.

j. ADJUST—C446 (Y HF Comp) for an optimum square top front corner on the 607A display (see Fig. 4-3).

D2. Adjust Vertical (Y) Input Attenuation Compensation (C400, C500) and Check Vertical (Y) Input Attenuation (Option 22 only)

a. Set S400 (+Y Atten) and S500 (−Y Atten) to the 5X (down) position.

b. Move the bnc Tee connector attached to the calibration generator fast-rise output to the Ampl Output connector. (Leave the cables attached to the 607A +Y and +X INPUT connectors and the ramp generator trigger input as in Step D1.)

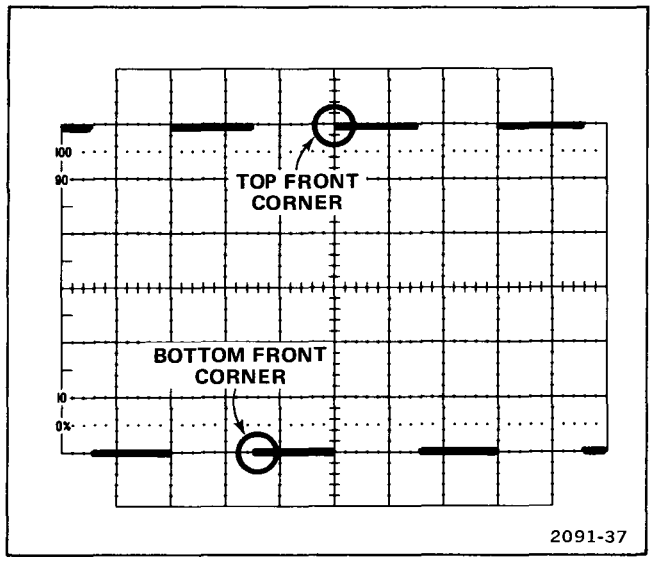


Fig. 4-3. Typical crt display for adjustment of vertical (Y) gain and compensation.

c. Set the ramp generator for a ramp duration of 5 ms. Set the calibration generator mode to Std Ampl (standard amplitude), and set the Amplitude control to 5 volts (check that the Variable Amplitude control is pushed in).

d. CHECK—for an eight-division (within 0.24 division) vertical square-wave display on the 607A.

e. Terminate the cable at the +Y INPUT connector in 50 Ω.

f. Set the calibration generator mode to High Ampl, and set the Period control to 1 μs (1 kHz). Set the Pulse Amplitude control for a six-division display on the 607A.

g. ADJUST—C400 (+Y Atten Comp) for an optimum square top front corner on the 607A display (see Fig. 4-3). For best accuracy, position the display corner of interest to graticule center.

h. (Option 21, parts h through m.) Remove the grounding cap from the −Y INPUT connector. Move the 50-ohm termination and cable from the +Y INPUT to the −Y INPUT connector. Attach the grounding cap to the +Y INPUT.

i. ADJUST—C500 (−Y Atten Comp) for an optimum square bottom front corner on the 607A display (see Fig. 4-3). For best accuracy, position the display corner of interest to graticule center.

j. Remove the 50-ohm termination from the −Y INPUT and cable, and reconnect the cable directly to the −Y INPUT connector.

k. Set the calibration generator mode to Std Ampl, and check that the Amplitude control is set to 5 volts (calibrated).

l. CHECK—for an eight-division (within 0.24 division) vertical square-wave display on the 607A.

m. Disconnect the calibration generator from the −Y INPUT. Remove the grounding cap from the +Y INPUT, and place it on the −Y INPUT.

n. Turn off the 607A POWER. Then, set S400 (+Y Atten switch) and S500 (−Y Atten switch) to the 1X position (switches up). Turn on the instrument POWER.

D3. Check Vertical Settling Time

a. Connect the ramp generator gate output to the +Z INPUT connector. Check that a grounding cap is on the −Z INPUT connector. (Option 21 only.)

b. Set the ramp generator duration to 10 μs, check that the ramp output is connected to the +X INPUT, and set the ramp amplitude for exactly 10 divisions of trace length.

c. Connect the calibration generator fast-rise positive-going output to the +Y INPUT via a 50-ohm cable and 50-ohm termination. Set the generator mode to Fast Rise, and set the Pulse Amplitude control for eight divisions of vertical display. Set the Period control to 10 μs (100 kHz).

d. Connect the calibration generator Trigger Output to the ramp generator trigger input, and set the ramp generator triggering controls for a stable, triggered output. Then, set the calibration generator Variable Period control to obtain a display of approximately 1 cycle.

e. CHECK—that the time required for the leading edge of the square wave to travel from the zero percent level to the 100 percent level (see Fig. 4-4) is 1 μs (1 division) or less, within a trace width.

NOTE

Settling time includes any front-corner aberrations.

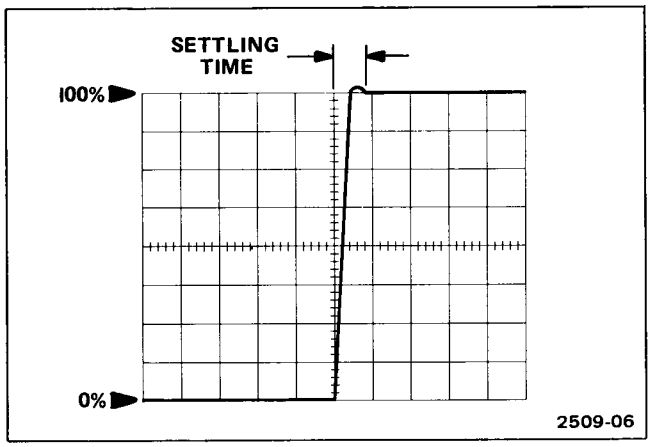


Fig. 4-4. Typical crt display for vertical (Y) settling time measurement (settling time includes corner distortion).

f. INTERACTION—If the check requirement in part e cannot be met, repeat the adjustment of C446 (Y HF Comp) as outlined in Step D1.

D4. Check Vertical (Y) Common-Mode Rejection (Options 21 and 22)

NOTE

The following procedure includes the check for both the Option 21 (differential inputs) and Option 22 (5X attenuators) instruments. If your instrument does not include Option 22, disregard those subparts referring to use of attenuators.

a. Connect the function-generator output to the test oscilloscope vertical input via a 50-ohm cable (do not terminate).

b. Set the function generator controls for a 500 kHz, 3-volt (p-p) sine wave as indicated on the test oscilloscope.

c. Disconnect the sine-wave signal from the test oscilloscope and connect it (using the dual-input coupler) to both the +Y and −Y INPUT connectors on the 607A.

d. With the ramp-generator output connected to the +X INPUT, set the generator controls for a 10 ms duration ramp with an amplitude of approximately 2 volts (to fill the screen horizontally).

e. CHECK—for 0.24 division, or less, of free-running vertical display on the 607A (position as necessary).

f. (Option 22 only, parts f through i.) Turn off the instrument POWER. Set S400 (+Y Atten switch) and S500 (−Y Atten switch) to the 5X position (switches down). Turn on the instrument POWER.

g. Connect the function-generator output to the test oscilloscope vertical input via a 50-ohm cable (do not terminate), and set the generator controls for a 15-volt (p-p) sine wave at 500 kHz. Then, reconnect the function-generator output to both the +Y and −Y INPUT connectors. using the dual-input coupler.

h. CHECK—for 0.6 division, or less, of free-running vertical display on the 607A (position as necessary).

i. Turn off the instrument POWER. Set S400 and S500 to the 1X (up) position, and disconnect the X and Y input signals. Turn on the instrument POWER.

D5. Check Vertical (Y) Bandwidth

a. Connect the ramp-generator output to the +X INPUT. Check that the −X INPUT has a grounding cap attached. Set the ramp duration to 10 milliseconds, and set the ramp amplitude to approximately 2 volts (to fill the screen horizontally).

b. Connect the sine-wave generator output to the +Y INPUT connector (terminate into 50 Ω). Check that the −Y INPUT has a grounding cap attached.

c. Set the sine-wave generator for 50 kHz output frequency, and set the amplitude for six divisions of deflection.

d. Slowly increase the sine-wave generator output frequency until the display amplitude is 4.2 divisions.

e. CHECK—that the sine-wave generator frequency is at least 3 MHz.

f. INTERACTION—If the check requirement in part e cannot be met, repeat the adjustment of C446 (Y HF Comp) as outlined in Step D1.

D6. Check Vertical (Y) Positioning

a. Disconnect the sine-wave generator from the +Y INPUT connector.

b. CHECK—that the horizontal trace can be positioned vertically anywhere in the graticule area when rotating the vertical Position control.

c. Disconnect the ramp generator from the +X INPUT connector.

D7. Check/Adjust Phasing (C470)

a. Connect the sine-wave generator to the +X and +Y INPUT connectors with a 50-ohm cable, 50-ohm termination, and a dual-input coupler.

b. Set the sine-wave generator for a 500 kHz frequency and a 1-volt amplitude output.

c. Center the display within the graticule area.

d. CHECK—that the diameter of the displayed ellipse, measured vertically at the center of the graticule, is 0.1 division, or less (see Fig. 4-5).

e. ADJUST—C470 (Phasing) for an ellipse diameter of 0.1 division or less.

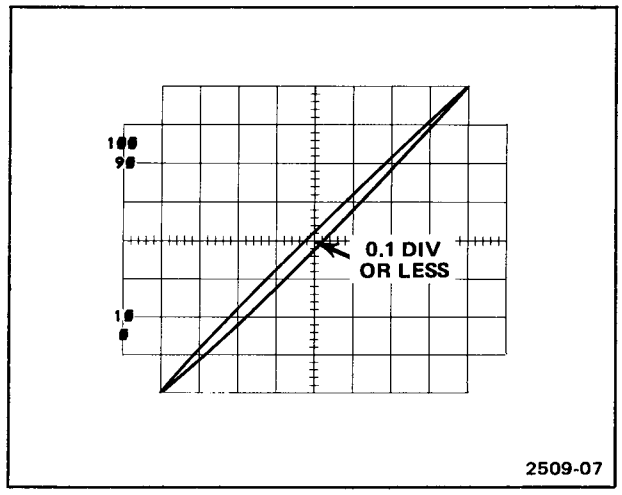


Fig. 4-5. Typical horizontal and vertical phase difference display.

f. INTERACTION—C470 (Phasing) affects the vertical amplifier frequency compensation. If adjustment was necessary in part e, repeat the Vertical (Y) Gain Y HF Compensation procedures in Step D1.

NOTE

If may be necessary to make a slight compromise between the Y HF Compensation in Step D1 and the Phasing adjustment in part e.

@

E. Z-AXIS AMPLIFIER

Equipment Required

1. Test oscilloscope
2. Ramp generator
3. Calibration generator
4. Sine-wave generator
5. Function generator
6. 10X probe
7. 50-ohm cables (2 required)
8. 50-ohm termination
9. Dual-input coupler

BEFORE YOU BEGIN, see **TEST POINT AND ADJUSTMENT LOCATIONS** in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

E1. Adjust Z-Axis Gain (R615) and Z HF Compensation (C734)

NOTE

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

In this step, the test oscilloscope is used as the amplitude-measurement standard. The accuracy of the adjustment of Z-axis gain is determined by the test oscilloscope vertical sensitivity calibration.

a. Connect the calibration-generator Ampl Output through a 50-ohm cable to the test oscilloscope vertical input. (Do not terminate the cable.) Set the calibration-generator mode to Std Ampl (standard amplitude). Set the Amplitude control to 1 V.

b. Set the test oscilloscope vertical deflection factor to 200 mV/div and the sweep rate to 500 μs/div.

c. Set the test oscilloscope gain for exactly five divisions of deflection. This serves to calibrate the test oscilloscope vertical deflection factor.

d. Apply a positive-going 100 μs ramp signal of approximately 2 volts amplitude from the ramp generator output to the +X INPUT connector on the 607A. (Set the ramp amplitude to just fill the screen horizontally.)

e. Move the cable on the calibration generator from the Ampl Output connector to the negative-going fast-rise output. Set the calibration generator mode to Fast Rise, and set the Period control to 10 μs (100 kHz). Set the Pulse Amplitude control for a five-division display on the test oscilloscope. This serves to calibrate the output level of the calibration-generator fast-rise output signal.

f. Connect the calibration-generator trigger output signal to the ramp-generator trigger input. Set the ramp-generator triggering controls for triggered operation.

g. Disconnect the 1-volt square-wave signal from the test oscilloscope vertical input, and connect the signal to the 607A +Z INPUT.

h. Set the 607A INTENSITY control to the fully clockwise position.

i. ADJUST—R615 (Z Gain) for bright line segments that are completely blanked between each segment.

j. Attach a 10X probe to the test oscilloscope vertical input. Set the test oscilloscope deflection factor to 5 V/div (includes attenuation of probe), and set the sweep rate to 1 μs/div. Set the vertical input for dc coupling, and set the triggering mode to Auto (automatic).

k. Reduce the 607A display intensity and disconnect the calibration generator from the +Z INPUT connector.

l. Connect the 10X probe from the test oscilloscope vertical input to test point TP720 on the Z-Axis Amplifier board.

m. Set the 607A INTENSITY control for a 10-volt dc level at test point TP720 as indicated on the test oscilloscope.

n. Move the cable on the calibration generator from the negative-going fast-rise output to the positive-going fast-rise output connector.

o. Check that the calibration-generator Period control is set to 10 μs (100 kHz), and connect the output signal to the 607A +Z INPUT connector.

p. Set the calibration-generator Pulse Amplitude for a four-division display at TP720, as indicated on the test oscilloscope.

q. ADJUST—C734 (Z HF Comp) for an optimum square front corner on the test oscilloscope display.

E2. Check Z-Axis Bandwidth

a. Disconnect the calibration-generator from the +Z INPUT connector.

b. Set the 607A INTENSITY control for a +30-volt dc level at test point TP720 as indicated on the test oscilloscope.

c. Connect the sine-wave generator output to the +Z INPUT connector (terminate into 50 Ω). Set the sine-wave generator frequency to 50 kHz.

d. Set the sine-wave generator amplitude for eight divisions of deflection on the test oscilloscope (set the test-oscilloscope triggering and sweep rate controls for a free-running display).

e. Slowly increase the sine-wave generator frequency until the test-oscilloscope display is 5.66 divisions.

f. CHECK—that the sine-wave generator output frequency is at least 5 MHz.

g. INTERACTION—If the check requirement in part f cannot be met, repeat the adjustment of C734 (Z HF Comp) as outlined in Step E1.

E3. Check Z-Axis Common-Mode Rejection (Option 21 only)

NOTE

Z-Axis Gain must be set for 1 volt = full intensity when performing this step. At other settings of the Gain adjustment, appropriate allowance must be made for either the input signal amplitude, or the differential signal measured at TP720.

a. Connect the function-generator output to the test oscilloscope vertical input via a 50-ohm cable and a 50-ohm termination.

b. Set the function-generator controls for a 100 kHz, 5-volt (p-p) sine wave as indicated on the test oscilloscope.

c. Attach a 10X probe to the test oscilloscope vertical input and connect the probe tip to test point TP720 on the Z-Axis Amplifier board. Set the test oscilloscope vertical input for dc coupling.

d. Set the 607A INTENSITY control for a +25-volt dc level at test point TP720 as indicated on the test oscilloscope.

e. Set the test oscilloscope vertical input for ac coupling and set the deflection factor to 1 V/div (including 10X attenuation of probe). Set the sweep rate to 10 μs/div.

f. Connect the function-generator output to the +Z and −Z INPUT connectors with a 50-ohm cable, 50-ohm termination, and a dual-input coupler.

g. CHECK—that the test-oscilloscope display amplitude is three divisions (3 volts, p-p) or less.

h. Disconnect all test equipment.

F. STORAGE CIRCUIT

Equipment Required

1. Test oscilloscope
2. Pulse generator
3. Ramp generator (2 required)
4. 10X probe
5. 50-ohm termination
6. 5X attenuator
7. 50-ohm cables (4 required)

BEFORE YOU BEGIN, see TEST POINT AND ADJUSTMENT LOCATIONS in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

F1. Adjust Collimation (R1030, R1054, and R1042)

a. Set the INTENSITY control fully counterclockwise and check that there is no display.

b. Push in the STORE button.

c. Turn the OPERATE LEVEL control fully clockwise.

d. Set R835 (Prep Level) fully counterclockwise and R965 (Op Level) fully clockwise.

e. ADJUST—R1030 (CE 1), R1054 (CE 2), and R1042 (CE 3) alternately until the brightened storage area does not have any shadowed corners or scallops (wavy edges).

F2. Adjust Storage Levels (R835 and R965)

a. Set R965 (Op Level) fully counterclockwise.

b. ADJUST—R965 (Op Level) clockwise in small increments, while pushing and releasing the ERASE button after each increment, until the display area just reaches a uniformly bright condition. (Further adjustment will make the display area brighter, but will degrade performance.)

c. Push and release the ERASE button.

d. ADJUST—R835 (Prep Level) clockwise in small increments, while pushing and releasing the ERASE button after each increment, until the display area brightness just begins to decrease.

e. ADJUST—R965 (Op Level) counterclockwise in small increments, while pushing and releasing the ERASE button after each increment, until a slight glow remains on the display area.

F3. Adjust Pulse Height (R975)

a. Connect the 10X probe from the test-oscilloscope vertical input to test point TP1066 on the Storage board. Set the test-oscilloscope vertical to 500 mV/div (includes attenuation of probe) and the sweep rate to 100 μs/div. Set the input for dc coupling.

b. Turn the PERSISTENCE/SAVE TIME control clockwise until a waveform is displayed on the test oscilloscope.

c. Push and hold the ERASE button in.

d. Note the dc (prepare) level of the test oscilloscope display and release the ERASE button.

e. ADJUST—R975 (Pulse Ht) until the top of the waveform is 1 volt above the dc (prepare) level noted in part d.

F4. Check Stored Dot Writing Time

NOTE

For the 607A Option 4 (Internal Time Base), disconnect the internal sweep by setting S220 (Int Swp) on the Deflection Amplifier board and S735 (Int Blank) on the Z-Axis Amplifier board to the X-Y position. See Connecting the Internal Sweep (Option 4) in Section 5, Installation, for additional information.

a. Push in the PERSISTENCE/SAVE TIME control and turn it fully counterclockwise.

b. Push and release the ERASE button.

c. Turn the OPERATE LEVEL control until the crt background glow just disappears.

d. Set the INTENSITY control for a bright stored dot displayed on the crt.

e. Position the displayed dot to the lower-left corner of the graticule with the vertical and horizontal Position controls.

f. Set the INTENSITY control fully counterclockwise.

g. Apply a one-second duration, automatically-triggered, positive-going ramp from a ramp generator to the +Y INPUT connector.

h. Apply the gate output signal from the ramp generator through the 5X attenuator to the +Z INPUT connector.

i. Apply a 50 ms duration, automatically-triggered, positive-going ramp from a second ramp generator to the +X INPUT connector.

j. Turn the INTENSITY control clockwise until a display appears.

k. Set both ramp-generator output amplitudes for a 6 X 8 division display (six divisions vertically, eight divisions horizontally).

l. Alternately push the ERASE button and turn the INTENSITY control counterclockwise, in small increments, until the display just disappears.

m. Apply a minimum-amplitude, negative-going 1 μs duration, 1 ms period pulse from the pulse generator through a 50-ohm termination to the −Z INPUT connector.

n. Connect the 10X probe from the test-oscilloscope vertical input to test point TP720 (on the Z-Axis Amplifier board) and set the sweep rate for 1 μs/div.

o. Slowly increase the pulse-generator output amplitude for a 30-volt (p-p) display on the test oscilloscope.

p. Set the ramp generator (connected to the +Y INPUT connector) for normal triggering.

q. Push the ERASE button and check for no display.

r. Turn the ramp generator (connected to the +Y INPUT connector) triggering level from one extreme to the other until a 6 X 8 division dot display appears on the 607A crt.

s. CHECK—that the 6 X 8 division dot display remains visible for at least three minutes.

t. Set the pulse generator for a 0.5 μs duration pulse output (the pulse period should remain at 1 ms).

u. Push and release the ERASE button.

v. Set the OPERATE LEVEL control fully clockwise.

w. Turn the ramp generator (connected to the +Y INPUT connector) triggering level from one extreme to the other until a 6 X 8 division dot display appears on the crt.

x. CHECK—that the 6 X 8 division display remains visible for at least 15 seconds.

F5. Check Stored Linear Writing Speed

a. Remove the pulse generator from the −Z INPUT connector and replace the grounding cap.

b. Remove the 5X attenuator from the gate output of the ramp generator connected to the +Y INPUT connector, and apply the gate output directly to the +Z INPUT connector.

c. Set the ramp generator (connected to the +Y INPUT connector) for an automatically-triggered ramp output with a duration of approximately 300 μs.

d. Set the ramp generator (connected to the +X INPUT connector) for a 10 μs duration ramp output.

e. Set the ramp amplitude of both ramp generators for a 6 X 8 division stored display (push and release the ERASE button after each amplitude change).

f. Connect the 10X probe from the test-oscilloscope vertical input to test point TP720 (on the Z-Axis Amplifier board), and set the test oscilloscope sweep rate for 0.1 ms/div.

g. Turn the 607A INTENSITY control for a +60-volt dc level displayed on the test oscilloscope.

h. Set the ramp generator (connected to the +Y INPUT connector) for normal triggering.

i. Push and release the ERASE button.

j. Turn the triggering level on the ramp generator (connected to the +Y INPUT connector) from one extreme to the other until a 6 X 8 division display of stored lines appears on the 607A crt.

k. CHECK—that the stored lines are visible without any gaps or breaks for at least 1 minute.

l. Disconnect all test equipment.

G. SWEEP GENERATOR (OPTION 4)

Equipment Required

1. Sine-wave generator
2. Time-mark generator
3. 50-ohm cable
4. 50-ohm termination
5. 50-ohm 5X attenuator

BEFORE YOU BEGIN, see TEST POINT AND ADJUSTMENT LOCATIONS in the Diagrams and Circuit Board Illustrations section.

NOTE

Perform the Preliminary Procedure before making the following checks and adjustments.

G1. Adjust Sweep Length (R1115)

a. Set the Option 4 controls as follows:

Int Swp (S22 on Deflection Amplifier board)	Y-T (up position)
Int Blank (S735 on Z-Axis Amplifier board)	Y-T (right position)
Trig Mode (S1109 on Sweep board)	Auto (rear position)
SEC/DIV (front panel)	1 μ
VARIABLE (front panel)	Fully clockwise (calibrated)
TRIG SLOPE/LEVEL (front panel)	Centered

b. Set the INTENSITY control for a visible trace. Position the display to center the trace.

c. ADJUST—R1115 (Swp Length) for a sweep length of approximately 10.5 divisions.

G2. Check TRIGger SLOPE/LEVEL

a. Apply a 2 MHz sine-wave signal from the sine-wave generator to the +Y INPUT connector.

b. Set the sine-wave generator amplitude for a 0.5-division display.

c. CHECK—that a stable, jitter-free display of sine waves can be obtained by turning the TRIG SLOPE/LEVEL control.

d. CHECK—for a free-running display when the TRIG SLOPE/LEVEL control is set fully clockwise and fully counterclockwise.

e. Set the Trig Mode switch, S1109, to Norm (forward position).

f. CHECK—that a stable, jitter-free display of sine waves can be obtained by turning the TRIG SLOPE/LEVEL control.

g. CHECK—for no display when the TRIG SLOPE/LEVEL control is set fully clockwise and fully counterclockwise.

h. Set the Trig Mode switch, S909, to Auto (rear position).

G3. Check/Adjust Sweep Timing (R1165)

a. Set the SEC/DIV switch to 1 m. Check that the VARIABLE control is fully clockwise (calibrated).

b. Connect the time-mark generator output through a 50-ohm cable, a 50-ohm 5X attenuator, and a 50-ohm termination to the 607A +Y INPUT connector. Set the time-mark generator for 1 ms markers.

c. Position the first time marker to the left edge of the graticule and check for 1 time marker per major graticule division.

d. CHECK—that the distance between the second and tenth time markers (center eight) is exactly eight divisions apart.

e. ADJUST—R1165 (Swp Cal) so that the second and tenth time markers (center eight) are exactly eight divisions apart.

f. CHECK—remaining SEC/DIV switch positions with time markers that correspond to each switch position. The distance between the second and tenth time markers at each SEC/DIV switch position should be eight divisions within 0.24 division (3%).

G4. Check VARIABLE Time/Division

a. Set the time-mark generator for 0.1 ms markers.

b. Set the SEC/DIV switch to 0.1 m. Note 1 time marker per division.

c. Set the front-panel VARIABLE control fully counterclockwise.

d. Set the SEC/DIV switch to 10 μ.

e. CHECK—for at least 1 time marker per graticule division.

f. Disconnect all test equipment.

NOTE

For X-Y operation, return the Int Swp and Int Blank switches on the Deflection board and the Z-Axis Amplifier board to the X-Y position.

This completes the Performance Check and Adjustment procedure.

INSTALLATION

OPERATING POWER INFORMATION

This instrument can be operated from either a 120-volt or 220-volt nominal line-voltage source, 48 to 440 Hz. 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 proper mating power outlet.

Table 5-1

POWER-CORD CONDUCTOR IDENTIFICATION

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounding (Earthing)	Green-Yellow	Green-Yellow

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 5-2.

Table 5-2

LOCATION OF POWER-CORD PLUG CONFIGURATIONS INFORMATION

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

[a] **ANSI—American National Standards Institute**
[b] **NEMA—National Electrical Manufacturer's Association**
[c] **AS—Standards Association of Australia**
[d] **BS—British Standards Institution**
[e] **CEE—International Commission on Rules for the Approval of Electrical 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. Remove the bottom cabinet panel of the instrument (see Section 7, Maintenance) to gain access to the Low-Voltage Power Supply board.

3. 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 labeled for the desired nominal line-voltage range. Refer to Fig. 5-1, for location and additional information.

4. 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 Fig. 5-1 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. 5-1).

5. Change the nominal line-voltage information recorded on the 607A rear panel. Use a non-abrasive eraser to remove previous data, and mark on the new data with a pencil.

6. Replace the bottom cabinet panel and 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 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 appropriate corrective measures.

IMAGE CONTRAST AND RESOLUTION

When in the store mode, a uniformity ramp signal from the Variable-Persistance Pulse Generator improves the crt storage area background uniformity at the sacrifice of some image contrast and resolution. A slight improvement in image contrast and resolution can be obtained with some loss of background uniformity by removing jumper wire W988 on the Storage board (see the Internal Control and Selector Locations pullout page in section 10, Diagrams and Circuit Board Illustrations).

REMOTE PROGRAM INPUTS (OPTION 10)

REMOTE PROGRAM connector input logic level requirements are discussed in section 2, Operating Instructions. However, if low logic levels (i.e., between +0.48 and +0.8 volt) are to be applied to the REMOTE PROGRAM connector inputs, it may be necessary to replace current-limiting resistors R802, R852, R860, and R912 (located on the Storage board) with jumpers. Although this modification allows the use of logic levels outside the normal limits, the current surge protection provided by these resistors is not available. See the Internal Control and Selector Locations pullout page in section 10, Diagrams and Circuit Board Illustrations, for the jumper locations.

Input and output pin connections on the REMOTE PROGRAM connector are shown in Fig. 5-2.

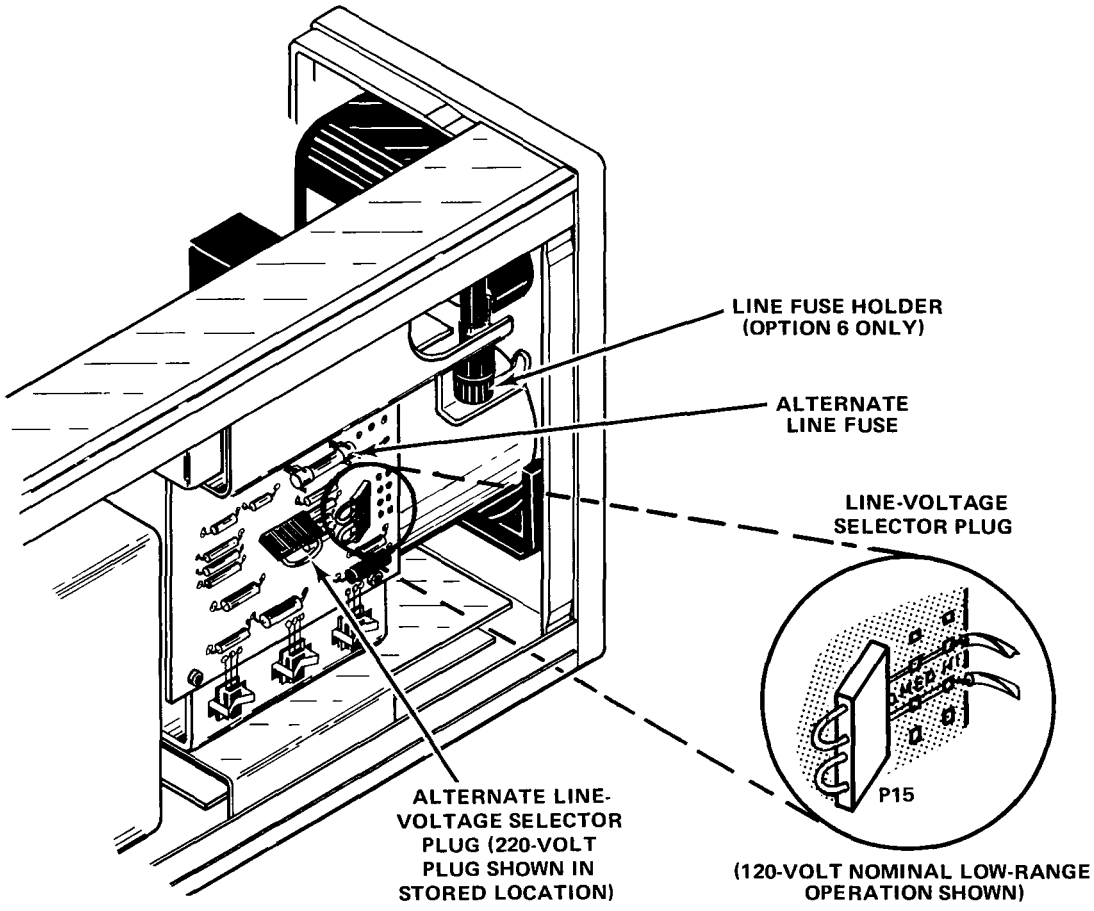
INPUT ATTENUATION SELECTION (OPTION 22)

X and Y Input Attenuation

WARNING

The heat sinks on the horizontal output transistors on the Deflection Amplifier board are elevated to approximately +80 volts. To avoid potential electric shock, always turn the POWER off before changing the settings of the X or Y Input attenuators.

The Horizontal (X) and Vertical (Y) Amplifiers include a selectable 1:1 and 5:1 step attenuator in both the + (non-inverting) and the − (inverting) input circuits. These

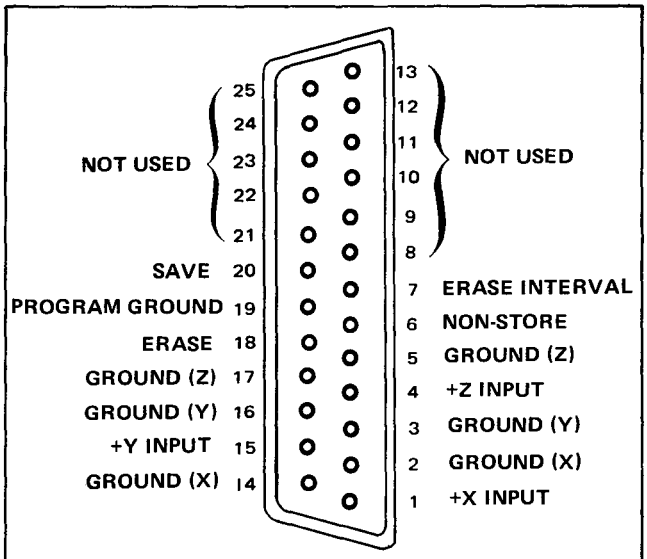


Regulating Ranges

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	0.7 A slow-blow	0.4 A slow-blow

2091-35A

Fig. 5-1. Location of Low Voltage Power Supply fuses.



AS SEEN FROM THE REAR PANEL

THE SWITCHING REQUIREMENTS (VOLTAGE LEVELS, LOADING, DRIVE, ETC.) OF REMOTE-CONTROLLED FUNCTIONS CAN BE SATISFIED BY A TTL CIRCUIT.

TTL-COMPATIBLE LOGIC LEVELS:

	VOLTS	CURRENT
LOGICAL 1 =	⩽ +5 V ⩾ +2.4 V	OPEN CIRCUIT
LOGICAL 0 =	⩾ 0 V ⩾ +0.52 V	1.6 mA

2090-3

Fig. 5-2. REMOTE PROGRAM connector data.

attenuators extend the deflection factor range of the appropriate amplifier to at least 12.5 volts for full-screen signal deflection. Refer to the Internal Control and Selector Locations foldout page in Section 10, Diagrams and Circuit Board Illustrations, for the position settings and locations of the attenuator switches. To maintain proper differential operation of the amplifier, always change both the + and − attenuators to the same setting.

Z-Axis Input Attenuation

The Z-Axis Amplifier is shipped from the factory with 1X input attenuation and 1 MΩ input impedance. However, the attenuation and input impedance can be modified to suit a specific application. Posts, on the Z-Axis board, allow components to be changed without damage to the circuit board. Figure 5-3 illustrates the method used to modify input attenuation and input impedance of the +Z INPUT. The same method applies to both the +Z INPUT

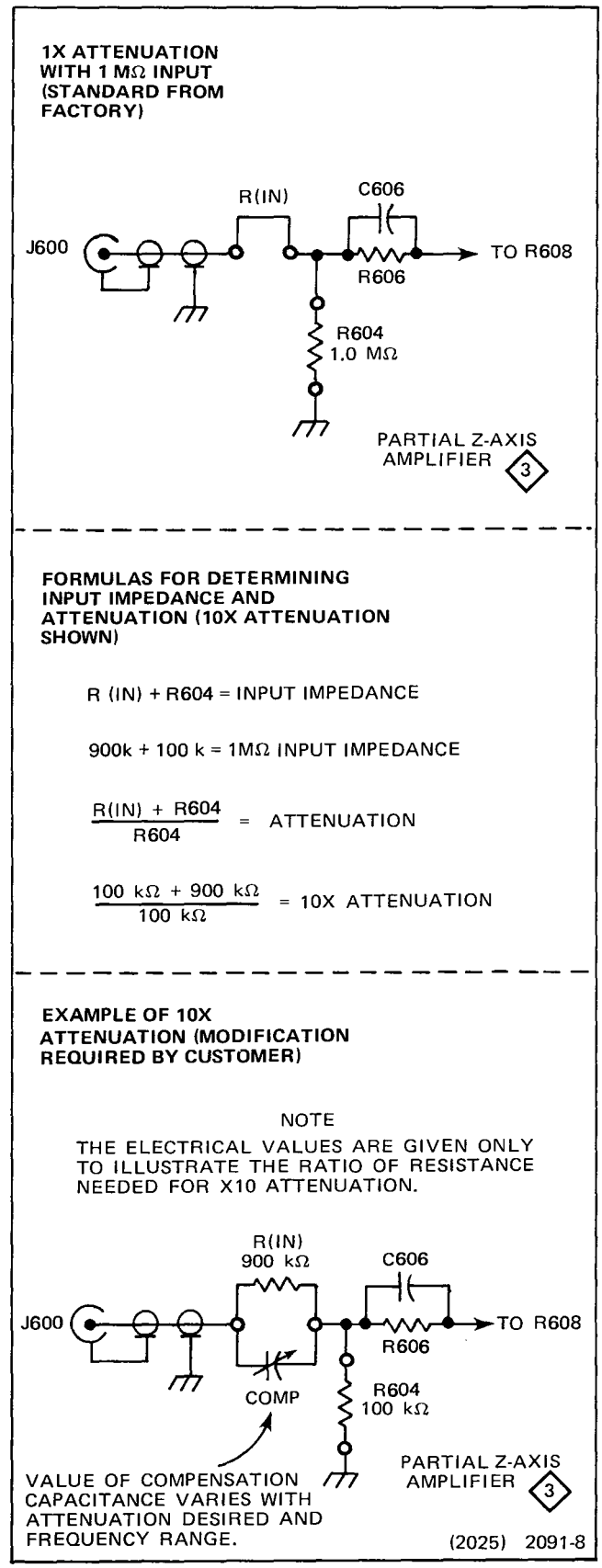


Fig. 5-3. Typical method for modifying Z-Axis input impedance and attenuation.

and the −Z INPUT. Refer to the Internal Control and Selector Locations foldout page in Section 10, Diagrams and Circuit Board Illustrations, for location of the Z-Axis attenuation components. Refer to your Tektronix Field Office or representative for additional information.

CONNECTING THE INTERNAL SWEEP (OPTION 4)

Internal switches are provided to connect the optional sweep generator circuit. Remove the protective cabinet panels from the Monitor (see Section 7, Maintenance) to gain access to these switches. Switch locations and positions are shown on the Internal Control and Selector Locations foldout page in Section 10, Diagrams and Circuit Board Illustrations. To use the internal sweep, proceed as follows:

1. Set S220 (Int Swp) located on the Deflection Amplifier board to the Y-T (rear) position.

2. Set S735 (Int Blank) located on the Z-Axis Amplifier board to the Y-T (right) position.

3. Set S1109 (Trig Mode) located on the Sweep board to the Auto (rear) position.

4. Replace the cabinet panels.

RACKMOUNTING INFORMATION

The 607A 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 607A 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.

Cabinet-to-Rackmount Conversion

Tektronix Part 040-0600-00. Mounts two 607A Storage 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 607A 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 with each kit.

Tektronix Part 040-0624-01. Converts one TM 503 Power Module and one 607A Storage Monitor to mount side-by-side in a standard 19-inch wide instrument rack. The kit includes a slide-out assembly and securing hardware. Complete rack-mounting instructions are included with each kit.

Tektronix Part 016-0337-00. Converts one 607A Storage Monitor and one 602 Monitor or one 528 Waveform Monitor to rackmount side-by-side in a standard 19-inch rack. The kit includes a slide-out assembly, securing hardware, and blank panel for mounting only one instrument in the rack. Complete rackmounting instructions are included in each kit.

Rackmount-to-Cabinet Conversion

Tektronix Part 040-0602-00. Converts one 607A Storage 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 607A is shown in Fig. 3-1 (Specification section). Further details and tolerances are shown on the Detailed Dimensional Drawing foldout page in Section 10, Diagrams and Circuit Board Illustrations.

Ventilation Requirements

When the 607A Storage Monitor 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 need to be employed to maintain ambient temperatures below +50°C (+122°F). Reliability and performance of the 607A will be affected if the ventilation holes in the protective panels are obstructed, or if the 607A is operated at an ambient temperature higher than +50°C (+122°F).

Slide-Out Tracks Information

The slide-out tracks provided in the conversion kits permit this instrument to be extended out of the rack for maintenance without removing it from the rack. Be sure the power cord and signal cables are long enough to allow operation in the extended position. Refer to the instructions in the appropriate rackmount kit for additional information.

Slide-Out Track Lubrication

The special finish on the sliding surfaces of the tracks provides permanent lubrication. However, if the tracks require additional lubrication, a thin coat of paraffin can be rubbed onto the sliding surfaces.

Removing or Installing the Instrument

After initial installation and adjustment of the slide-out tracks, the instrument can be removed or installed by following the instructions given in Fig. 5-4. No further adjustments are required under normal conditions.

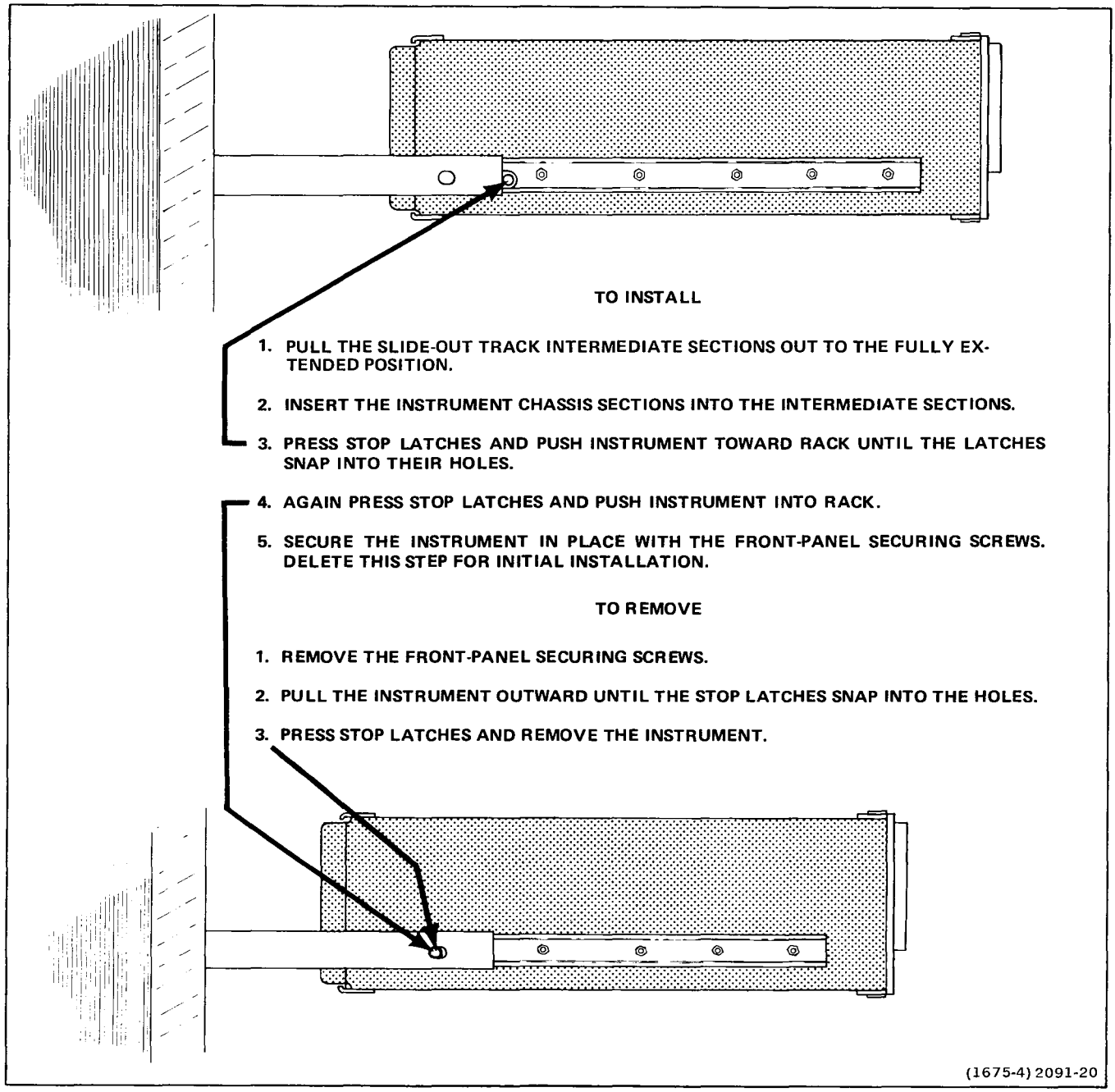


Fig. 5-4. Installing and removing a rackmounted instrument.

THEORY OF OPERATION

This section of the manual describes the circuitry in the 607A Monitor. The description begins with a discussion of the instrument using the block diagram of Fig. 6-1, and then continues in detail, showing the relationships between the stages in each major circuit. Schematics of all major circuits are given in Section 10, Diagrams and Circuit Board Illustrations. Refer to these schematics throughout the following discussions for specific electrical values and relationships.

NOTE

The Theory of Operation for available electrical options is included in the following text. The information is preceded by the appropriate option number.

BLOCK DIAGRAM

The following discussion is provided to aid in understanding the overall concept of the 607A before the individual circuits are discussed in detail. A basic block diagram is shown in Fig. 6-1.

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 cathode-ray tube (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 front-panel INTENSITY control sets the output level of the Z-axis amplifier, thus controlling the static brightness of the display.

The High-Voltage and Low-Voltage Power Supplies provide all the voltages necessary for operation of the 607A. Electronic regulation is used on all critical supplies to provide stable operation under varying line-voltage conditions.

The Storage Control circuit includes the Erase-Pulse Generator for erasing stored information and a Variable-Persistence Pulse Generator for varying the crt phosphor persistence. Also provided are erase, save, and non-store input and erase interval output gate stages for remote operation. (See Option 10 Remote Program Connector.)

The Storage Output circuit consists of the Storage Mesh Amplifier stage and the regulators for the collimation and flood-gun anode and cathode electrodes. These stages provide the voltage levels necessary to operate the crt storage elements.

Option 4 (Internal Sweep). This circuitry produces a positive-going sawtooth voltage, which is amplified by the Horizontal (X) Amplifier to provide sweep deflection in the crt. A sample of the signal applied to the Vertical (Y) Amplifier is picked off to serve as a triggering signal. The level of the vertical signal from which triggering occurs is determined by the setting of the TRIG SLOPE/LEVEL control. The Sweep circuit also produces an unblanking gate signal coincident with the sawtooth waveform. This gate signal is coupled to the Z Output Amplifier to unblank the crt and permit display presentation.

Option 10 (REMOTE PROGRAM connector). This option includes a REMOTE PROGRAM connector, mounted on the rear panel of the instrument. The REMOTE PROGRAM connector provides direct connections to the positive (+) inputs of the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers from a remote location. Also, Save, Erase, and Non-store functions of the Storage circuitry can be controlled from a remote location. A negative-going pulse, logical 0 (TTL) is present as an output at a contact on the connector during the erase interval. All inputs and the output are TTL compatible.

Option 21 (Differential Inputs). Instruments equipped with this option have both positive (+) and negative (−) inputs for the vertical (Y), horizontal (X), and Z-Axis Amplifiers. This option permits driving the amplifiers with either single-ended or differential input signals. Use of the instrument in each case is described in Section 2, Operating Instructions.

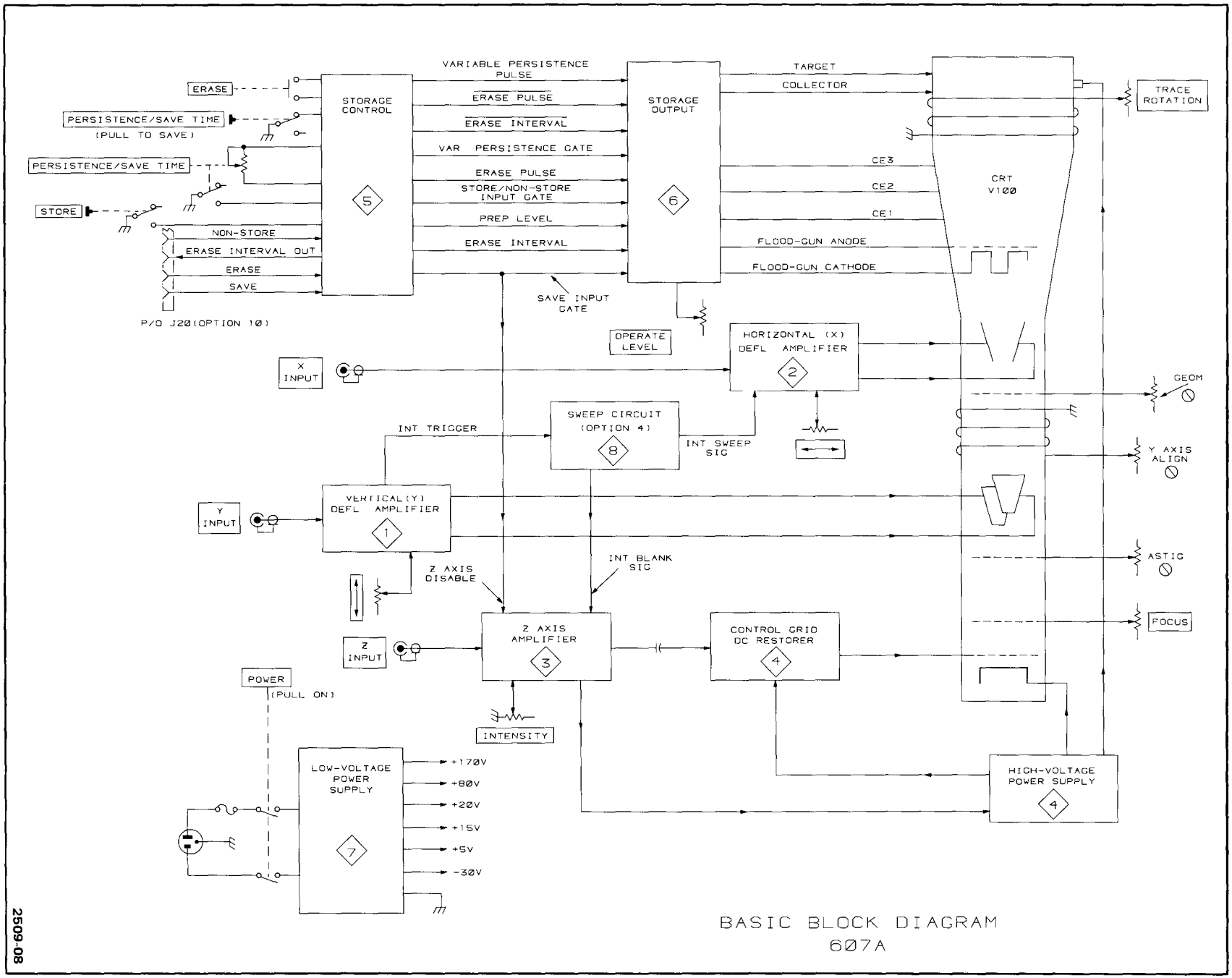


Fig. 6-1. 607A basic block diagram (with Options 4 and 10).

Option 22 (1X—5X Input Attenuators). This option includes internal, switchable 1:1—5:1 attenuators for the vertical and horizontal amplifiers. The attenuators are frequency-compensated.

Option 26 (50-Ω Inputs). This option changes the input impedance of the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers to 50 Ω.

DETAILED CIRCUIT DESCRIPTION

Complete schematic diagrams are provided in Section 10, 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 shaded borders around the major stages of the circuits to conveniently locate the components as mentioned in the following discussions. The name of each major stage is given in a shaded box on the diagram and as the sub-heading in the discussion of that schematic diagram.

VERTICAL (Y) AMPLIFIER ◇1

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

Input Attenuators (Option 22 only)

An internal switch (S400, and S500 with Option 21) allows either 1X or 5X attenuation of the input signal before it is applied to the Y Preamplifier(s). The 5X position of each attenuator is a frequency-compensated voltage divider. The step attenuators are set in the 1X position when shipped from the factory. For optimum frequency-response of the amplifier, both attenuators (with Option 21) should be set in the same position.

Differential Inputs (Option 21 only)

This option consists primarily of an added bnc connector (J500) to permit application of signals to the inverting (−) input of the amplifier, thus providing differential operation. With this option, the gate of Q410B receives drive from the −Y INPUT connector.

With this option, the instrument is shipped from the factory prepared for single-ended operation, with a grounding cap connected to the −INPUT of the amplifier.

Y Preamplifier

Two identical, noninverting operational amplifiers, Q410A-Q420 and Q410B-Q520, form the Y Preamplifier. The amplifier can be operated as either a paraphase amplifier (with a single-ended input) or as a differential amplifier (with Option 21). A push-pull signal is produced at the collectors of Q420 and Q520. The Y Preamplifier employs field-effect transistors to provide high input impedance and temperature stability. Excessively large negative-going signals are clamped by diodes CR408 and CR508 before application to transistors Q410A and Q410B. The Y Gain control, R415, allows setting the crt full-screen deflection from 0.5 volt, or less, to at least 2.5 volts. This adjustment is set at the factory for eight divisions of deflection with a 1-volt input signal applied.

Vertical Position and Limiter

Vertical positioning is provided by front-panel control R440, through the current sources of Q430-Q530, via Q432-Q532. The push-pull signals from the Y Preamplifier are applied through R428 and R528 to the Y Output Amplifier after being offset by the vertical positioning stage. Diodes CR454-CR455 and CR456-CR457 prevent overdriving the Y Output Amplifier by limiting the Y Preamplifier signals to within about 5 volts of each other.

Output Amplifier

The Output Amplifier consists of two identical non-inverting operational amplifiers connected in a differential configuration. Transistors Q432 and Q532 provide bias current for input transistors Q430 and Q530. Transistors Q430 and Q530 amplify the push-pull signal from the Preamplifier stage. The amplified signal is fed to emitter followers Q460 and Q560, which drive Q464 and Q564.

The bases of Q460 and Q560 are diode limited to ensure quick overdrive recovery. The output signal at the collectors of Q464 and Q564 causes a change in the current

through feedback resistors R450 and R550 that just balances the current through R442 due to the input signal. Thus the current in Q430 and Q530 is held nearly constant.

Display vertical positioning is accomplished by R440, which provides a shift in constant-current source transistors Q432 and Q532 to change the quiescent output voltage. Capacitor C446 (Y HF Comp) provides frequency compensation.

NOTE

(Option 21 only)

Since operation of the − Output Amplifier is complementary to that of the +Y Output Amplifier, signal operation of only the +Y Output Amplifier will be discussed. To locate the components of the −Y Output Amplifier which correspond to those in the following discussion, add 100 to the circuit number (e.g., Q430-Q432 becomes Q530-Q532).

HORIZONTAL (X) AMPLIFIER ◇2

The Horizontal (X) 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) Amplifier is shown in Diagram 2. A detailed block diagram showing each major stage of the Horizontal (X) Amplifier is superimposed on the schematic with shaded lines.

The Horizontal (X) Amplifier is identical to the Vertical (Y) Amplifier, with the exception of the circuit numbers and the provisions made for the optional internal sweep. For the Option 4 instrument, a sample of the vertical signal is taken from the collector of Q420 in the Vertical (Y) Amplifier, and is sent to the Sweep (Option 4) circuit. The internal sweep signal is applied to the collector of Q220 on the Horizontal (X) Amplifier.

The Horizontal (X) Amplifier circuit numbers are of the 200- and 300-series, whereas the Vertical (Y) Amplifier circuit numbers are in the 400- and 500-series. For example, Q464 on the Vertical (Y) Amplifier (Diagram 1) corresponds to Q264 on the Horizontal (X) Amplifier (Diagram 2). Therefore, the Vertical (Y) Amplifier discussion will apply to the Horizontal (X) Amplifier after converting the circuit numbers to those of the 200- and 300-series.

Z-AXIS AMPLIFIER ◇3

The Z-Axis Amplifier circuit provides the drive signal that controls 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 of the Z-Axis Amplifier, is superimposed on the schematic diagram with shaded lines. The stage names (given as sub-headings in the following discussion) can be found in shaded boxes on Diagram 3.

Z Inputs

Signals can be applied to either the +Z INPUT (noninverting) bnc connector J600, or the −Z INPUT (inverting) bnc connector J650 (Option 21 only), as single-ended inputs; or to both connectors as a differential input. Provisions are made on each input line to permit installation of attenuating resistors and to change the input impedance (see Input Attenuation Selection in Section 5, Installation).

Preamplifier

The Z-Axis Preamplifier employs a dual FET (field effect transistor), Q610, to provide a high input impedance. The stage consists of two identical feedback amplifiers, Q610A-Q620-Q630 and Q610B-Q670-Q680, which can be operated as either a paraphase amplifier (with a single-ended input) or as a differential amplifier (with Option 21). A single-ended output is produced at the collector of Q680 which is in phase with the signal applied to the +Z INPUT connector, and opposite in phase to the signal applied to the −Z INPUT connector. Additional bias current for the stage is supplied by Q640. The FET gates are diode-clamped on negative-going overdrive signals to protect the field-effect transistors from excessive input voltages. Potentiometer R615 (Z Gain) provides an adjustable amplification factor to provide a maximum allowable crt grid drive when a signal of at least 1 volt to 5 volts is applied to either the +Z or −Z INPUT connector, and R175A (INTENSITY) is set to about midrange. Under this condition, a zero-volt input cuts off the intensity to below the visible level.

Output Amplifier

The Output Amplifier is a non-inverting operational amplifier consisting of Q690, Q710, Q720, and Q724. The feedback resistor is R734 while C734 (Z HF Comp) provides a means of adjusting the amplifier response. Transistors Q720 and Q724 are connected as a collector-coupled complementary amplifier to provide a fast, linear output signal while consuming minimum quiescent power. The quiescent output level can be set by potentiometer R175A (INTENSITY). The output is applied to the crt control-grid circuit.

To prevent writing over information being saved in the stored mode, Q700 disables the Z-Axis Amplifier when the save mode is enabled.

HIGH VOLTAGE ◇4

High-Voltage Regulator

High-Voltage Primary. A repetitive, sinusoidal signal is produced by a regenerative feedback oscillator in the primary of T120 and induced into the secondary. Current drive for the primary winding is furnished by Q130 and Q132. The conduction of Q130 and Q132 is controlled by the output voltage of U110.

High-Voltage Regulation. Regulation is accomplished by comparing a sample of the −1500 volts with a sample of the regulated +15 volts from potentiometer R100 (HV Adj) and divider network R104A-R104B to the positive input (pin 3) of U110. If the output level of the Cathode Supply goes above the nominal −1.5 kV (i.e., goes more negative), the positive input (pin 3) of U110 goes negative from its quiescent +1.2 volts. The output of U110 then goes less positive to reduce the conduction of Q130 and Q132. This reduces the peak-to-peak sinusoidal signal amplitude, resulting in a reduced voltage across the secondary of T120. Conversely, if the output drops below −1.5 kV (i.e., goes more positive), Q130 and Q132 will conduct harder (i.e., have a larger sinusoidal signal amplitude). Transistor Q120 protects the High-Voltage Power Supply, in the event the output is shorted, by limiting the maximum current drawn by high-voltage oscillator Q130 and Q132.

High-Voltage Outputs

The secondary winding of T120 provides the negative and positive accelerating potentials for the crt, the bias voltage for the control grid, the +80-volt and the +170-volt supply voltages used elsewhere in the 607A, and the crt writing-gun filament voltage.

Positive accelerating voltage for the crt anode is supplied by voltage tripler U120. The applied voltage to the input of the tripler from the T120 secondary winding is about +3.5 kV peak. The output voltage of the tripler is about +10.5 kV at the crt anode. The negative accelerating voltage for the crt cathode is also obtained from the T120 secondary winding. Diode CR150 rectifies the transformer output and supplies the −1.5 kV to the crt cathode. Crt writing-gun filament voltage is provided by a winding on the secondary of T120 which is elevated to −1.5 kV.

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. 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 −1600 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 R192 (Cutoff). (The cutoff voltage at the crt control grid is typically about 100 volts more negative than the crt cathode level.)

NOTE

A simplified diagram of the Control-Grid Dc Restorer is shown in Fig. 6-2. 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 in this description 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.

Modulator. When the secondary-winding output of T120 (pin 11) swings positive, C186 charges through R150 and C150 to a voltage level determined by the setting of R192 (Cutoff). At this voltage level (approximately 110 volts), CR186 conducts, preventing any additional increase in positive voltage across C186. When the secondary-winding output swings negative, CR186 turns off. Then CR148 conducts and clamps the negative excursion at C186 to the voltage level of the Z-Axis Amplifier output. The result is a square-wave output from the Modulator, with the amplitude determined by the difference between the Z-Axis Amplifier output level and the setting of R192 (Cutoff). (See waveform 2 on Fig. 6-2.) This square wave is coupled through C186 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 (see Fig. 6-2) is limited by CR182 to the Cathode Supply level while the negative excursion is coupled through CR180 to C180. Quiescently, C180 will charge to about −1500 volts through R182. After repetitive cycles from C186, C180 will

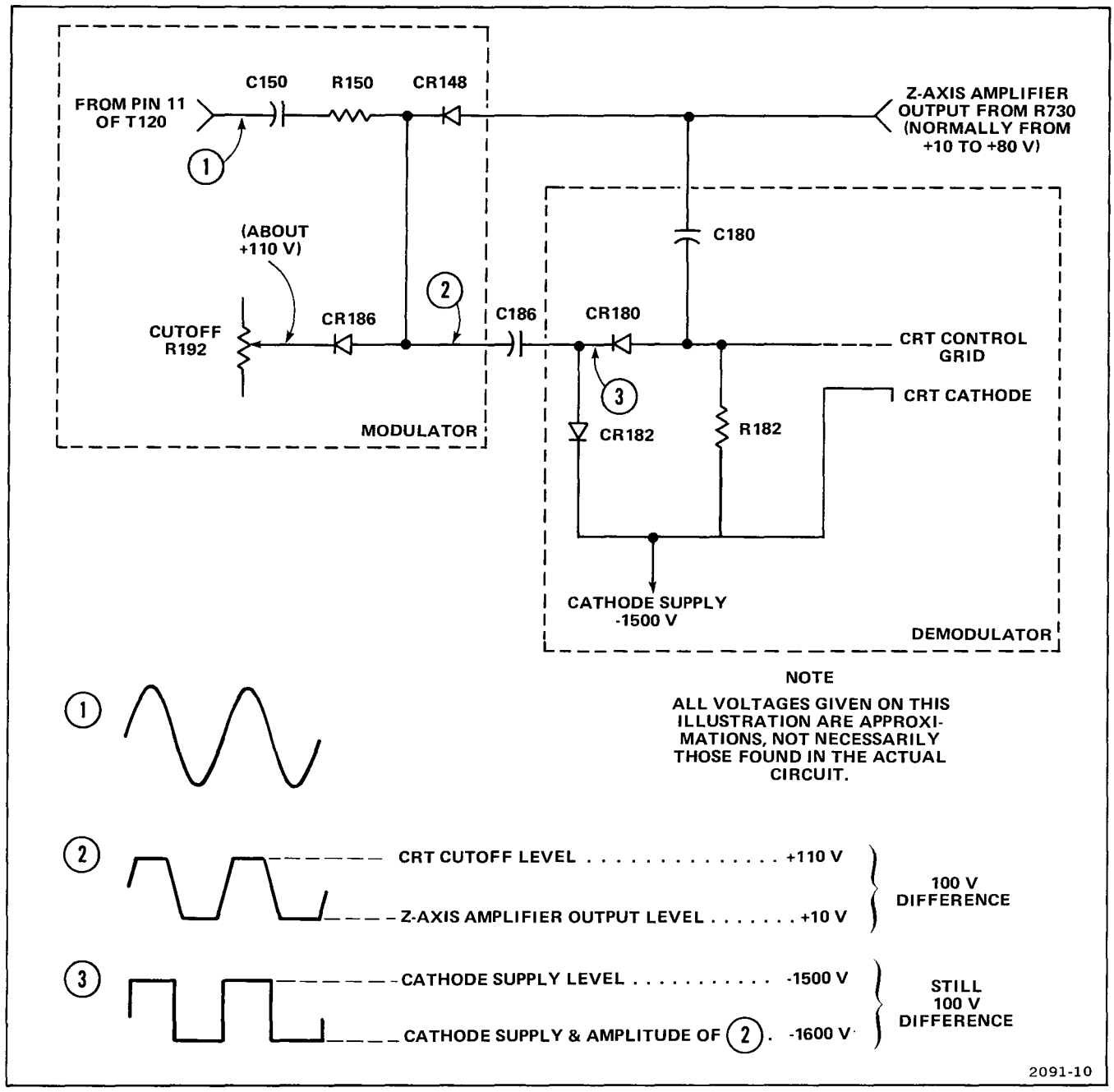


Fig. 6-2. Simplified diagram of Dc Restorer circuit.

charge to the negative level of waveform 3. Capacitor C180 holds the voltage constant at the crt control grid, and also provides a path for the ac portions of the Z-Axis Amplifier output signal to be coupled to the crt control grid.

The remainder of the components not shown in the simplified diagram provide protection for the active components and the Z-Axis Amplifier in the event of a high-voltage arc or other malfunction.

Crt Control Circuits

In addition to the INTENSITY control discussed previously, a front-panel FOCUS control and internal Astig adjustment have been incorporated for obtaining an optimum crt display. Potentiometer R175B (FOCUS) provides the correct voltage for the second anode in the crt. Proper voltage for the third anode is obtained by adjusting potentiometer R170 (Astig). In order to obtain optimum spot size and shape, both R175B (FOCUS) and R170 (Astig) are adjusted to provide the proper electrostatic lens configuration in the crt.

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Potentiometer R165 (Geom) varies the positive level on the horizontal deflection plate shields to control the overall geometry of the display. Potentiometer R145 (TRACE ROTATION) permits adjustment of the dc current through beam-rotation coil L145 to align the display horizontally.

Potentiometer R173 (Y-Axis Align) varies the dc current through beam rotation coil L172 to align the crt vertical (Y) axis. Beam-rotation coil L172 is located between the vertical and horizontal deflection plates to allow rotation of the vertical (Y) axis only.

STORAGE CONTROL AND OUTPUT 5 6

Storage Cathode-Ray Tube

The cathode-ray tube (crt) is a standard transmission half-tone storage tube. The collector mesh is a coarse mesh that accelerates electrons toward the target area. The target (storage mesh) is a fine mesh with a highly insulative dielectric layer deposited on it. Storage occurs in the dielectric layer. The flood guns cover the entire storage target with a continuous stream of low-velocity electrons that are prevented from reaching the phosphor screen unless a display has been written on the storage mesh.

Erase-Pulse Generator

The Erase-Pulse Generator consists of three timing circuits. The timing circuit outputs are summed together to form the composite erase pulse that appears on the storage mesh (see Fig. 6-3). T1 (the 50 ms, approximately 120-volt pulse), is derived from monostable multivibrator U820, which is formed by RC network R838, C840, and switching transistor Q835, returns the storage mesh to the 0-volt level for approximately 10 ms at the end of T1. T3, which is determined by U850 and is initiated at the start of T1, maintains control over the storage mesh after T1 and T2 have passed and sets the storage mesh preparation level for the remainder of the erase cycle. The T1, T2, and T3 signals control diode gates CR950, CR952, CR954, CR956, CR960, and CR962 which in turn supply the control currents to the summing point at the base of Q1060 in the Storage Mesh Amplifier stage.

The output of U810B is used to trigger U820 to initiate an erase cycle. If S870 (ERASE) is held depressed longer than one erase cycle, the erase cycle will repeat, thereby generating multiple erase cycles to clear the crt of such problems as residual images.

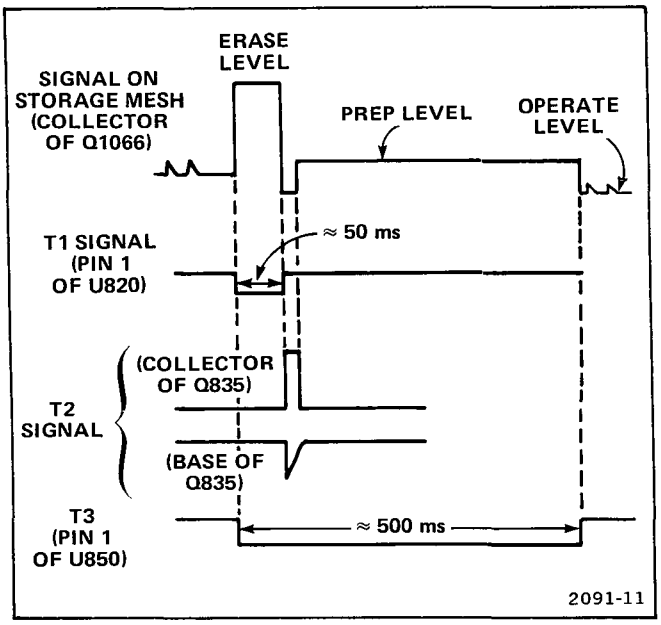


Fig. 6-3. Idealized waveform ladder showing the outputs of the Erase Pulse Generator.

When an erase cycle is initiated, pin 1 of U850 goes low and causes C890 to discharge through CR890. When pin 1 of U850 returns positive (at the end of the erase cycle), and if S870 (ERASE) is still depressed, C890 momentarily pulls pin 6 of U810B positive, then recharges negative because of the current in R870. As U810B pin 6 swings to its low level, the output of U810B pin 4 goes high again and triggers U820. This cycle will repeat as long as S870 (ERASE) is held depressed. Multiple erase cycles cannot be obtained when using the remote erase feature (Option 10 instruments).

Option 10 (Remote Program Connector). Pin 6 of U850 drives Erase Interval Output Gate U810A to generate an Erase Interval Out signal at pin 7 of J20 on the REMOTE PROGRAM connector. The output from U850 is also used as a lockout signal for U820 and U895 during the erase cycle.

Transistor Q810, along with C810 and R810, form a circuit to initiate an erase cycle whenever the 607A storage mode is changed from store to non-store. The erase cycle is initiated by depressing the front-panel ERASE pushbutton, or may be initiated by a logic signal applied to pin 18 of J20 in Option 10 instruments.

Variable-Persistence Pulse Generator

Transistors Q872 and Q876 are connected as a relaxation oscillator that generates sharp positive pulses (see Fig. 6-4) at a 100 Hz rate. The timing components for the relaxation oscillator are R875 and C886. The sharp

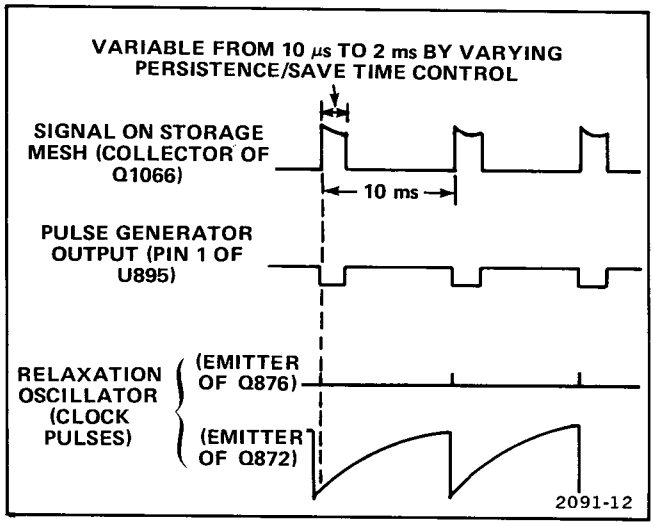


Fig. 6-4. Idealized waveform ladder showing the output and internal clock pulses of the Variable-Persistence Pulse Generator.

positive pulses from the emitter of Q876 are used to trigger monostable multivibrator U895. The on time of U895 is controlled by C895, R892, R894, and potentiometer R895 (PERSISTENCE/SAVE TIME). The output of U895 controls diode gates CR973 and CR975, which subtract current from the summing point at the base of Q1060 in the Storage Mesh Amplifier, thus modulating the storage mesh. The amount of current to be subtracted is set by potentiometer R975 (Pulse Ht).

Turning R895 (PERSISTENCE/SAVE TIME) fully counterclockwise (maximum persistence position) closes S895A and Grounds the output of the relaxation oscillator through R882, thereby preventing U895 from being triggered.

Pulling the PERSISTENCE/SAVE TIME knob out to the save mode causes the output of Save Input Gate U810D to bias CR984 on and CR975 off. Thus, the output of U895 is fed to the flood-gun cathode through CR986. With the output of U895 modulating the flood-gun cathode current instead of the storage mesh, the stored image can now be observed without complete loss of the save feature by adjusting potentiometer R895 (PERSISTENCE/SAVE TIME). The maximum average flood-gun cathode current corresponds to the fully clockwise position (minimum persistence) of potentiometer R895 (PERSISTENCE/SAVE TIME). When potentiometer R895 (PERSISTENCE/SAVE TIME) is fully counterclockwise, U895 is not triggered and the flood-gun cathode current is zero, which results in maximum save time. During the time U895 is not triggered (PERSISTENCE/SAVE TIME control fully counterclockwise), the flood-gun cathode is positive with respect to the flood-gun anode level (i.e., approximately +35 volts) and no flood-gun cathode current flows (Q996 is turned off).

Store/Non-Store Input Gate

The Store/Non-Store Input Gate consists of U810C which initiates an erase cycle each time the storage mode is changed from store to non-store or vice versa.

When the non-store mode is selected, either by releasing S910 (STORE) to the out position, or remotely by a logic signal through pin 6 of J20 in Option 10 instruments, pin 10 of U810C goes high and turns on Q810 in the Erase Pulse Generator. Consequently, pin 6 of U810B goes low and triggers U820, which initiates an erase cycle. After a short time, due to the delay introduced by C904, pin 4 of U820 is then pulled high through CR812 to disable U820 and prevent any additional erase pulses during the erase cycle. The high at pin 10 of U810C also turns on Q990 in the Flood-Gun Cathode Regulator. Transistor Q996 is turned on coincidentally with Q990 for about 50 ms by the erase pulse from pin 6 of U820 through R1000 and CR1000. Thus, cathode current flows and the crt phosphor is flooded with electrons for 50 ms. After 50 ms, Q990 turns Q996 off and R998 holds the flood-gun cathode positive with respect to the flood-gun anode, which stops the flow of cathode current.

When the store mode is selected by pushing S910 (STORE), pin 10 of U810C goes low and pulls pin 6 of U810B low through CR814 and C814, thereby initiating an erase cycle. Capacitor C814 then charges through R806 which allows pin 6 of U810B to return high and enable the Erase Pulse Generator to generate another erase cycle.

Save Input Gate

The Save Input Gate, composed of U810D, disables the Z-Axis Amplifier and the Erase Pulse Generator, and switches the output of the Variable-Persistence Pulse Generator from the Storage Mesh Amplifier to the Flood-Gun Cathode Regulator.

When the save mode is selected, either by pulling out the PERSISTENCE/SAVE TIME knob to close S895B, or remotely by a logic signal applied to pin 20 of J20 in Option 10 instruments, pin 13 of U810D goes high. Consequently, pin 4 of U820 goes high to disable the Erase Pulse Generator while Q700 in the Z-Axis Amplifier is biased on to disable the Z-Axis Output Amplifier. The high at pin 13 of U810D also biases CR984 on and CR975 off, which feeds the Variable-Persistence Pulse Generator output through CR986 to the base of Q990 in the Flood-Gun Cathode. Thus, the Variable-Persistence Pulse Generator output now modulates the flood-gun cathode current instead of the storage mesh as described in the Variable-Persistence Pulse Generator discussion.

Input-Output Gate Protection

Resistors R802, R852, R860 and R912, and diodes CR801, CR802, CR852, CR853, CR860, CR861, CR910, and CR912 provide limited protection against accidental line transients as an additional voltage drop is introduced.

Storage Element Supplies

The storage-element supply provides operating and control voltages for the storage and flood-gun crt elements.

Flood-Gun Cathode Regulator. Transistors Q990 and Q996 form a clamped switching circuit. When Q996 is on, the flood-gun cathode is held at +15 volts and cathode current flows. With Q996 off, R998 holds the flood-gun cathode positive with respect to the flood-gun anode, and no cathode current flows.

Flood-Gun Anode Regulator. Transistor Q1010 forms a shunt regulator with the output voltage set by R1014 and R1012 to about +35 volts. During an erase cycle, the flood-gun anode voltage is raised by the added current drawn by R1018. Normally, the additional R1018 current is supplied by pin 1 of U850. However, when the output (pin 1) of U850 goes low for the duration of the erase cycle, CR1018 turns off, CR1016 turns on, and the additional current is then supplied from the summing point (base of Q1010).

Collimation Electrode Regulators. Transistor Q1036 with R1034, R1032, and R1030 forms a shunt regulator. Potentiometer R1030 (CE 1) sets the output voltage to collimation electrode 1. When the 607A is changed from store to non-store mode, Q1026 is momentarily turned on. Consequently, the additional current from the base of Q1036 is switched to ground through R1026, which raises the voltage at collimation electrode 1.

Transistor Q1050 with R1052, R1054, and R1055 form a shunt regulator. Potentiometer R1054 (CE 2) sets the output voltage to collimation electrode 2. Zener diode VR1040 supplies a regulated +135 volts to potentiometer R1042 (CE 3), which sets the output voltage to collimation electrode 3.

Storage Mesh Amplifier. Transistors Q1060 and Q1066 form an operational amplifier that is used as a current-to-voltage conversion amplifier to control the storage mesh. The output dc level of the amplifier is set by R970 (OPERATE LEVEL) and R965 (Op Level). In addition to the input signals that modulate the supply during the erase cycle and variable persistence modes of operation, an additional input in the form of a modified ramp is made to the summing point (base of Q1060). The modified ramp provides more consistent storage performance and is supplied from relaxation oscillator Q872 and Q876.

Option 8 (Faster Writing Speed Storage Crt). This option changes the storage cathode-ray tube to a faster writing speed version with some sacrifice in resolution. The Storage Output stages are slightly modified to provide optimum performance with the different storage crt.

Collimation electrode 2 (CE 2) is connected directly to CE 1, and is not independently variable. CE 3 Regulator is adjusted to a different level than the standard version, and the Collector Mesh (COL) is fixed at a different dc level. Operation of the various stages is otherwise identical with the standard instrument.

LOW VOLTAGE ◇7

Power Input

Power is applied to the primary of transformer T15 through fuse F10, thermal cutout S10, power switch S12, and line-voltage selector plug P15 (or P17). The line-voltage selector plug allows changing the primary-winding taps of T15 to fit different line-voltage requirements.

Low-Voltage Rectifiers and Unregulated Outputs

The full-wave bridge rectifiers and associated filter components in the secondaries of T15 provide filtered dc voltages. The unregulated +20-volt output goes to the high-voltage transformer, where it is fuse protected.

Low-Voltage Regulators

+15 Volt Supply. The +15-Volt Supply, besides providing power to circuitry throughout the instrument, provides a reference-voltage source to establish operating levels for the feedback regulators in the −30-Volt Supply and the +5-Volt Supply. The regulator for the +15-Volt Supply is a feedback amplifier system that operates between ground and the unregulated +20-volts. Current to the load is delivered by series-pass transistor Q30 and the supply voltage is established by the drop across R38, R40, and R42, which is compared to the voltage drops across VR50 and the emitter-base junction of Q50. Any variation in output voltage due to ripple is amplified by Q50 and Q32. The current change through the load is applied to the base of Q30 which maintains a constand output. The output of the supply is set to exactly +15 volts by potentiometer R40 (+15 V). During initial turn on, CR30 biases Q30 on. Sufficient voltage is then developed across shunt resistor R34 to start the High-Voltage Power Supply.

Transistor Q32 protects the supply in the event of a current overload. The overload will cause the voltage across R36 to become high enough to overcome the voltage drops across CR40, CR41 and the base-collector junction of Q32. At this time, Q32 becomes saturated and turns off Q30, thereby current-limiting the supply.

−30-Volt Supply. The regulator for the −30-Volt Supply consists of series-pass transistor Q70 and error amplifier Q80. This is a feedback amplifier system similar to that just described for the +15-Volt Supply, except that the regulator is located in the return side of the supply instead of the output.

The center of resistive divider network R86 and R88 is set by error amplifier Q80 to be zero volts with respect to ground during normal operation. Any variation in output from the −30-Volt Supply is coupled to the error amplifier, which changes the bias of the series-pass transistor. This change in bias, and the resulting change in conduction of the regulator, alters the voltage at the −30-Volt Supply return, which maintains the −30-Volt Supply at the proper level.

Transistor Q76 protects the −30-volt series regulator Q70 if excess current is demanded from this supply. All current from this supply must flow through R72. When excess current is demanded, the voltage drop across R72 increases enough to forward bias CR74. The resulting current through this diode takes control away from Q80, and will turn on Q76 while turning off Q70, thus limiting the supply current to a safe level.

+5-Volt Supply. The regulator for the +5-Volt Supply consists of series-pass transistor Q60 and error amplifier Q64. Operation of this feedback amplifier system is similar to that described for the +15-Volt Supply. Current limiting, in the event of an overload, is provided by R56.

SWEEP (OPTION 4) ◈8

Trigger and Sweep Generator

The Trigger and Sweep Generator produces a positive-going sawtooth voltage that is amplified by the Horizontal (X) Amplifier to provide sweep deflection in the crt. Six sweep rates are provided in decade steps from 0.1 s through 1 μs/div. A negative-going gate is produced at the same time the sawtooth is being produced to unblank the crt.

The Trigger and Sweep Generator is composed of Tektronix-manufactured integrated circuit U1130 and its associated discrete circuit components. Integrated circuit U1130 contains the trigger generator, the sweep-gating circuit, and an operational amplifier to form the basis of a Miller integrator. Power is applied to pins 7 and 12 to establish the operating levels within the device. An internal reference Zener diode provides 6.4 volts between pins 8 and 9 for operation of external controls; pin 8 provides a level of two diode junctions above the negative level at pin 12.

The timing components are selected by S1130 (SEC/DIV) which permits one of six nominal sweep rates to be chosen. Potentiometer R1145 (VARIABLE) adjusts the timing current to provide a continuously variable sweep rate.

Pins 10, 11, 13, and 14 are associated with the Trigger Generator portion of U1130. The triggering signal is applied to a field-effect transistor (FET) input at pin 13. Potentiometer R1118 (TRIG SLOPE/LEVEL) at pin 14 controls the internal comparators that determine the level and slope at which the internal Schmitt multivibrator switches states, initiating a sweep trigger. Differentiating capacitor C1112 at pin 11 determines the trigger-pulse width.

For normal triggered operation, −8.2 volts is applied to pin 10 to hold the bright-baseline auto circuit inactive. In this mode, when the triggering signal is lost, a sweep cannot be produced. When internal switch S1109 (Trig Mode) is set to Auto, the −8.2 volts is disconnected to permit a free-running sweep, or bright baseline, to be produced. Pin 10 moves positive as C1110 charges, and this positive potential then acts as the triggering signal. A new sweep will be initiated immediately following the sweep hold-off time. However, with S1109 (Trig Mode) in the Auto position, any incoming triggering signal will discharge C1110. If the signal is occurring at a rate greater than about 20 Hz, C1110 will be held below the auto-trigger level to permit a triggered sweep to be produced.

Pins 1 through 6 and pin 16 are associated with the Sweep Generator portion of U1130. Upon receipt of a trigger from the Trigger Generator, the sweep gate turns on. While the gate is on, CR1130 is turned off by a high logic level at pin 2, allowing the current through external R_t components R1130 and R1146 to be switched to timing capacitors C1130 and C1138. Pin 5 is the operational amplifier null point, thus the nearly constant timing current charges the capacitors linearly, producing a linear, negative-going sawtooth voltage at pin 4. When the sawtooth reaches a level determined by R1115 (Swp Length), the sweep terminates. At this point, the sweep gate turns off, turning on CR1130 and quickly discharging the timing capacitors. A short-duration trigger-lockout period, (to allow the sweep generator to reset and stabilize), is provided by C1124 and C1125 at pin 3.

Sawtooth Amplifier

Operational amplifier system Q1160 and Q1164 provides amplification of the sweep sawtooth to a suitable amplitude to meet the sensitivity requirements of the Horizontal (X) Amplifier. Potentiometer R1165 (Swp Cal) permits calibrating the sweep to the crt graticule. The base of Q1160 is the null point, R1150 is the R_{in} element, and R1155 is the feedback element. A positive-going sawtooth is produced at the emitter of Q1164.

Unblanking-Gate Output Amplifier

The negative-going gate produced at pin 16 of U1130 is amplified by Q1175 and Q1178. The negative-going gate produced at the collector of Q1178 is applied to R735 in the Z-Axis Amplifier circuit to turn on the crt during the sweep.

MAINTENANCE

This section of the manual contains information for performing preventive maintenance, troubleshooting, and corrective maintenance for the 607A Storage 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.

CABINET PANEL REMOVAL (Options 6, 23, or 28)

WARNING

Disconnect power to the instrument before removing the cabinet panels to avoid electric-shock hazard.

The cabinet panels are held in place by slotted fasteners. To remove the panels, turn each fastener counterclockwise a quarter turn with a large screwdriver. Lift the panels away. Always operate the instrument with the panels in place to protect the interior from dust.

CLEANING

The 607A Storage 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 and prevents efficient heat dissipation. It also provides an electrical conduction path which may result in instrument failure. The cabinet panels provide protection against dust in the interior of the instrument.

CAUTION

Avoid the use of chemical cleaning agents which might damage the plastics used in the 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.

Cathode-Ray Tube (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 607A Storage Monitor should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged or 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, it is important that the cause of overheating 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 4, 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 607A Storage 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 6, Theory of Operation, for this information.

TROUBLESHOOTING AIDS

Diagrams

Complete schematic diagrams are given on the foldout pages in Section 10, Diagrams and Circuit Board Illustrations. The component number and electrical value of each component in this instrument are shown on these diagrams. Values that have been selected for optimum circuit performance are noted "SEL" rather than the value. See the Replaceable Electrical Parts list for these values. (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 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 blocks, as indicated by the wide shaded lines. These functional blocks are described in detail in Section 6, 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 10, Diagrams and Circuit Board Illustrations, to aid in locating a defective circuit. The shaded blocks on the Troubleshooting Chart indicate circuit(s) that may cause the indicated malfunction. The circuits listed are discussed in detail in Section 6, Theory of Operation.

Adjustment and Test Point 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 10, Diagrams and Circuit Board Illustrations.

Component Color Coding

The instrument contains brown 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. 7-1). Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

COLOR CODE

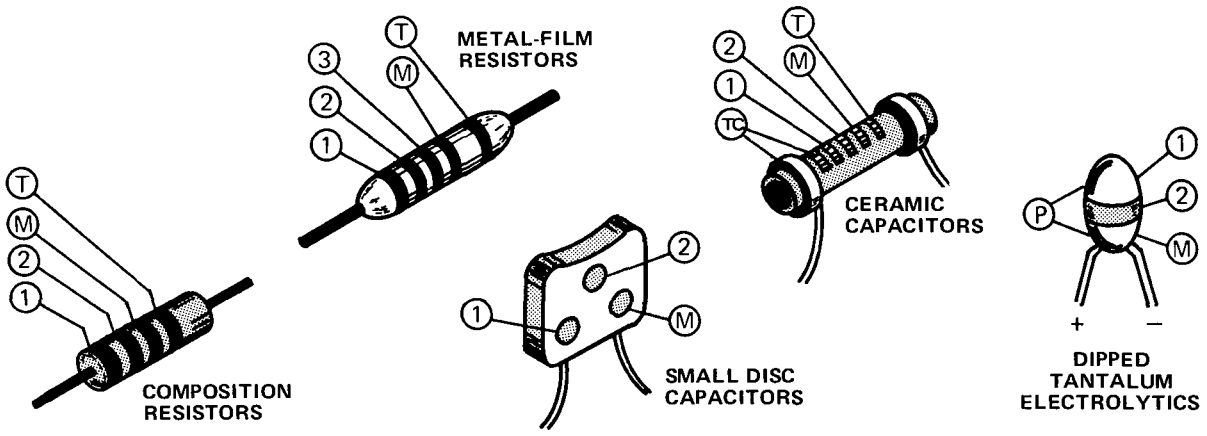
(1) (2) AND (3) - 1st, 2nd, AND 3rd SIGNIFICANT FIGS.

(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 10 pF	
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

Fig. 7-1. Color code for resistors and capacitors.

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. 7-1).

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.

Cam-Switch Contact Identification

Cam switches shown on the diagrams are coded to indicate the position of the contact in the complete switch assembly counting from the front, or knob end of the switch, toward the rear. The contact closure chart on the diagrams indicates when each contact is closed.

Semiconductor Lead Configurations

Figure 7-2 shows the lead configurations of the semiconductors in the 607A Storage Monitor.

Multi-Connector Holders

The multi-connector holders are keyed either with two triangles, one on the holder and one on the circuit board, or with one triangle on the holder and a dot 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. 7-3).

Troubleshooting Equipment

The following equipment, in addition to that listed in the Performance Check and Adjustment section, is useful for troubleshooting the 607A Storage Monitor:

Semiconductor Tester.

Description: Dynamic-type tester.

Purpose: To test the semiconductors used in this instrument.

Recommended type: TEKTRONIX Type 576 or equivalent.

Multimeter.

Description: 10 MΩ input impedance and 0 to 300 volts range, ac and dc; ohmmeter, 0 to 50 MΩ. Accuracy, within 3%. Test probes must be insulated to prevent accidental shorting.

Purpose: To check voltages and for general troubleshooting.

Test Oscilloscope.

Description: Frequency response, dc to 10 MHz minimum; deflection factor, 1 mV/div to 5 V/div. A 10X, 10-MΩ voltage probe should be used to reduce circuit loading for voltage measurements.

Purpose: To check operating waveforms.

Recommended type: TEKTRONIX 5440 Oscilloscope with 5A45 Amplifier, 5B40 Time Base, and P6105 1-meter probe; or, TEKTRONIX 7603 Oscilloscope with 7A15A Amplifier, 7B50A Time Base, and P6053B 3.5-foot probe.

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 not 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 indicate a trouble that does not exist. If there is any question about the correct function or operation of any control on the 607A, 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 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 Facilities, section 3038, "Signal Transmission Between Appliances".

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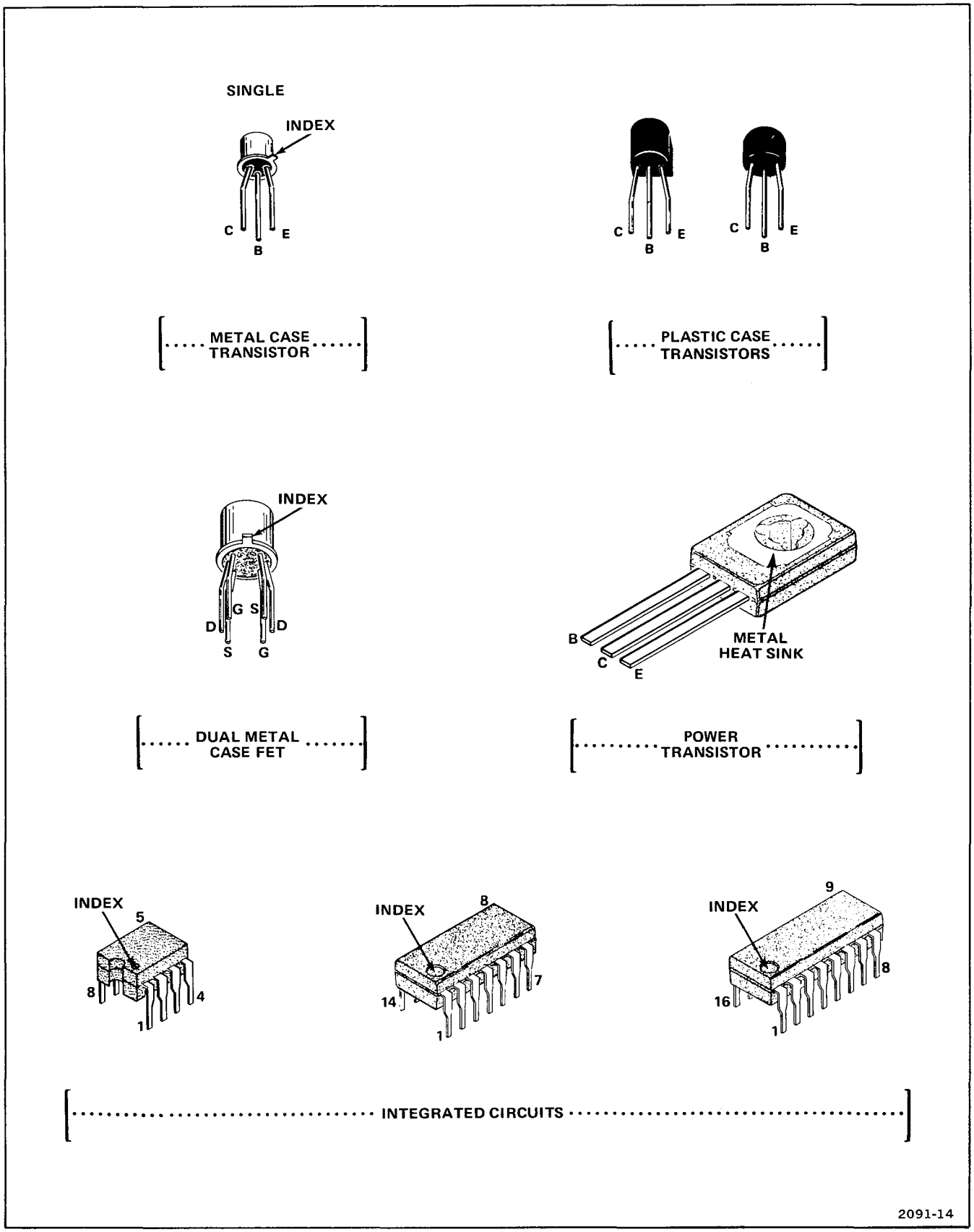

Fig. 7-2. Semiconductor lead configurations.

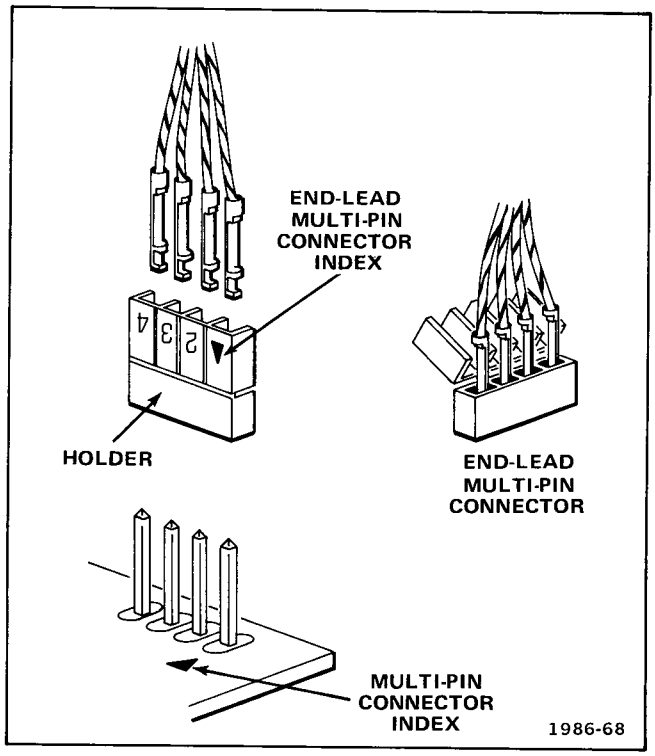

Fig. 7-3. Orientation of multi-connector holders.

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 4, 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 (for example, a shorted decoupling capacitor on one of the circuit boards), and may also affect the operation of other circuits. Table 7-1 lists the output voltage range and typical ripple of the power supplies in the instrument. These voltages are measured between the power-supply test points and ground (see the Adjustment and Test Point Locations foldout page in Section 10, 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 4, Performance Check and Adjustment, to adjust the power supplies.

Figure 10-10 in Section 10, 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 of the circuit in which the trouble is suspected, as listed underneath the Step. The shaded blocks on the Troubleshooting Chart indicate the circuit(s) that may cause the malfunction. The circuits listed are discussed in detail in Section 6, Theory of Operation. After the defective circuit has been located, proceed with Steps 6 and 7 of the 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 10, Diagrams and Circuit Board Illustrations.

Table 7-1

POWER-SUPPLY OUTPUT VOLTAGES

Power Supply	Test Point	Output Voltage Range	Typical Ripple (peak-to-peak)
+5 V	TP+5 V	+4.75 to +5.25 V	5 mV or less
+15 V (Adjustable)	TP+15 V	+14.92 V to +15.08 V	5 mV or less
−30 V	TP−30 V	−29.10 V to −30.90 V	5 mV or less
+80 V	TP+80 V	+75 V to +90 V	0.5 V or less
+170 V	TP+170 V	+160 V to +190 V	1 V or less
−1500 V (Adjustable)	Pin 2 of crt socket	−1470 V to −1530 V	

@

NOTE

Voltages and waveforms given in Section 10, Diagrams and Circuit Board Illustrations, are not absolute and may vary slightly between 607A Storage Monitors. To obtain operating conditions similar to those used to take these readings, see the appropriate schematic under the heading "Voltage and Waveform Conditions".

7. Check Individual Components

The following procedures describe methods of checking individual components in the 607A Storage 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

Always disconnect the Monitor from the power source before replacing components to avoid electric-shock hazard.

Fuses. Check for open fuses by checking continuity with an ohmmeter.

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 to troubleshooting circuits using integrated circuits. In addition, operating waveforms, logic levels, and other operating information for the integrated circuits are given in Section 6, Theory of Operation and Section 10, 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. Special IC test tips are also available for most probes (see your Tektronix Products catalog for further information about probe tips).

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 1 K 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 9, Replaceable Electrical Parts. Normally, resistors do not need to be replaced unless the measured value varies widely from the specified value.

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 607A Storage 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 adversely affect instrument performance.

Special Parts

Some components of the 607A 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; for example, VR239).

4. Tektronix part number.

SOLDERING TECHNIQUES

WARNING

To avoid electric-shock hazard, 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 rosin-core, electronic-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 (see Fig. 7-4). Use a solder-removing wick to remove excess solder from connections or to clean circuit-board pads.

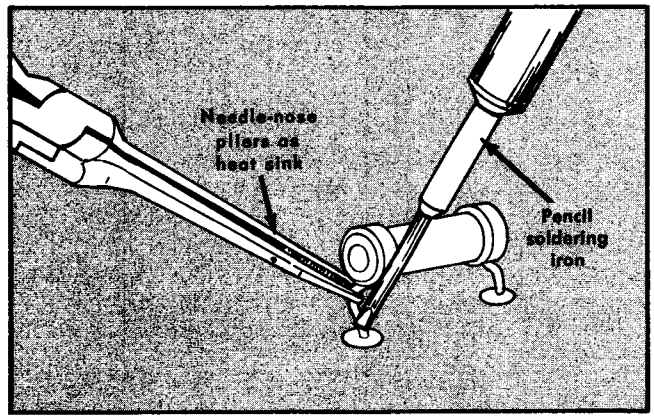

Fig. 7-4. Use of a heat sink to protect components during soldering.

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 tip 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 boards 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 tip 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

Always disconnect the Monitor from the power source before replacing components to avoid potential electric-shock hazard.

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.

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 9, Replaceable Electrical Parts.

All boards in this instrument are mounted on the chassis. Removal and replacement procedures for the Z-Axis Amplifier, and High- and Low-Voltage Power Supply boards are included here. The remaining boards are easily removed and replaced by first removing the securing screws and then the interconnecting wires. Replacement is accomplished in the reverse order of removal.

Z-Axis Amplifier Board—A2. Remove and replace the Z-Axis Amplifier board as follows (see Fig. 7-5):

1. Remove the two securing screws to loosen the Z-Axis Amplifier board.

2. Slide the board sideways toward the front of the instrument.

3. Unsolder the attaching wires from the left and top edge of the board (see Soldering Techniques in this section).

4. Lift the top of the board up through the slot in the chassis assembly and slide the board out of the instrument.

5. Unsolder the remaining wires to free the board.

6. Replace the Z-Axis Amplifier board in the reverse order of removal.

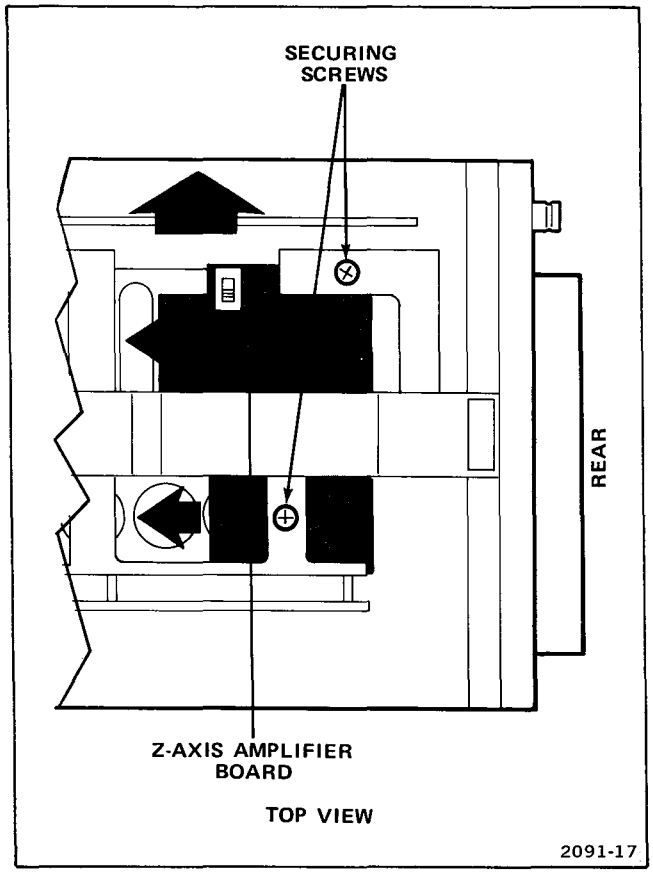

Fig. 7-5. A2—Z-Axis Amplifier board removal and replacement.

High-Voltage Power Supply Board—A3. Remove and replace the High-Voltage Power Supply board as follows (see Fig. 7-6):

1. Disconnect the crt anode lead at the anode plug.

WARNING

Momentarily ground the jack (crt) end of the anode plug to the chassis to dissipate any stored charge.

2. Remove the chassis-mounted clamp (on the left side of the board) that holds transistor Q130 against the heat sink.

3. Remove the three securing screws that hold the board to the chassis.

4. Gently lift the board up and over the chassis rail.

5. Unsolder all attached wires to free the board (see Soldering Techniques in this section).

6. Replace the High-Voltage Power Supply board in the reverse order of removal. Refer to Semiconductors in this section for instructions on replacing the transistor (Q130) heat sink.

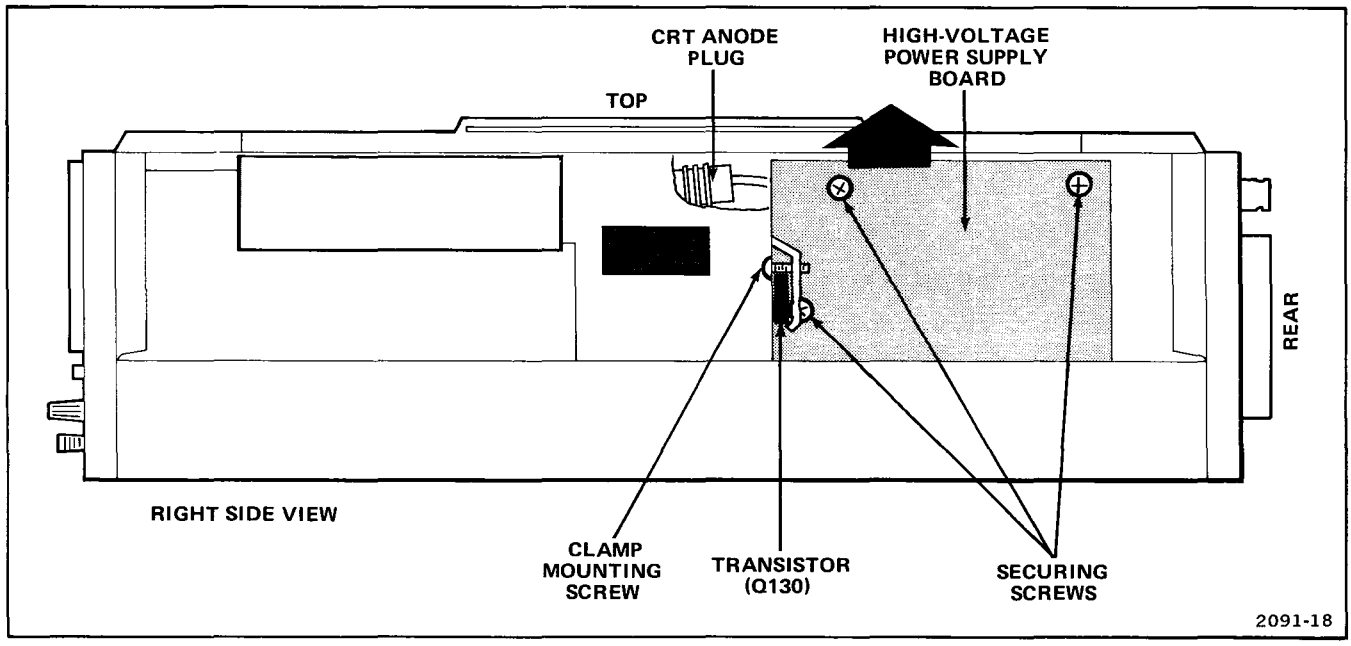

Fig. 7-6. A3—High-Voltage Power Supply board removal and replacement.

Low-Voltage Power Supply Board—A5. Remove and replace the Low-Voltage Power Supply board as follows (see Fig. 7-7):

1. Reach around behind the power transistors (Q30, Q60, and Q70) and release the clips that hold the transistor cases to the heat sinks.

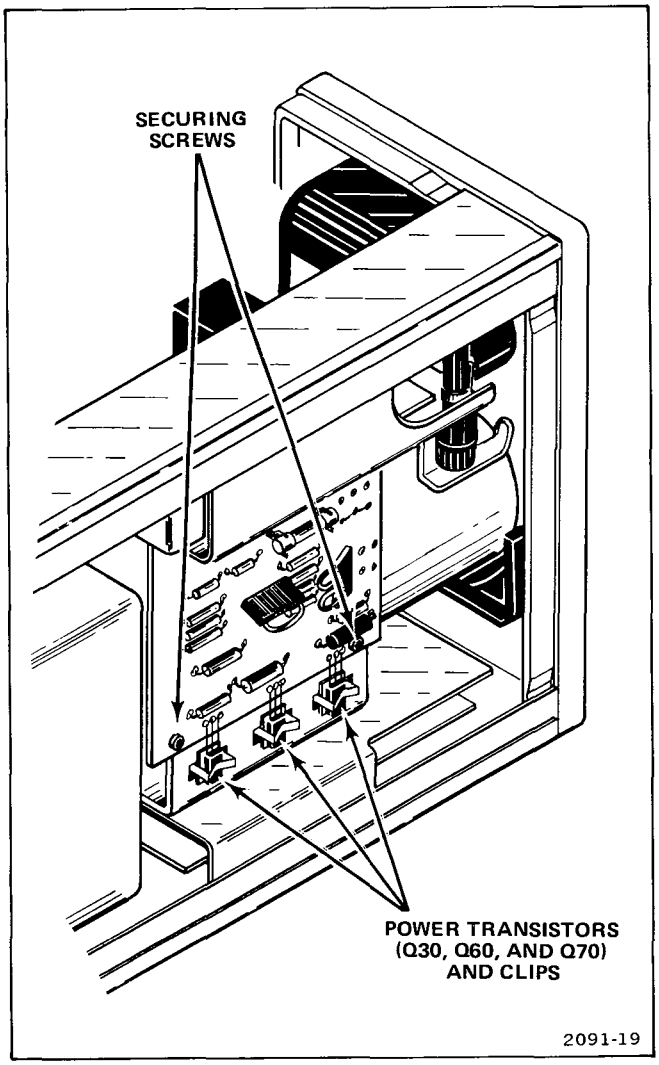

Fig. 7-7. A5—Low-Voltage Power Supply board removal and replacement.

2. Unsolder the wires from the board (see Soldering Techniques in this section).

3. Remove the two securing screws to free the board from the instrument.

4. Replace the Low-Voltage Power Supply board in the reverse order of removal. Refer to Semiconductors for instructions on replacing the transistor (Q30, Q60, and Q70) heat sinks.

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.

CAUTION

The POWER switch must be turned off before removing or replacing semiconductors to prevent damage to the instrument.

Replacement semiconductors should be of the original type or a direct replacement. Lead configurations of the semiconductors used in this instrument are shown in Fig. 7-2.

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 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 holes in the circuit board. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace the 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 the eyes. Wash hands thoroughly after use.

To replace one of the power transistors mounted on the chassis adjacent to the Low-Voltage Power Supply board, first unsolder the leads. Then, remove the push-on clip that clamps the transistor to the chassis. Remove the defective transistor.

To replace the transistor mounted on the chassis adjacent to the High-Voltage Power Supply board, first unsolder the leads. Then remove the chassis clamp to remove the defective transistor.

An extracting tool should be used to remove the 8-pin integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc.; order Tektronix Part No.

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 IC. Try to avoid having one end disengage from the socket before the other.

Cathode-Ray Tube Removal

Remove the cathode-ray tube (crt) as follows (see Fig. 7-8):

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.

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

2. Remove the left and right cabinet panels, if present (see Cabinet Panel Removal in this section).

3. Disconnect the four leads from the crt X and Y deflection plate pins.

NOTE

The red and black leads entering the crt shield from the Deflection Amplifier board and the 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 unsoldered.

4. Disconnect plug P1000 from the Storage board and the anode lead from the crt anode plug.

5. Remove the five 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 support will slide out with the crt.

8. Remove the crt front support and gently pull the crt out from the front of the instrument while guiding plug P1000 and the crt anode plug through the holes in the crt shield.

NOTE

Be careful not to lose the soft plastic crt faceplate supports if they should become detached during crt removal.

9. Slide the crt center support toward the rear of the crt to remove it.

Cathode-Ray Tube Replacement

Replace the cathode-ray tube (crt) as follows (see Fig. 7-8):

1. Slide the crt center support to the bottom of the shield with the four legs facing the back of the instrument.

2. Press the crt front support into the front-panel recess.

3. Insert the four soft plastic crt faceplate supports into the corners of the crt front support.

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

5. Feed plug P1000 and the crt anode plug through the appropriate holes in the shield.

6. Fully insert the crt through the crt center support and into the shield. Make sure the four soft plastic crt faceplate supports are properly positioned in the corners of the crt front support.

7. Connect plug P1000 to the Storage board and the crt anode plug to the mating jack.

8. Mount and fasten the bezel and implosion shield to the front panel with the two bezel securing screws.

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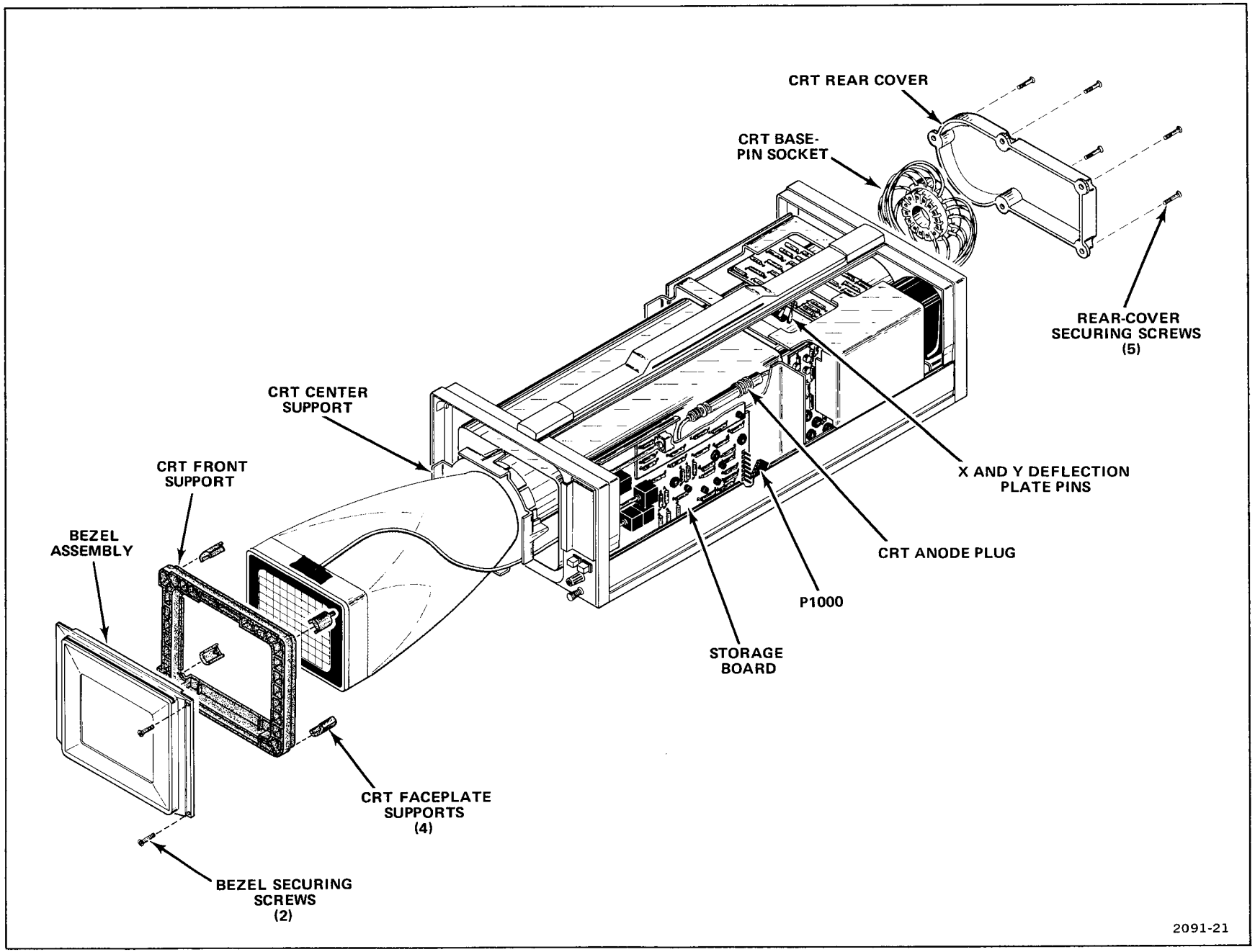

Fig. 7-8. Cathode-ray tube (crt) removal and replacement.

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

10. Connect the four leads to the proper crt X and Y deflection pins.

NOTE

The replacement crt will require that the monitor be readjusted. Refer to Section 4, Performance Check and Adjustment.

Power Transformer Replacement

Replace the power transformer only with a direct replacement Tektronix transformer. After the transformer has been replaced, check the power supply output voltages and the instrument performance as outlined in section 4, Performance Check and Adjustment.

Interconnecting 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 No. 040-0542-00.

To replace a damaged pin on a circuit board, first disconnect any pin connectors. Then unsolder (see Soldering Techniques) the damaged pin and pull it from the board with a pair of pliers, leaving the ferrule (see Fig. 7-9) in 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. Solder the pin to the circuit board on each side of the 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.

Sweep Board—A6 (Option 4 only). Remove and replace the optional Sweep board as follows:

NOTE

When removing wires from a circuit board, always tag the wire and the corresponding connection point on the circuit board.

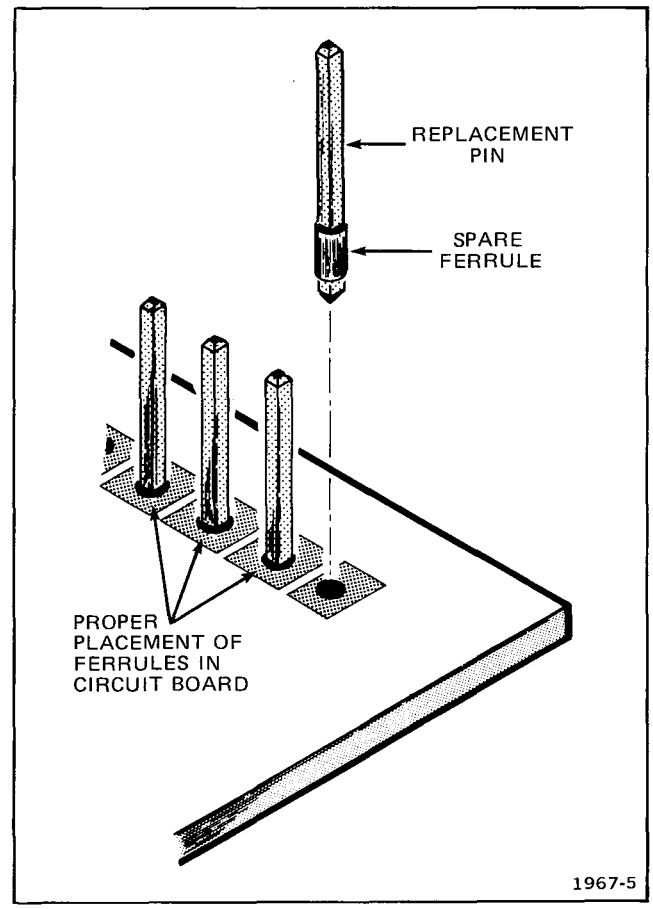

Fig. 7-9. Exploded view of circuit board pin and ferrule.

1. Disconnect all wires connected to the component side of the circuit board.

2. Remove the four screws holding the board to the chassis.

3. Slide the board toward the rear of the instrument to free the front-panel controls.

4. Lift the board out of the instrument. Do not force or bend the circuit board.

5. To replace the board, reverse the order of removal.

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INSTRUMENT OPTIONS

INTRODUCTION

Your instrument may be equipped with one or more instrument options. These options are factory-installed additions or changes to the standard instrument to more closely adapt it to your particular application needs.

A brief description of each available option is given in the following discussion. Refer to Table 8-1 for location of option information in this manual. Further information is included in the Tektronix catalog, or contact your local Tektronix representative.

OPTION 1

Includes an internal, unlighted, 8 X 10-division (0.9 cm/div) graticule.

OPTION 4

Includes an internal X-axis time-base (sweep) with rates from 0.1 s/div to 1 μs/div in decade steps, plus an uncalibrated VARIABLE control provides sweep rates between the calibrated decade steps and extends the slowest range to at least 1 s/div. The instrument includes internal selection of X-Y or Y-T mode of operation. Refer qualified service personnel to the servicing information sections of this Instruction Manual for further information.

OPTION 6

The standard 607A has been modified to meet Underwriter's Laboratory 544 Medical and Dental Equipment requirements. The modifications include warnings required for medical equipment, a hospital-grade power cord and plug cap, and an internal line fuse. The option also includes protective cabinet panels, cabinet feet, and a carrying handle.

OPTION 8

Changes the cathode-ray tube to provide a faster writing speed (200 ns/division) with a lower resolution.

OPTION 9

The instrument is designated as a recognized component by Underwriter's Laboratory for medical-dental applications.

OPTION 10

Includes a REMOTE PROGRAM connector, mounted on the rear panel of the instrument. The REMOTE PROGRAM connector provides direct connections to the + inputs of the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers from a remote location. Also, remote save, remote erase, and remote non-store can be controlled from a remote location. A negative-going pulse, logical 0 (TTL) is present as an output at a connector contact during the erase interval. All inputs and outputs are TTL compatible.

OPTION 21

Includes differential INPUT connectors (+ and −) 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 to permit extending the gain range of the instrument.

OPTION 23

Includes a carrying handle, protective cabinet panels, and feet. (Not available with Options 6 and 28.)

OPTION 26

Provides 50-Ω inputs for the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers.

OPTION 28

Includes protective cabinet panels. (Not available with Options 6 and 23.)

Table 8-1

OPTION INFORMATION LOCATOR

Instrument Option	Manual Section	Location of Information
Option 1 (Crt with internal graticule.)	2 Operating Instructions	Operating Information for Options (Option 4 Internal Time Base) Discusses use of the graticule.
	3 Specification	Electrical Table 3-1, Cathode-Ray Tube Display Describes the Option 1 graticule.
	8 Instrument Options	Option 1 The introduction includes a description of Option 1.
	9 Replaceable Electrical Parts	Includes the replacement part number for the Option 1 crt.
Option 4 (Provides an internal horizontal sweep circuit.)	2 Operating Instructions	Controls and Connectors Describes the function of the Option 4 front-panel controls.
		Functional Check Provides a functional check procedure for the Option 4 instrument.
		Operating Information for Options (Option 4 Internal Time Base) Discusses use of the graticule, controls, and internal sweep generator for making accurate time measurements.
	3 Specification	Electrical Table 3-1, Option 4 Sweep System Includes electrical characteristics for the Option 4 instrument.
	4 Performance Check and Adjustment	Sweep Generator (Option 4) Contains a procedure for checking and adjusting the Option 4 instrument.
	5 Installation	Connecting the Internal Sweep (Option 4) Provides a procedure for setting internal switching to connect the internal sweep generator.
	6 Theory of Operation	Option 4—Time Base Sweep Discusses the operation of the internal sweep circuit.
	7 Maintenance	Corrective Maintenance Sweep Board—A6 Gives instructions on removal and replacement of the Option 4 Sweep board.
	8 Instrument Options	Option 4 The introduction includes a description of Option 4.

Table 8-1 (cont)

Instrument Option	Manual Section	Location of Information
Option 4 (cont)	9 Replaceable Electrical Parts	Provides an electrical parts list for the Option 4 instrument.
	10 Diagrams and Circuit Board Illustrations	Provides a block diagram, component adjustment, test point, internal control and selector locations, and a schematic diagram for the Option 4 instrument.
	11 Replaceable Mechanical Parts	Provides a mechanical parts list and an exploded-view drawing for the Option 4 instrument.
Option 6 (Listed by Underwriter's Laboratories, Inc., 544 Medical-Dental Equipment Requirements.)	5 Installation	Line-Voltage and Regulating-Range Selection Figure 5-1 shows the location of the line fuse for the Option 6 instrument.
	8 Instrument Options	Option 6 The introduction includes a description of Option 6.
	9 Replaceable Electrical Parts	Provides an electrical parts list with replacement parts for the Option 6 instrument.
	11 Replaceable Mechanical Parts	Provides a mechanical parts list with replacement parts for the Option 6 instrument.
Option 8 (Crt with faster writing speed and lower resolution.)	3 Specification	Electrical Table 3-1, Cathode-Ray Tube Display Includes electrical characteristics of the Option 8 cathode-ray tube.
	8 Instrument Options	Option 8 The introduction includes a description of Option 8.
	9 Replaceable Electrical Parts	Includes the replacement part number for the Option 8 crt.
Option 9 (Instrument designated by Underwriter's Laboratories as a recognized component for Medical-Dental Equipment applications.)	8 Instrument Options	Option 9 The introduction includes a description of Option 9.
Option 10 (Remote Program Connector.)	2 Operating Instructions	Rear-panel Controls and Connectors Describes the REMOTE PROGRAM connector.
	3 Specification	Electrical Table 3-1, Z-Axis Amplifier Includes electrical characteristics of the REMOTE PROGRAM inputs and output.

Table 8-1 (cont)

Instrument Option	Manual Section	Location of Information
Option 10 (cont)	5 Installation	Remote Program Inputs (Option 10) Provides connection details and logic levels for remote program operation.
	6 Theory of Operation	Storage Control and Output 5 & 6 Remote Programming (P/O Option 10) Describes operation of the Storage circuit with remote programming.
	8 Instrument Options	Option 10 The introduction includes a description of Option 10.
	10 Diagrams and Circuit Board Illustrations	Provides a block diagram and schematic diagram for the Option 10 instrument.
	11 Replaceable Mechanical Parts	Provides an exploded-view drawing and a mechanical parts list with replacement parts for the Option 10 instrument.
Option 21 (Provides differential inputs for the X, Y, and Z-Axis Amplifiers.)	2 Operating Instructions	Rear-panel Controls and Connectors Describes the functions of the −X, −Y, and −Z INPUT connectors.
		Functional Check Provides a functional check procedure for the Option 21 instrument.
		Operating Information for Options (Option 21 Full Differential Inputs) Provides application information for Option 21 instruments.
	3 Specification	Electrical Table 3-1, Vertical & Horizontal Amplifiers Includes electrical characteristics for the Option 21 instrument. Table 3-1, Z-Axis Amplifier Includes electrical characteristics for the Option 21 instrument.
	4 Performance Check and Adjustment	Provides a procedure for checking and adjusting the Option 21 instrument.
	6 Theory of Operation	Differential Inputs (Option 21) Discusses operation with Option 21 (differential operation).
	8 Instrument Options	Option 21 The introduction includes a description of Option 21.

Table 8-1 (cont)

Instrument Option	Manual Section	Location of Information
Option 21 (cont)	9 Replaceable Electrical Parts	Provides an electrical parts list with replacement parts for the Option 21 instrument.
	10 Diagrams and Circuit Board Illustrations	Provides a block diagram, test point locations, and schematic diagrams for the Option 21 instrument.
	11 Replaceable Mechanical Parts	Provides an exploded-view drawing and a mechanical parts list with replacement parts for the Option 21 instrument.
Option 22 (Internal 1:1 and 5:1 switchable attenuators for the X and Y Amplifiers.)	2 Operating Instructions	Operating Information for Options Option 22 Switchable Attenuators for X and Y INPUTS. Describes use of the 5:1 input attenuators.
	3 Specification	Electrical Table 3-1, Vertical & Horizontal Amplifiers Includes electrical characteristics for the Option 22 instrument.
	4 Performance Check and Adjustment	Provides a procedure for checking and adjusting the Option 22 instrument.
	5 Installation	Input Attenuation Selection (Option 22) Provides information on attenuators.
	6 Theory of Operation	Vertical (Y) Amplifier & Horizontal (X) Amplifier Describes function of the Option 22 attenuators.
	8 Instrument Options	Option 22 The introduction includes a description of Option 22.
	9 Replaceable Electrical Parts	Provides an electrical parts list with replacement parts for the Option 22 instrument.
	10 Diagrams and Circuit Board Illustrations	Provides a block diagram, component adjustment, internal control and selector locations, and schematic diagrams for the Option 22 instrument.
Option 23 (With handle, feet, and protective cabinet panels.)	3 Specification	Overall Dimensions Figure 3-1 shows the 607A with handle, feet, and protective cabinet panels.
	7 Maintenance	Cabinet Panel Removal Includes directions on removal of the protective cabinet panels.

Table 8-1 (cont)

Instrument Option	Manual Section	Location of Information
Option 23 (cont)	8 Instrument Options	Option 23 The introduction includes a description of Option 23.
	11 Replaceable Mechanical Parts	Provides an exploded-view drawing and a mechanical parts list with replacement parts for the Option 23 instrument.
Option 26 (50 Ω inputs.)	3 Specification	Electrical Table 3-1 Includes electrical characteristics for the Option 26 instrument.
	4 Performance Check and Adjustment	Test Equipment Table 4-1 Indicates change of required equipment with Option 26.
	8 Instrument Options	Option 26 The introduction includes a description of Option 26.
	9 Replaceable Electrical Parts	Provides an electrical parts list with replacement parts for the Option 26 instrument.
	10 Diagrams and Circuit Board Illustrations	Provides component locations and schematic diagrams for the Option 26 instrument.
Option 28 (With cabinet panels only.)	3 Specification	Overall Dimensions Figure 3-1 shows the 607A with cabinet panels.
	7 Maintenance	Cabinet Panel Removal Includes directions on removal of the protective cabinet panels.
	8 Instrument Options	Option 28 The introduction includes a description of Option 28.
	11 Replaceable Mechanical Parts	Provides an exploded-view drawing and a mechanical parts list with replacement parts for the Option 28 instrument.

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
00213	NYTRONICS, COMPONENTS GROUP, INC., SUBSIDIARY OF NYTRONICS, INC.	ORANGE STREET	DARLINGTON, SC 29532
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
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
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03888	KDI PYROFILM CORPORATION	60 S JEFFERSON ROAD	WHIPPANY, NJ 07981
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
05397	UNION CARBIDE CORPORATION, MATERIALS SYSTEMS DIVISION	11901 MADISON AVENUE	CLEVELAND, OH 44101
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
11237	CTS KEENE, INC.	3230 RIVERSIDE AVE.	PASO ROBLES, CA 93446
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14552	MICRO SEMICONDUCTOR CORP.	2830 F FAIRVIEW ST.	SANTA ANA, CA 92704
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600,600 W. JOHN ST.	HICKSVILLE, NY 11802
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
52306	HIGH VOLTAGE DEVICES, INC.	7485 AVENUE 304	VISALIA, CA 93277
53944	ELT INC., GLOW LITE DIVISION	BOX 698	PAULS VALLEY, OK 73075
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
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
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
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
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
91929	HONEYWELL, INC., MICRO SWITCH DIV.	CHICAGO & SPRING STS.	FREEPORT, IL 61032

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3178-04			CKT BOARD ASSY:DEFLECTION	80009	670-3178-04
A2	670-3182-02			CKT BOARD ASSY:Z AXIS	80009	670-3182-02
A3	670-4515-00			CKT BOARD ASSY:HIGH VOLTAGE	80009	670-4515-00
A3	670-4515-01			CKT BOARD ASSY:HIGH VOLTAGE	80009	670-4515-01
	----- -----			(OPTION 8 ONLY)		
A4	670-4516-00			CKT BOARD ASSY:STORAGE	80009	670-4516-00
A4	670-4516-01			CKT BOARD ASSY:STORAGE	80009	670-4516-01
	----- -----			(OPTION 8 ONLY)		
A5	670-3125-02			CKT BOARD ASSY:POWER SUPPLY	80009	670-3125-02
A6	670-2278-00			CKT BOARD ASSY:SWEEP GENERATOR	80009	670-2278-00
	----- -----			(OPTION 4 ONLY)		
A7	670-5175-00			CKT BOARD ASSY:MULTIPLIER	80009	670-5175-00
	----- -----			(OPTION 8 ONLY)		
C18	290-0702-00			CAP.,FXD,ELCTLT:2000UF,+100-0%,50V	56289	68D10715
C20	290-0571-00			CAP.,FXD,ELCTLT:5000UF,+100-0%,25V	90201	PFP20-36043
C21	290-0571-00			CAP.,FXD,ELCTLT:5000UF,+100-0%,25V	90201	PFP20-36043
C36	290-0559-00			CAP.,FXD,ELCTLT:22UF,20%,35V	90201	TDC226M035WLG
C40	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C46	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C58	281-0543-00			CAP.,FXD,CER DI:270PF,10%,500V	72982	301055X5P271K
C60	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C62	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C78	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	04222	7001-1380
C88	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C90	290-0528-00			CAP.,FXD,ELCTLT:15UF,20%,50V	90201	TDC156M050WLC
C104	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C106	283-0021-00			CAP.,FXD,CER DI:0.001UF,20%,5000V	72982	848-556-Y5S-102M
C112	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
C114	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
C117	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C118	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C126	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C128	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C132	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C141	283-0300-00			CAP.,FXD,CER DI:0.001UF,+80-20%,10,000V	72982	3910BW509C142K
C143	283-0300-00			CAP.,FXD,CER DI:0.001UF,+80-20%,10,000V	72982	3910BW509C142K
C148	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C149	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C150	281-0512-00			CAP.,FXD,CER DI:27PF,+/-2.7PF,500V	72982	308-000C0G0270K
C154	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C156	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C158	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	500D105F150BA7
C160	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	500D105F150BA7
C164	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C165	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C170	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C180	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C186	283-0021-00			CAP.,FXD,CER DI:0.001UF,20%,5000V	72982	848-556-Y5S-102M
C188	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	500D105F150BA7
C200	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C202	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C206	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C212	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C218	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C246	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C250	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C256	281-0628-00			CAP.,FXD,CER DI:15PF,5%,500V	72982	301-000C0G0150J

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C300	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C302	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C306	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C312	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C320	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C326	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C350	281-0661-00			CAP.,FXD,CER DI:0.8PF,+/-0.1PF,500V	72982	301-000C0K0808B
C380	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C382	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C384	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C400	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C402	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C406	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C412	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C418	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C446	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C450	281-0534-00			CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C456	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
C470	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C500	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C502	281-0510-00			CAP.,FXD,CER DI:22PF,+/-4.4PF,500V	72982	301-000C0G0220M
C506	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C512	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C520	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C526	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C550	281-0534-00			CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C606	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C612	281-0508-00			CAP.,FXD,CER DI:12PF,+/-0.6PF,500V	72982	301-000C0G0120J
C614	281-0549-00			CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C642	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C656	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C662	281-0508-00			CAP.,FXD,CER DI:12PF,+/-0.6PF,500V	72982	301-000C0G0120J
C670	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C690	281-0534-00			CAP.,FXD,CER DI:3.3PF,+/-0.25PF,500V	72982	301-000C0J0339C
C692	281-0526-00			CAP.,FXD,CER DI:1.5PF,+/-0.5PF,500V	72982	301-000S2K0159D
C716	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C718	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C724	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C734	281-0064-00			CAP.,VAR,PLSTC:0.25-1.5PF,600V	72982	530-002
C740	283-0057-00			CAP.,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C810	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C812	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C814	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C816	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C820	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
C840	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C848	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
C886	285-0686-00			CAP.,FXD,PLSTC:0.068UF,10%,100V	56289	410P68391
C890	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C895	285-0686-00			CAP.,FXD,PLSTC:0.068UF,10%,100V	56289	410P68391
C904	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1062	281-0627-00			CAP.,FXD,CER DI:1PF,+/-0.25PF,500V	72982	301-000C0K0109C
CR15	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR16	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR17	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR18	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR20	152-0556-00			SEMICOND DEVICE:BRIDGE,50V,2.5A	04713	SDA10271K

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CR25	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR27	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR29	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR30	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR32	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR36	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR40	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR48	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR74	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR80	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR90	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
CR106	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012
CR107	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	07263	FDH-6012
CR120	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR141	152-0409-00			SEMICOND DEVICE:SILICON,12,000V,5MA	80009	152-0409-00
	----- -----			(OPTION 8 ONLY)		
CR143	152-0409-00			SEMICOND DEVICE:SILICON,12,000V,5MA	80009	152-0409-00
	----- -----			(OPTION 8 ONLY)		
CR148	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
CR150	152-0409-00			SEMICOND DEVICE:SILICON,12,000V,5MA	80009	152-0409-00
CR154	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR158	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR164	152-0586-00			SEMICOND DEVICE:SILICON,600V,500MA	14936	RGP10J
CR180	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
CR182	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
CR186	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
CR208	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR220	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR254	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR255	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR256	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR257	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR270	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	07263	FDH2161
CR272	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	07263	FDH2161
CR308	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR320	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR408	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR420	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR454	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR455	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR456	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR457	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR508	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR520	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR608	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR620	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR642	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR658	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
CR670	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR698	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR699	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR730	152-0574-00			SEMICOND DEVICE:SILICON,120V,0.15A	80009	152-0574-00
CR801	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR802	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR812	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR814	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R

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CR852	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR853	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR856	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR857	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR860	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR861	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR874	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR888	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR890	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR902	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR910	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR912	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR950	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR952	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR954	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR956	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR960	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR962	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR972	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR973	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR975	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR982	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR984	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR986	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR996	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR998	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	01295	G727
CR1000	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR1016	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR1018	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
DS182	150-0111-00			LAMP,GLOW:NEON,1.2MA	53944	A1B-3
DS183	150-0111-00			LAMP,GLOW:NEON,1.2MA	53944	A1B-3
F10	159-0040-00			FUSE,CARTRIDGE:3AG,0.7A,SLOW-BLOW	71400	MDL 7/10
F120	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST-BLOW	71400	AGC 2
J20	131-0569-00			CONNECTOR,RCPT,:25 PIN,FEMALE	71468	DB25S
J200	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
J300	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
J400	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
J500	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
J600	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
J650	131-0955-00			CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE	13511	31-279
L145	108-0792-00			COIL,TUBE DEFLE:TRACE ROTATION	80009	108-0792-00
L154	108-0324-00			COIL,RF:10MH	76493	70F102A1
L158	108-0324-00			COIL,RF:10MH	76493	70F102A1
L172	108-0714-00			COIL,TUBE DEFLE:Y AXIS ALIGNMENT	80009	108-0714-00
Q30	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q32	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q50	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q60	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q64	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q70	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
Q76	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q80	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q120	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q130	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924
Q132	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00

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Q210A,B	151-1054-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q220	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q230	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q232	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q260	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q264	151-0279-00			TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q320	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q330	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q332	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q360	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q364	151-0279-00			TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q410A,B	151-1054-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q420	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q430	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q432	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q460	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q464	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q520	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q530	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q532	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q560	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q564	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q610A,B	151-1054-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
Q620	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q630	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q640	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q670	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q680	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q690	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q700	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q710	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q720	151-0279-00			TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q724	151-0270-00			TRANSISTOR:SILICON,PNP	01295	SWC2422
Q810	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q835	151-0126-00			TRANSISTOR:SILICON,NPN	04713	2N2484
Q872	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q876	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q990	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q996	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q1010	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q1026	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
Q1036	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q1050	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
	----- -----			(NOT INCLUDED IN OPTION 8)		
Q1060	151-0216-00			TRANSISTOR:SILICON,PNP	04713	SPS8803
Q1066	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
R25	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R27	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R30	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R31	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R34	308-0568-00			RES.,FXD,WW:35 OHM,5%,5W	91637	RS5-K35R00J
R36	308-0702-00			RES.,FXD,WW:0.33 OHM,5%,2W	75042	BWH-R3300J
R38	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
R40	311-1564-00			RES.,VAR,NONWIR:TRMR,500 OHM,0.5W	73138	91-86-0
R42	321-0242-00			RES.,FXD,FILM:3.24K OHM,1%,0.125W	91637	MFF1816G32400F
R44	315-0334-00			RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R46	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R48	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R50	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R54	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R56	305-0620-00			RES.,FXD,CMPSN:62 OHM,5%,2W	01121	HB6205
R58	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R60	321-0254-00			RES.,FXD,FILM:4.32K OHM,1%,0.125W	91637	MFF1816G43200F
R62	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
R64	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R70	308-0218-00			RES.,FXD,WW:150 OHM,5%,3W	00213	1240S-150-5
R72	308-0764-00			RES.,FXD,WW:2.7 OHM,5%,2W	75042	BWF-2R700J
R74	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R76	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
R78	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R80	315-0334-00			RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R82	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R84	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R86	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
R88	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
R100	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91-77-0
R102	321-0473-00			RES.,FXD,FILM:825K OHM,1%,0.125W	91637	MFF1816G82502F
R104A-D	307-0290-06			RES.,FXD,FILM:250K OHM	80009	307-0290-06
R106	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R108	321-0360-00			RES.,FXD,FILM:54.9K OHM,1%,0.125W	91637	MFF1816G54901F
R110	321-0258-00			RES.,FXD,FILM:4.75K OHM,1%,0.125W	91637	MFF1816G47500F
R112	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R114	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R116	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R118	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R120	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R124	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R126	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R128	308-0459-00			RES.,FXD,WW:1.1 OHM,5%,3W	91637	CW2B-D1R100J
R130	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R132	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R141	301-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.50W	01121	EB3355
	----- -----			(OPTION 8 ONLY)		
R143	301-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.50W	01121	EB3355
	----- -----			(OPTION 8 ONLY)		
R145	311-1332-00			RES.,VAR,NONWIR:5K OHM,10%,2W	12697	CM40936
R148	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R150	315-0564-00			RES.,FXD,CMPSN:560K OHM,5%,0.25W	01121	CB5645
R158	315-0180-00			RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
R162	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R164	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635
R165	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91-77-0
R170	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
R172	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R173	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91-83-0
R174	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R175A,B	311-1687-00			RES.,VAR,NONWIR:2K OHM X 5M OHM,20%,0.5W	01121	12M359
R180	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R182	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R184	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R186	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R188	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R190	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
R192	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91-77-0

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R194	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
R200	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R201	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R202	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R204	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R206	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R208	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R210	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R212	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	91637	MFF1816G14000F
R215	311-1417-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.25W	73138	72PM-58-0-252
R216	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R218	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
R220	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R222	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R226	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R228	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R230	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R232	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R234	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R238	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R240	311-1311-00			RES.,VAR,NONWIR:1K OHM,20%,1W	01121	73M4G048L102M
R242	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
R246	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R250	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R254	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R256	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R260	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R262	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R264	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R266	308-0349-00			RES.,FXD,WW:3.6K OHM,1%,3W	91637	RS2B-B36000F
R268	315-0240-00			RES.,FXD,CMPSN:24 OHM,5%,0.25W	01121	CB2405
R270	323-0154-00			RES.,FXD,FILM:392 OHM,1%,0.50W	75042	CECT0-3920F
R272	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R300	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R301	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R302	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R304	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R306	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R308	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R310	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R312	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	91637	MFF1816G14000F
R322	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R326	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R328	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R330	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R332	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R334	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R350	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R360	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R362	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R364	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R366	308-0349-00			RES.,FXD,WW:3.6K OHM,1%,3W	91637	RS2B-B36000F
R368	315-0240-00			RES.,FXD,CMPSN:24 OHM,5%,0.25W	01121	CB2405
R380	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R382	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R400	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R401	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R402	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R404	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R406	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R408	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R410	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R412	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	91637	MFF1816G14000F
R415	311-1417-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.25W	73138	72PM-58-0-252
R416	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R418	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
R420	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R422	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R426	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R428	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R430	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R432	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R434	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R438	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R440	311-1311-00			RES.,VAR,NONWIR:1K OHM,20%,1W	01121	73M4G048L102M
R442	321-0311-00			RES.,FXD,FILM:16.9K OHM,1%,0.125W	91637	MFF1816G16901F
R446	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R450	321-0354-00			RES.,FXD,FILM:47.5K OHM,1%,0.125W	91637	MFF1816G47501F
R454	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R456	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R460	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R464	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R466	321-0247-00			RES.,FXD,FILM:3.65K OHM,1%,0.125W	91637	MFF1816G36500F
R468	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R470	321-0196-00			RES.,FXD,FILM:1.07K OHM,1%,0.125W	91637	MFF1816G10700F
R500	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
R501	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R502	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R504	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R506	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R508	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R510	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R512	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	91637	MFF1816G14000F
R522	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R526	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R528	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R530	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R532	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R534	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R550	321-0354-00			RES.,FXD,FILM:47.5K OHM,1%,0.125W	91637	MFF1816G47501F
R560	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R564	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R566	321-0247-00			RES.,FXD,FILM:3.65K OHM,1%,0.125W	91637	MFF1816G36500F
R568	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
R600	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R604	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R606	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R608	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R610	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R612	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
R614	321-0142-00			RES.,FXD,FILM:294 OHM,1%,0.125W	91637	MFF1816G294R0F
R615	311-1561-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	73138	91-83-0
R620	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
R622	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R630	321-0198-00			RES.,FXD,FILM:1.13K OHM,1%,0.125W	91637	MFF1816G11300F
R632	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R636	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
R640	321-0127-00			RES.,FXD,FILM:205 OHM,1%,0.125W	91637	MFF1816G205R0F
R642	321-0208-00			RES.,FXD,FILM:1.43K OHM,1%,0.125W	91637	MFF1816G14300F
R644	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
R650	322-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.25W	75042	CEBT0-49R90F
	----- -----			(OPTION 26 ONLY)		
R654	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R656	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R658	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R660	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R662	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
R672	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R680	321-0198-00			RES.,FXD,FILM:1.13K OHM,1%,0.125W	91637	MFF1816G11300F
R682	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R690	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R692	321-0254-00			RES.,FXD,FILM:4.32K OHM,1%,0.125W	91637	MFF1816G43200F
R698	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R710	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R712	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R716	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R724	301-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.50W	01121	EB5615
R726	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R728	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R730	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R734	322-0613-00			RES.,FXD,FILM:20.4K OHM,1%,0.25W	91637	MFF1421G20401F
R735	321-0253-00			RES.,FXD,FILM:4.22K OHM,1%,0.125W	91637	MFF1816G42200F
R750	301-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.50W	01121	EB8215
R802	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R806	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R808	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R810	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R812	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R814	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R816	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R820	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R822	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R824	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R828	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R830	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R834	321-0458-00			RES.,FXD,FILM:576K OHM,1%,0.125W	91637	MFF1816G57602F
R835	311-1557-00			RES.,VAR,NONWIR:25K OHM,20%,0.50W	73138	91A R24K
R838	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R840	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R844	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R846	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R848	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635
R852	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R853	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R856	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R860	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R862	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R864	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R866	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R870	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R872	315-0364-00			RES.,FXD,CMPSN:360K OHM,5%,0.25W	01121	CB3645
R874	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R875	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R878	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R880	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R882	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R886	315-0125-00			RES.,FXD,CMPSN:1.2M OHM,5%,0.25W	01121	CB1255
R888	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R890	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R892	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
R894	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145
R895	311-1688-00			RES.,VAR,NONWIR:50K OHM,20%,1W	01121	12M792
	----- -----			(R895 FURNISHED AS A UNIT WITH S895A,B)		
R896	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R897	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R898	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R902	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R906	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R908	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R912	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R950	321-0393-00			RES.,FXD,FILM:121K OHM,1%,0.125W	91637	MFF1816G12102F
R960	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R962	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R965	311-1555-00			RES.,VAR,NONWIR:100K OHM,20%,0.5W	73138	91-77-0
R966	321-0466-00			RES.,FXD,FILM:698K OHM,1%,0.125W	91637	MFF1816G69802F
R968	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R970	311-1710-00			RES.,VAR,NONWIR:20K OHM,20%,1W	01121	16M148
R972	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R973	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R975	311-1550-00			RES.,VAR,NONWIR:2M OHM,20%,0.50W	73138	91-72-0
R976	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
R982	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R984	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R986	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R990	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R992	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R994	308-0503-00			RES.,FXD,WW:6.8 OHM,5%,2.50W	91637	RS2B-D6R800J
R996	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R998	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1000	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R1010	303-0303-00			RES.,FXD,CMPSN:30K OHM,5%,1W	01121	GB3035
R1012	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R1014	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R1016	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R1018	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R1026	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635
R1030	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
R1032	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R1034	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1036	305-0243-00			RES.,FXD,CMPSN:24K OHM,5%,2W	01121	HB2435
R1040	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1041	301-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.50W	01121	EB3635
	----- -----			(OPTION 8 ONLY)		

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1042	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
R1043	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
R1044	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
	----- -----			(OPTION 8 ONLY)		
R1046	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
	----- -----			(NOT INCLUDED IN OPTION 8)		
R1050	301-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.50W	01121	EB3335
	----- -----			(NOT INCLUDED IN OPTION 8)		
R1052	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
	----- -----			(NOT INCLUDED IN OPTION 8)		
R1054	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
	----- -----			(NOT INCLUDED IN OPTION 8)		
R1055	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
	----- -----			(NOT INCLUDED IN OPTION 8)		
R1060	321-0423-00			RES.,FXD,FILM:249K OHM,1%,0.125W	91637	MFF1816G24902F
R1062	321-0481-00			RES.,FXD,FILM:1M OHM,1%,0.125W	24546	NA4D1004F
R1064	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R1066	303-0563-00			RES.,FXD,CMPSN:56K OHM,5%,1W	01121	GB5635
R1068	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
S10	260-0413-00			SW,THERMOSTATIC:10A,240V	73803	20700L63-253
S12	260-1222-00			SWITCH,PUSH-PUL:10A,250VAC	91929	2DM301
S200	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S300	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S400	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S500	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S870	260-1308-00			SWITCH,PUSH:MOMENTARY	80009	260-1308-00
S895A,B	----- -----			(FURNISHED AS A UNIT WITH R895)		
S910	260-1211-00			SWITCH,PUSH:1A,28VDC	80009	260-1211-00
T15	120-0925-00			XFMR,PWR,STPDN:	80009	120-0925-00
T120	120-0926-00			XFMR,PWR,SDN & SU:	80009	120-0926-00
U110	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	02735	85145
U120	152-0660-00			SEMICOND DVC,DI:HV MULTR,SI,7KV,IN,105KV OUT	52306	CMX286
	----- -----			(NOT INCLUDED IN OPTION 8)		
U810	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7401N OR J
U820	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
U850	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
U895	156-0072-00			MICROCIRCUIT,DI:MONOSTABLE MV,TTL,14 DIP	80009	156-0072-00
V100	154-0697-11			ELECTRON TUBE:CRT	80009	154-0697-11
	----- -----			(OPTION 8 ONLY)		
V100	154-0771-00			ELECTRON TUBE:CRT	80009	154-0771-00
	----- -----			(OPTION 1 ONLY)		
V100	154-0771-01			ELECTRON TUBE:CRT	80009	154-0771-01
VR50	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR130	152-0243-00			SEMICOND DEVICE:ZENER,0.4W,15V,5%	14552	1N965B
VR166	152-0268-00			SEMICOND DEVICE:ZENER,0.4W,56V,5%	80009	152-0268-00
VR270	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR670	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,10V,5%	80009	152-0149-00
VR690	152-0227-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ13903
VR915	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR1040	152-0428-00			SEMICOND DEVICE:ZENER,0.4W,120V,5%	80009	152-0428-00
	----- -----			(STANDARD ONLY)		
VR1042	152-0286-00			SEMICOND DEVICE:ZENER,0.4W,75V,5%	80009	152-0286-00
	----- -----			(OPTION 8 ONLY)		
VR1043	152-0286-00			SEMICOND DEVICE:ZENER,0.4W,75V,5%	80009	152-0286-00
	----- -----			(OPTION 8 ONLY)		
W151	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				OPTION 4		
A6	670-2278-00			CKT BOARD ASSY:SWEEP GENERATOR	80009	670-2278-00
C1105	281-0503-00			CAP.,FXD,CER DI:8PF,+/-0.5PF,500V	72982	301-000C0H0809D
C1110	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1112	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
C1114	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
C1124	283-0041-00			CAP.,FXD,CER DI:0.0033UF,5%,500V	72982	841-541B332J
C1125	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1130	285-0754-02			CAP.,FXD,PLSTC:0.001UF,3%,400V	80009	285-0754-02
	----- -----			(C1130,C1134,C1138 AVAILABLE AS A MATCHED SET,		
	----- -----			PART NUMBER 295-0159-00. THE LETTER SUFFIX		
	----- -----			AND THE TOLERANCE SHOULD BE THE SAME FOR ALL		
	----- -----			OF THE CAPACITORS IN THE ASSEMBLY)		
C1134	285-0753-01			CAP.,FXD,PLSTC:0.01UF,3%,100V	80009	285-0753-01
	----- -----			(SEE FOOTNOTE ON C1130)		
C1138	285-0895-00			CAP.,FXD,PLSTC:1.0UF,3%,25V	80009	285-0895-00
	----- -----			(SEE FOOTNOTE ON C1130)		
C1160	281-0604-00			CAP.,FXD,CER DI:2.2PF,+/-0.25PF,500V	72982	301-000C0J0229C
C1162	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
C1176	281-0549-00			CAP.,FXD,CER DI:68PF,10%,500V	72982	301-000U2J0680K
C1190	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1194	290-0534-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	196D105X0035HA1
C1195	290-0572-00			CAP.,FXD,ELCTLT:0.1UF,20%,50V	56289	196D104X0050HA1
CR1130	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
CR1175	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
Q1160	151-0342-00			TRANSISTOR:SILICON,PNP	07263	S035928
Q1164	151-0341-00			TRANSISTOR:SILICON,NPN	07263	S040065
Q1175	151-0342-00			TRANSISTOR:SILICON,PNP	07263	S035928
Q1178	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
R1105	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
R1106	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1110	316-0332-00			RES.,FXD,CMPSN:3.3K OHM,10%,0.25W	01121	CB3321
R1115	311-0607-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	82P-59-4-103K
R1118	311-0949-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	01121	WA1G040S202UA
R1120	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R1122	316-0122-00			RES.,FXD,CMPSN:1.2K OHM,10%.0.25W	01121	CB1221
R1124	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1130	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
R1134	321-0452-00			RES.,FXD,FILM:499K OHM,1%,0.125W	91637	MFF1816G49902F
R1138	307-0381-00			RES.,FXD,FILM:4.99M OHM,1%,0.5W	03888	FLYZ 4.99M+/-1%
R1145	311-0443-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.75W	11237	300SF-41330
R1146	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R1150	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
R1152	321-0311-00			RES.,FXD,FILM:16.9K OHM,1%,0.125W	91637	MFF1816G16901F
R1155	321-0369-00			RES.,FXD,FILM:68.1K OHM,1%,0.125W	91637	MFF1816G68101F
R1156	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R1158	316-0222-00			RES.,FXD,CMPSN:2.2K OHM,10%,0.25W	01121	CB2221
R1160	316-0333-00			RES.,FXD,CMPSN:33K OHM,10%,0.25W	01121	CB3331
R1162	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
R1165	311-0635-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	73138	82-32-0
R1167	321-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.125W	91637	MFF1816G24300F
R1171	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R1173	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1175	316-0102-00			RES.,FXD,CMPSN:1K OHM,10%,0.25W	01121	CB1021
R1176	316-0471-00			RES.,FXD,CMPSN:470 OHM,10%,0.25W	01121	CB4711
R1178	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R1190	301-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.50W	01121	EB2415
R1194	303-0821-00			RES.,FXD,CMPSN:820 OHM,5%,1W	01121	GB8215
S220	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S735	260-1811-00			SWITCH,SLIDE:DPDT,0.5A,125VAC DC	82389	C56206L2
S1109	260-0960-01			SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
S1130	105-0389-00			ACTR ASSY,CAM S:TIMING	80009	105-0389-00
U1130	155-0055-00			MICROCIRCUIT,LI:MONOLITHIC,TRIG AND SWEEP	80009	155-0055-00
VR1162	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738
VR1190	152-0217-00			SEMICOND DEVICE:ZENER,0.4W,8.2V,5%	04713	SZG20
VR1194	152-0217-00			SEMICOND DEVICE:ZENER,0.4W,8.2V,5%	04713	SZG20

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).

Graphic symbols and class designation letters 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 overline on a signal name indicates that the signal performs its intended function when it goes to the low state.

Abbreviations are based on ANSI Y1.1-1972.

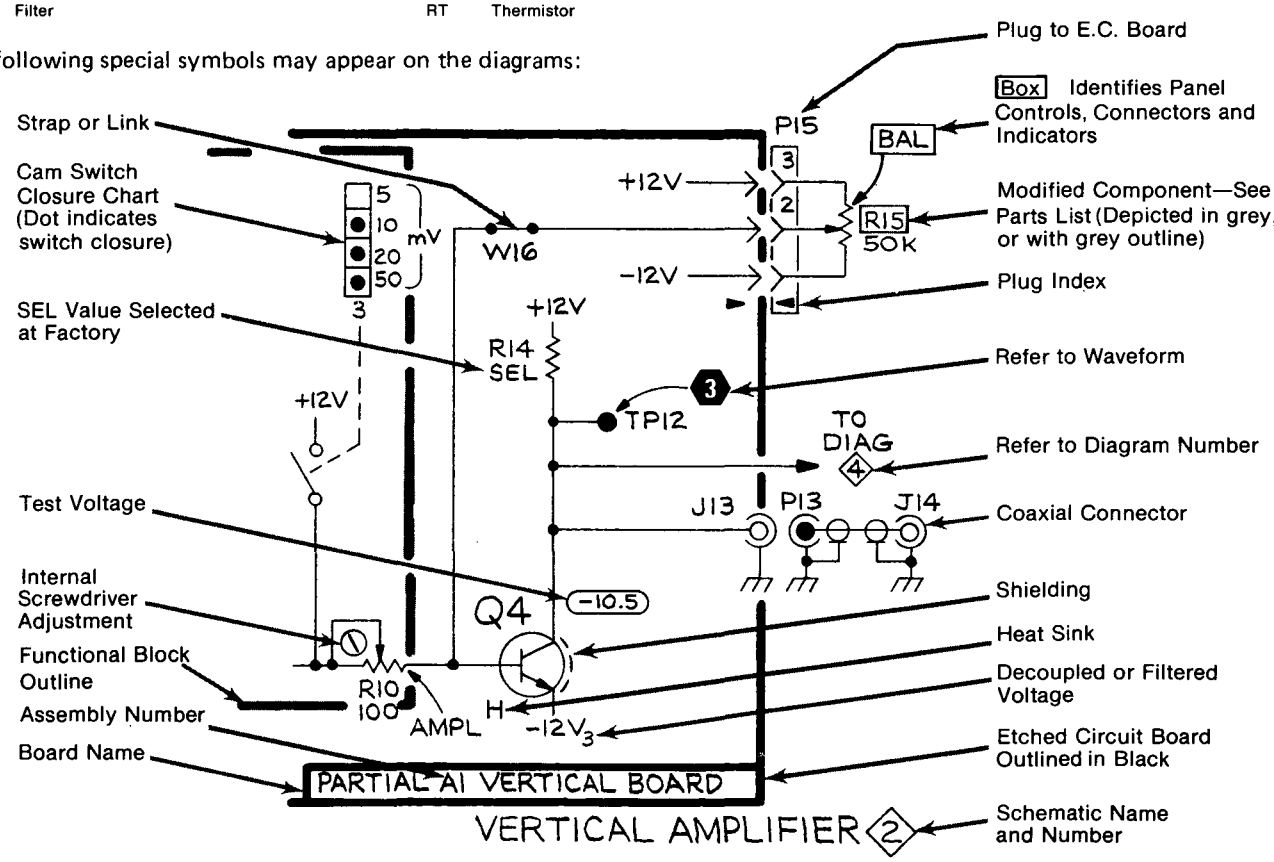
Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

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

The following special symbols may appear on the diagrams:



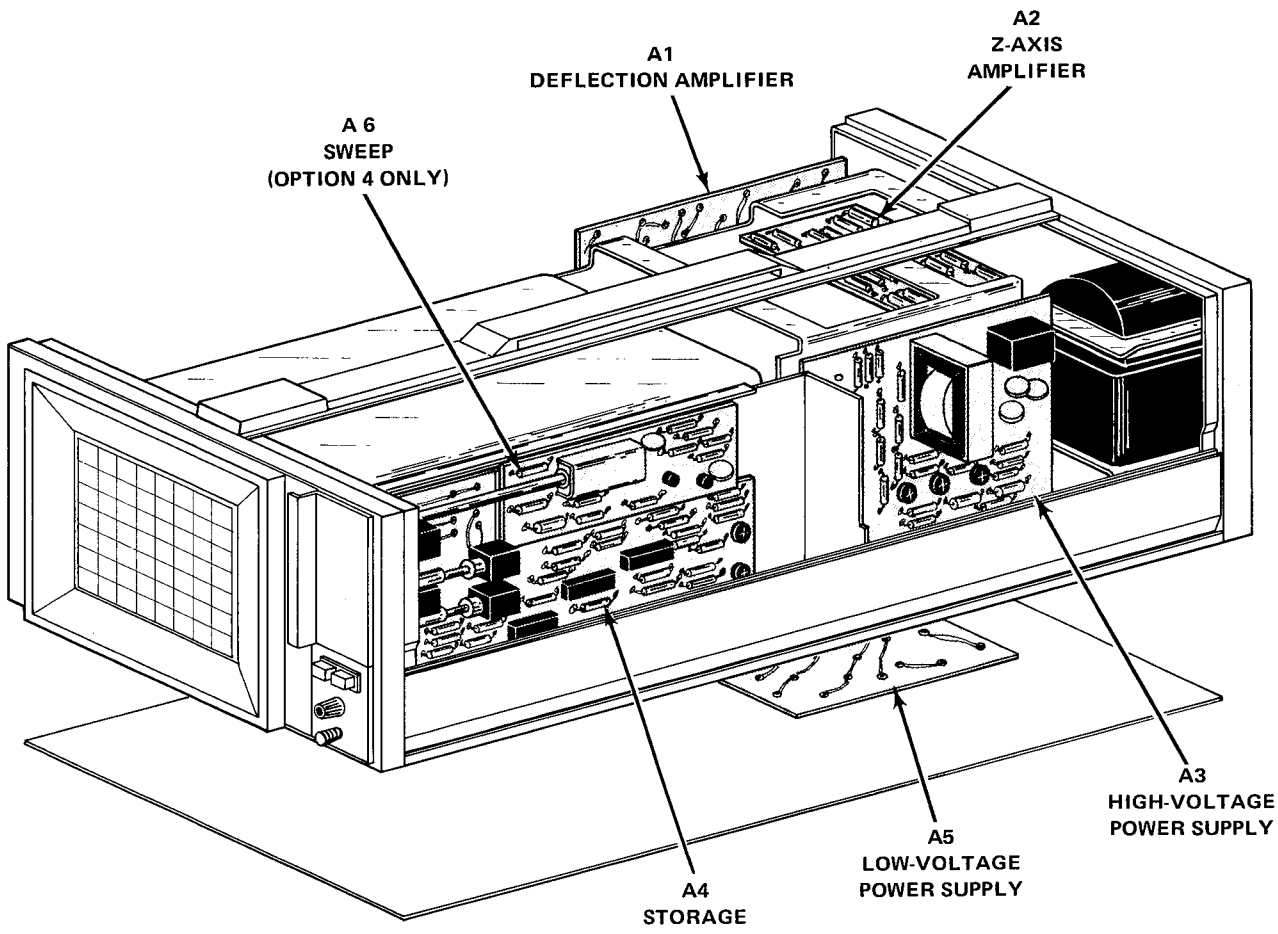
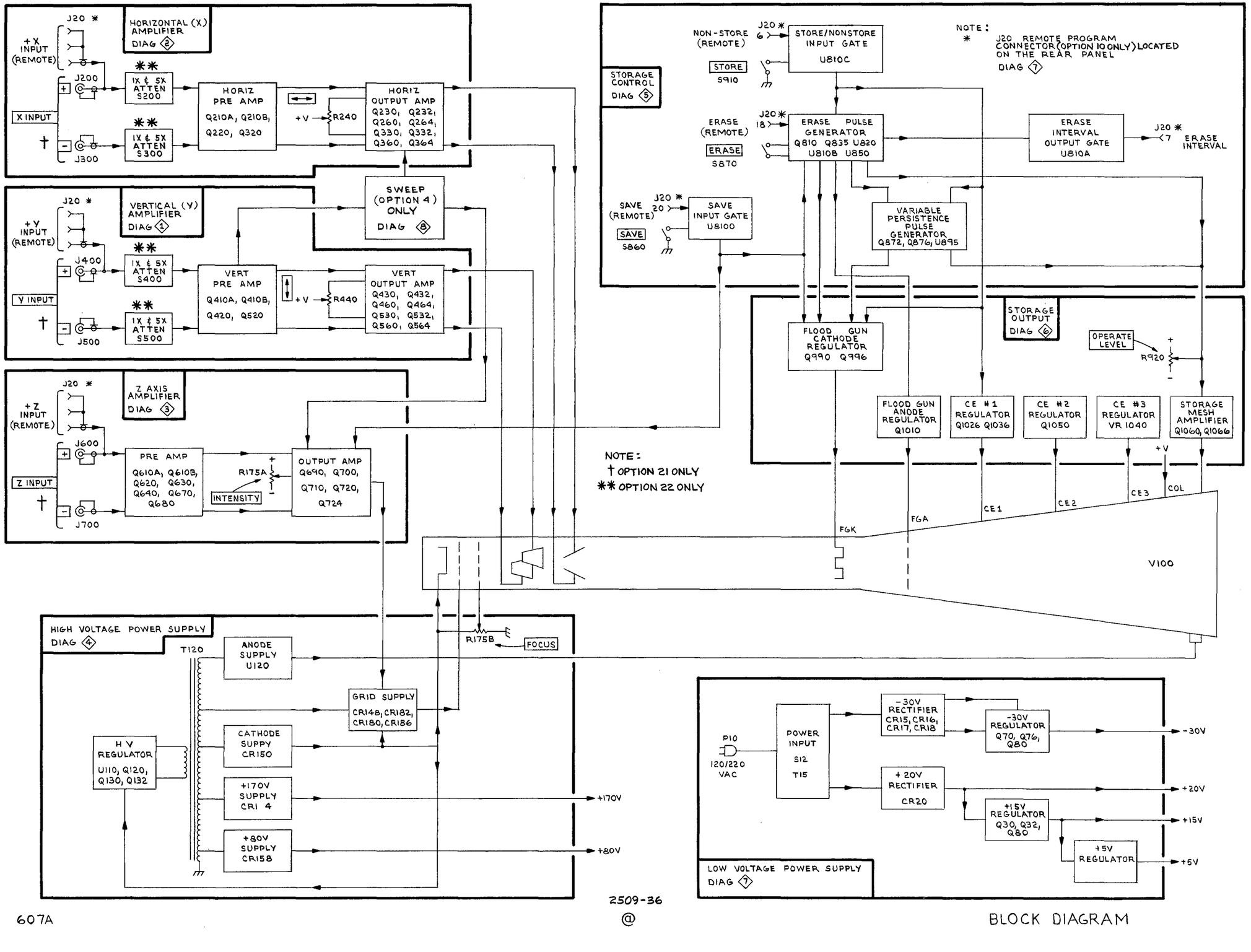


Figure 10-1. Circuit board locations in the 607A.



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BLOCK DIAGRAM

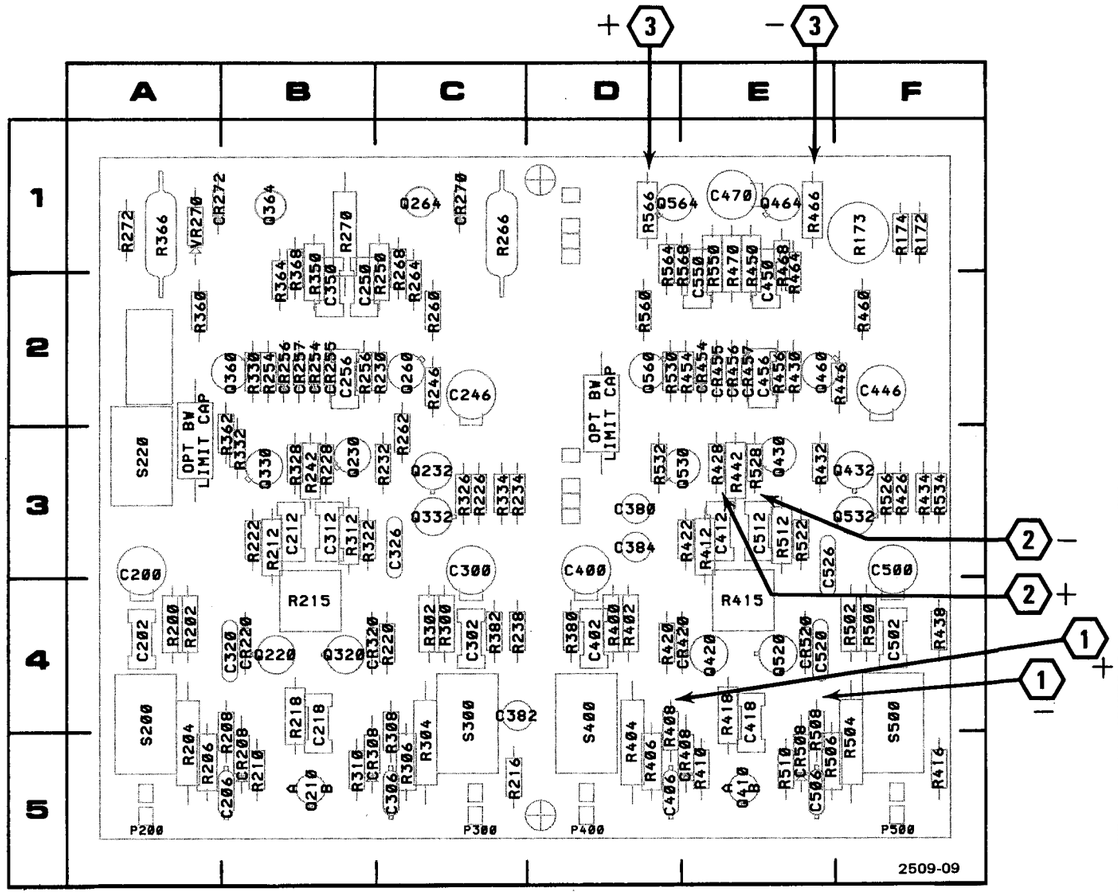


Figure 10-2. A1—Vertical Amplifier component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C200	3A	C512	3E	Q320	4B	R226	3C	R360	2A	R466	1E
C202	4A	C520	4E	Q330	3B	R228	3B	R362	3B	R468	1E
C206	5B	C526	3E	Q332	3C	R230	2C	R364	2B	R470	1E
C212	3B	C550	2E	Q360	2B	R232	3C	R366	1A	R500	4F
C218	4B	CR208	5B	Q364	1B	R234	3C	R368	2B	R502	4F
C246	2C	CR220	4B	Q410	5E	R238	4C	R380	4D	R504	5F
C250	2B	CR254	2B	Q420	4E	R242	3B	R382	4C	R506	5F
C256	2B	CR255	2B	Q430	3E	R246	2C	R400	4D	R508	5E
C300	3C	CR256	2B	Q432	3F	R250	2C	R402	4D	R510	5E
C302	4C	CR257	2B	Q460	2E	R254	2B	R404	5D	R512	3E
C306	5C	CR270	1C	Q464	1E	R256	2B	R406	5D	R522	3E
C312	3B	CR272	1B	Q520	4E	R260	2C	R408	4D	R526	3F
C320	4B	CR308	5C	Q530	3E	R262	3C	R410	5D	R528	3E
C326	3C	CR320	4C	Q532	3F	R264	2C	R412	3E	R530	2D
C350	2B	CR408	5E	Q560	2D	R266	1C	R415	4E	R532	3D
C366		CR420	4E	Q564	1D	R268	1C	R416	5F	R534	3F
C380	3D	CR454	2E			R270	1B	R418	4E	R550	1E
C382	4C	CR455	2E	R172	1F	R272	1A	R420	4D	R560	2D
C384	3D	CR456	2E	R173	1F	R300	4C	R422	3E	R564	1D
C400	3D	CR457	2E	R174	1F	R302	4C	R426	3F	R566	1D
C402	4D	CR508	5E	R200	4B	R304	5C	R428	3E	R568	1E
C406	5D	CR520	4E	R202	4B	R306	5C	R430	2E		
C412	3E	P200	5A	R204	5A	R308	4C	R432	3E	S200	4A
C418	4E	P300	5C	R206	5B	R310	5B	R434	3F	S220	3A
C442		P400	5D	R208	4B	R312	3B	R438	4F	S300	4C
C446	2F	P500	5F	R210	5B	R322	3B	R442	3E	S400	4D
C450	2E	Q210	5B	R212	3B	R326	3C	R446	2F	S500	4F
C456	2E	Q220	4B	R215	4B	R328	3B	R450	1E		
C470	1E	Q230	3B	R216	5C	R330	2B	R454	2E	VR270	1A
C500	3F	Q232	3C	R218	4B	R332	3B	R456	2E		
C502	4F	Q260	2C	R220	4C	R334	3C	R460	2F		
C506	5E	Q264	1C	R222	3B	R350	2B	R464	2E		

INDEX FOR FIG. 10-2.

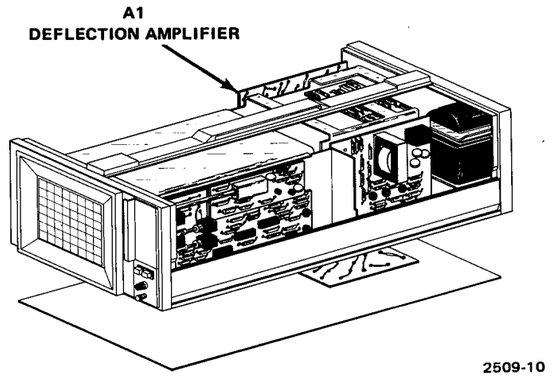


Figure 10-2A. Location of A1 Deflection Amplifier board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

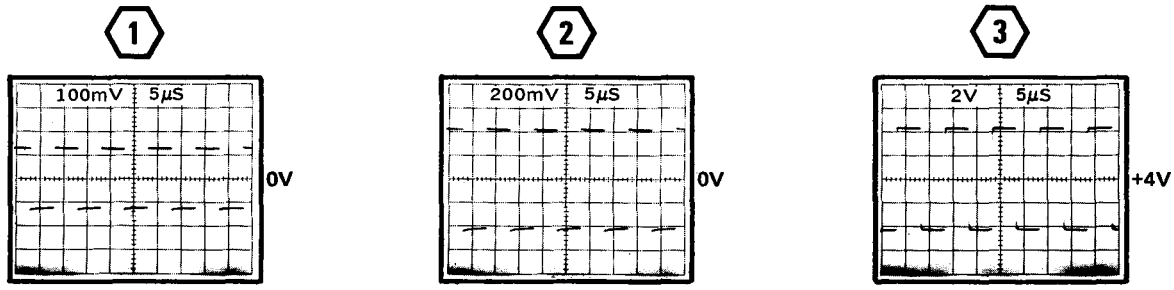
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored with a test oscilloscope and a 10X probe. A negative-going 100 kHz, 0.5 V, square wave was applied to the appropriate input connector with the vertical Position control centered, Y Atten switches at 1X, internal sweep generator disconnected (Option 4 version only), and the unused input connector grounded (grounding cap installed). The test points shown on the component and waveform test point location illustration with a + or − sign opposite the test point number indicates the input connector to which the test signal was applied.



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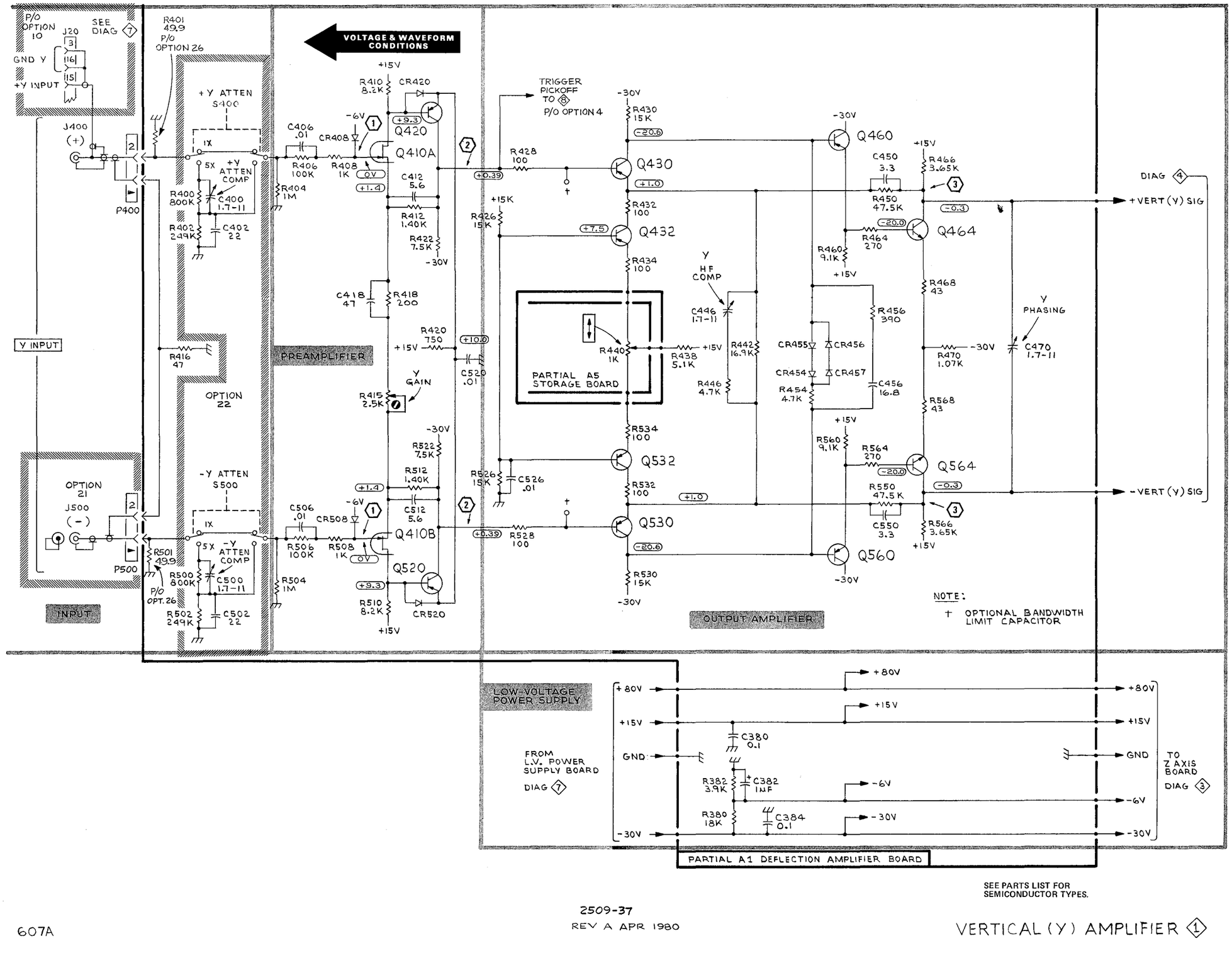


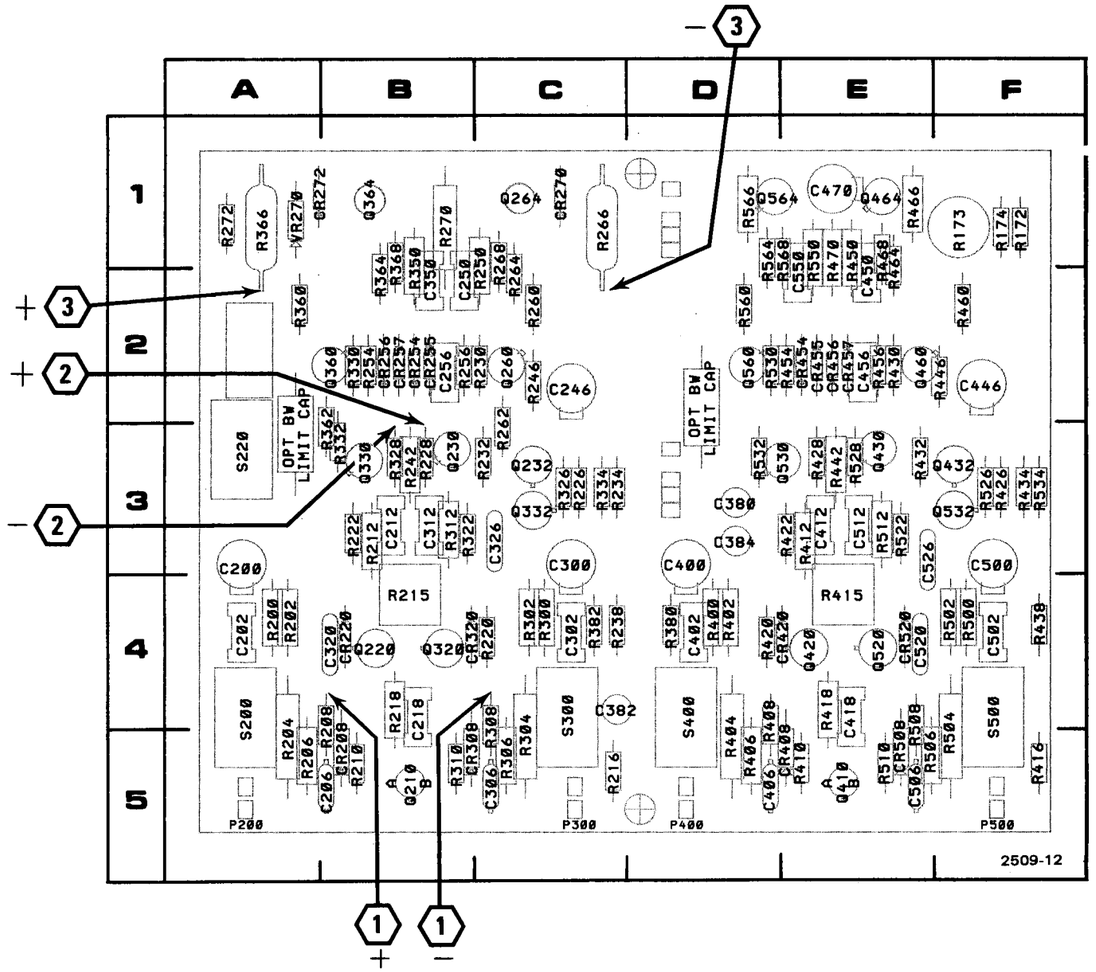


Figure 10-3. A1—Horizontal Amplifier component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C200	3A	C512	3E	Q320	4B	R226	3C	R360	2A	R466	1E
C202	4A	C520	4E	Q330	3B	R228	3B	R362	3B	R468	1E
C206	5B	C526	3E	Q332	3C	R230	2C	R364	2B	R470	1E
C212	3B	C550	2E	Q360	2B	R232	3C	R366	1A	R500	4F
C218	4B	CR208	5B	Q364	1B	R234	3C	R368	2B	R502	4F
C246	2C	CR220	4B	Q410	5E	R238	4C	R380	4D	R504	5F
C250	2B	CR254	2B	Q420	4E	R242	3B	R382	4C	R506	5F
C256	2B	CR255	2B	Q430	3E	R246	2C	R400	4D	R508	5E
C300	3C	CR256	2B	Q432	3F	R250	2C	R402	4D	R510	5E
C302	4C	CR257	2B	Q460	2E	R254	2B	R404	5D	R512	3E
C306	5C	CR270	1C	Q464	1E	R256	2B	R406	5D	R522	3E
C312	3B	CR272	1B	Q520	4E	R260	2C	R408	4D	R526	3F
C320	4B	CR308	5C	Q530	3E	R262	3C	R410	5D	R528	3E
C326	3C	CR320	4C	Q532	3F	R264	2C	R412	3E	R530	2D
C350	2B	CR408	5E	Q560	2D	R266	1C	R415	4E	R532	3D
C366		CR420	4E	Q564	1D	R268	1C	R416	5F	R534	3F
C380	3D	CR454	2E			R270	1B	R418	4E	R550	1E
C382	4C	CR455	2E	R172	1F	R272	1A	R420	4D	R560	2D
C384	3D	CR456	2E	R173	1F	R300	4C	R422	3E	R564	1D
C400	3D	CR457	2E	R174	1F	R302	4C	R426	3F	R566	1D
C402	4D	CR508	5E	R200	4B	R304	5C	R428	3E	R568	1E
C406	5D	CR520	4E	R202	4B	R306	5C	R430	2E		
C412	3E	P200	5A	R204	5A	R308	4C	R432	3E	S200	4A
C418	4E	P300	5C	R206	5B	R310	5B	R434	3F	S220	3A
C442		P400	5D	R208	4B	R312	3B	R438	4F	S300	4C
C446	2F	P500	5F	R210	5B	R322	3B	R442	3E	S400	4D
C450	2E	Q210	5B	R212	3B	R326	3C	R446	2F	S500	4F
C456	2E	Q220	4B	R215	4B	R328	3B	R450	1E		
C470	1E	Q230	3B	R216	5C	R330	2B	R454	2E	VR270	1A
C500	3F	Q232	3C	R218	4B	R332	3B	R456	2E		
C502	4F	Q260	2C	R220	4C	R334	3C	R460	2F		
C506	5E	Q264	1C	R222	3B	R350	2B	R464	2E		

INDEX FOR FIG. 10-3.

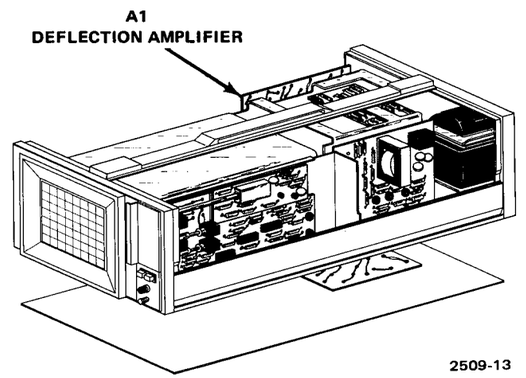


Figure 10-3A. Location of Deflection Amplifier board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

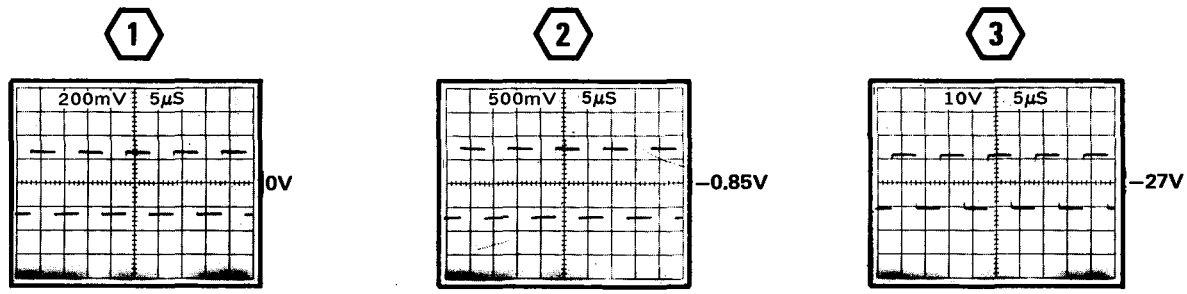
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored with a test oscilloscope and a 10X probe. A negative-going 100 kHz, 0.5 V, square wave was applied to the appropriate input connector with the vertical Position control centered, X Atten switches at 1X, internal sweep generator disconnected (Option 4 version only), and the unused input connector grounded (grounding cap installed). The X Gain was adjusted to 1 V for 8 divisions of deflection. The test points shown on the component and waveform test point location illustration with a + or − sign opposite the test point number indicates the input connector to which the test signal was applied.



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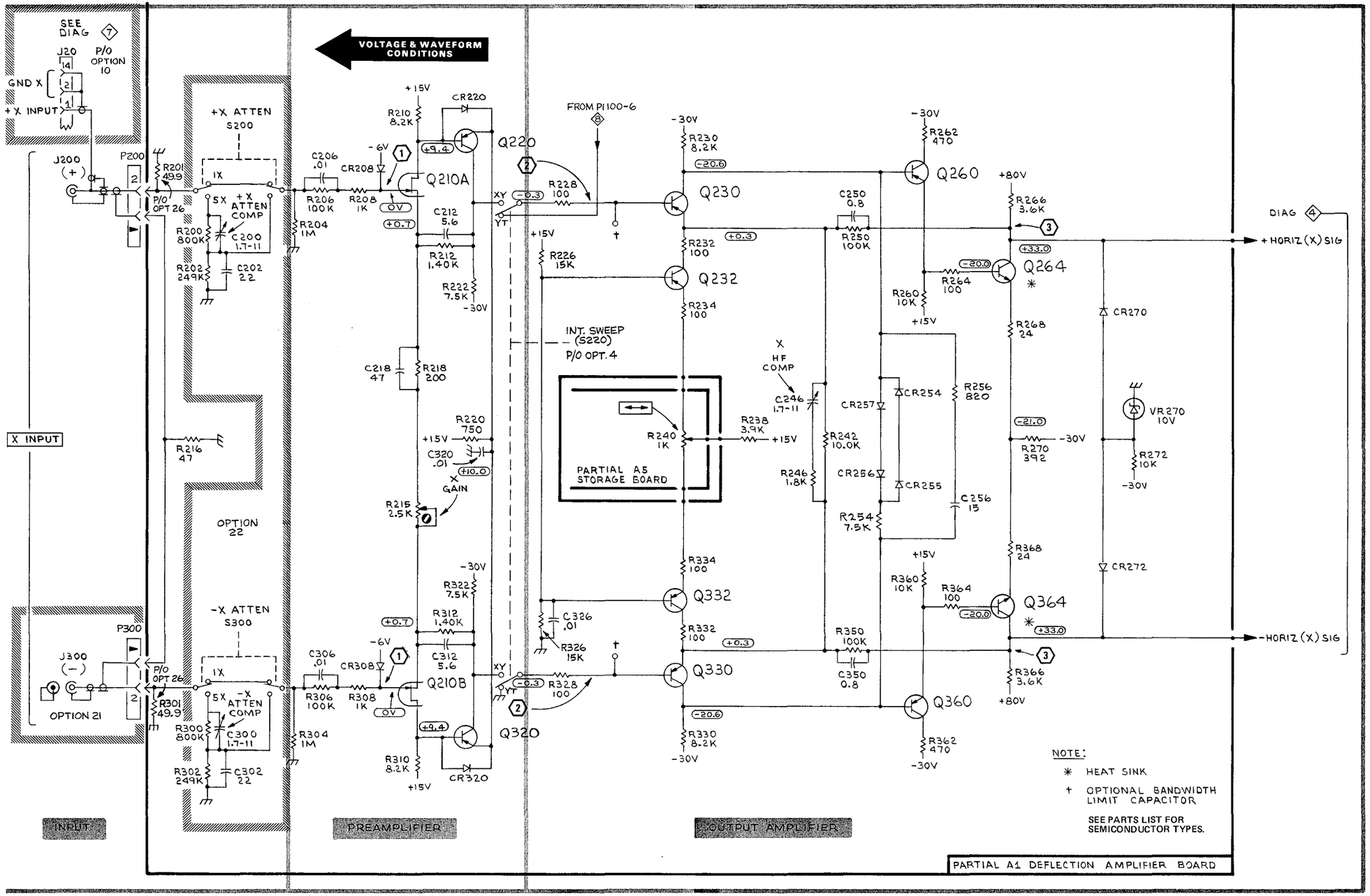


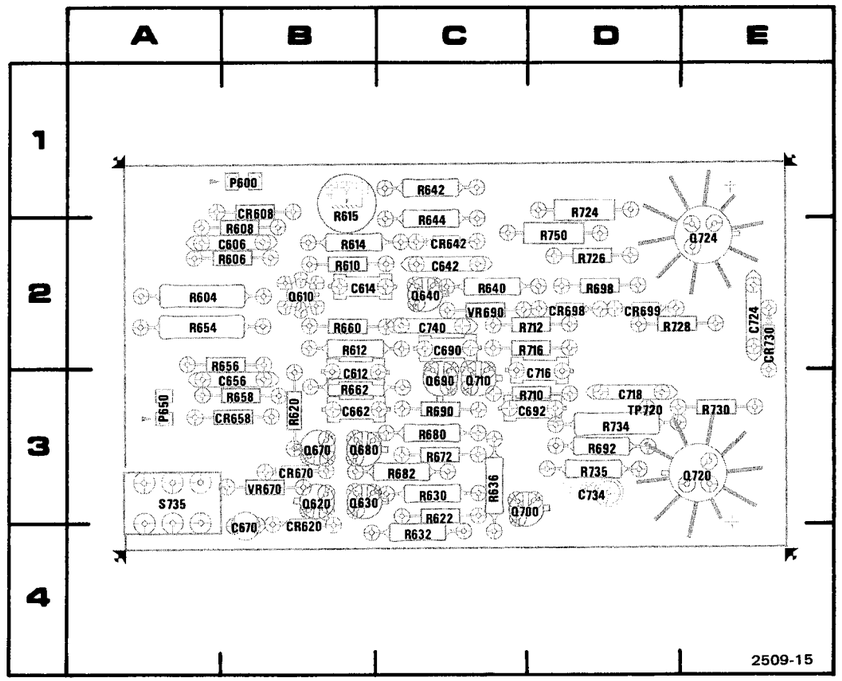


Figure 10-4. A2—Z-Axis Amplifier component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C606	2B	CR642	2C	Q710	3C	R640	2C	R716	2D
C612	3B	CR658	3B	Q720	3E	R642	2C	R724	2D
C614	2B	CR670	3B	Q724	2E	R644	2C	R726	2D
C642	2C	CR698	2D			R654	2A	R728	2D
C656	3B	CR699	2D	R604	2A	R656	3B	R730	3E
C662	3B	CR730	2E	R606	2B	R658	3B	R734	3D
C670	4B	P600	1B	R608	2B	R660	2B	R735	3D
C690	2C	P650	3A	R610	2B	R662	3B	R750	2D
C692	3D	Q610	2B	R612	2B	R672	3C		
C716	3D	Q620	3B	R614	2B	R680	3C	S735	3A
C718	3D	Q630	3B	R615	1B	R682	3C		
C724	2E	Q640	2C	R620	3B	R690	3C	TP720	3D
C734	3D	Q670	3B	R622	4C	R692	3D		
C740	2C	Q680	3B	R630	3C	R698	2D	VR670	3B
CR608	1B	Q690	3C	R632	4C	R710	3D	VR690	2C
CR620	4B	Q700	3C	R636	3C	R712	2D		

INDEX FOR FIG. 10-4.

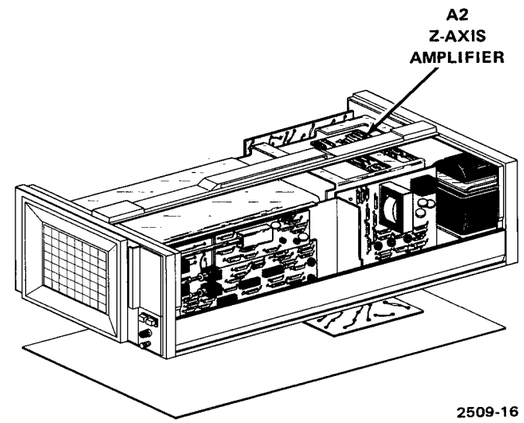


Figure 10-4A. Location of Z-Axis Amplifier board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

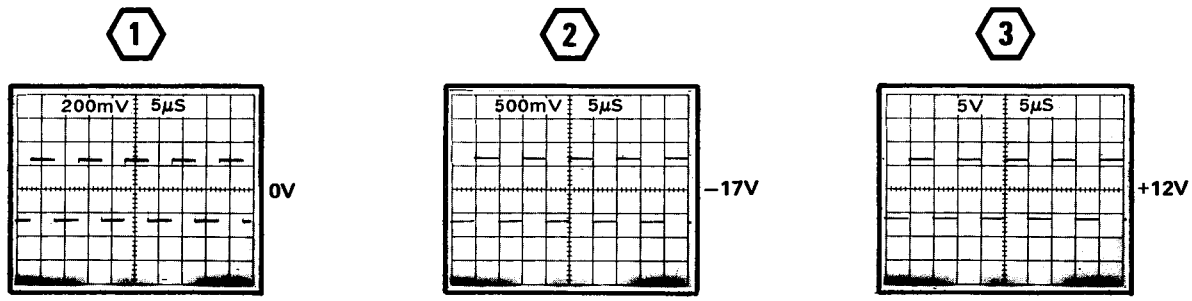
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

WAVEFORM CONDITIONS

The following waveforms were monitored with a test oscilloscope and a 10X probe. A negative-going 100 kHz, 0.5 V, square wave was applied to the appropriate input connector with the vertical and horizontal Position control fully clockwise, internal sweep generator disconnected (Option 4 version only), and the unused input connector grounded (grounding cap installed). The INTENSITY control was set for +40 V dc at test point 3 with the test signal applied to the +Z INPUT and +10 V dc at test point 3 with the test signal applied to the −Z INPUT.



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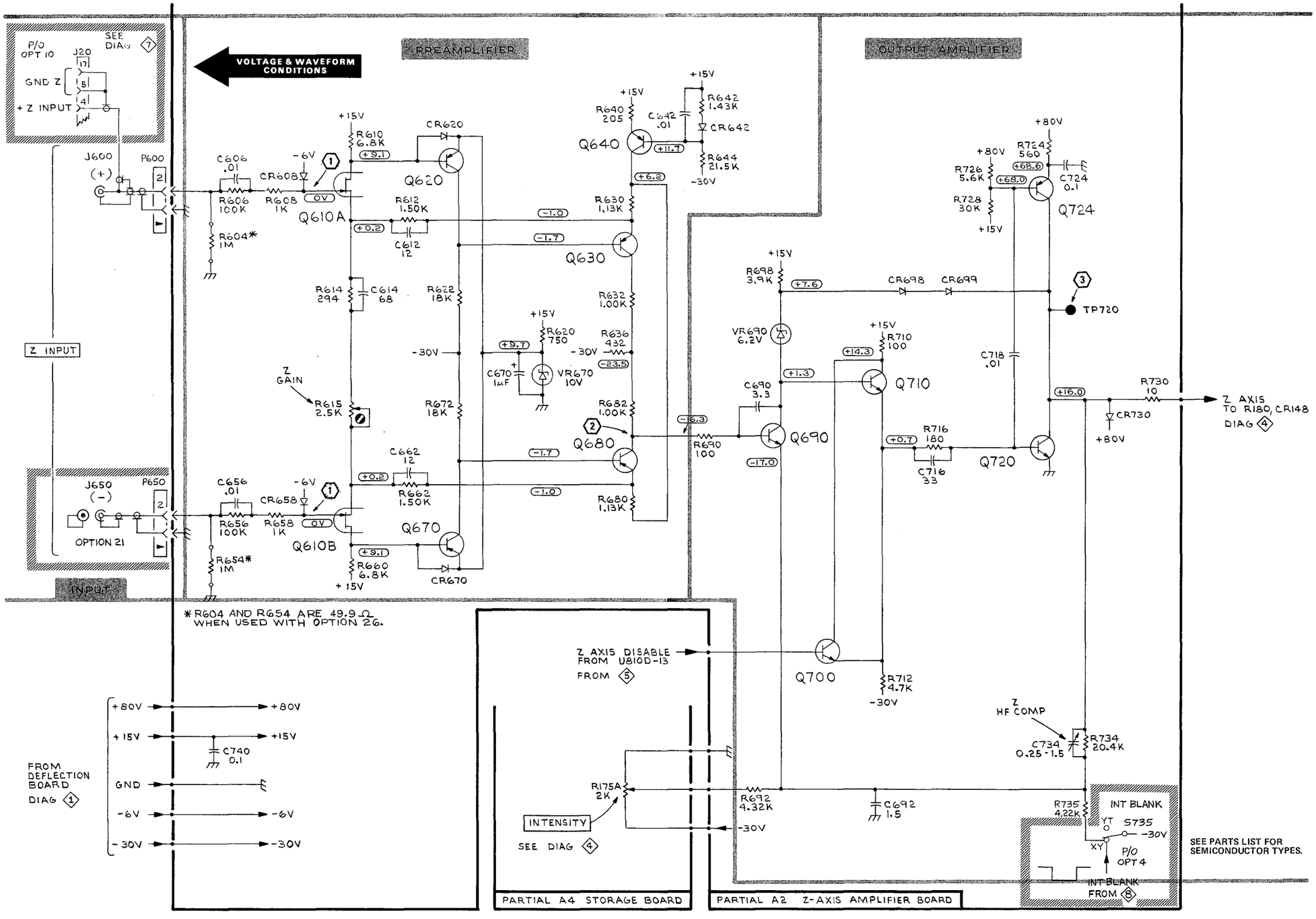

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

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REV A APR 1980

Z AXIS AMPLIFIER 3

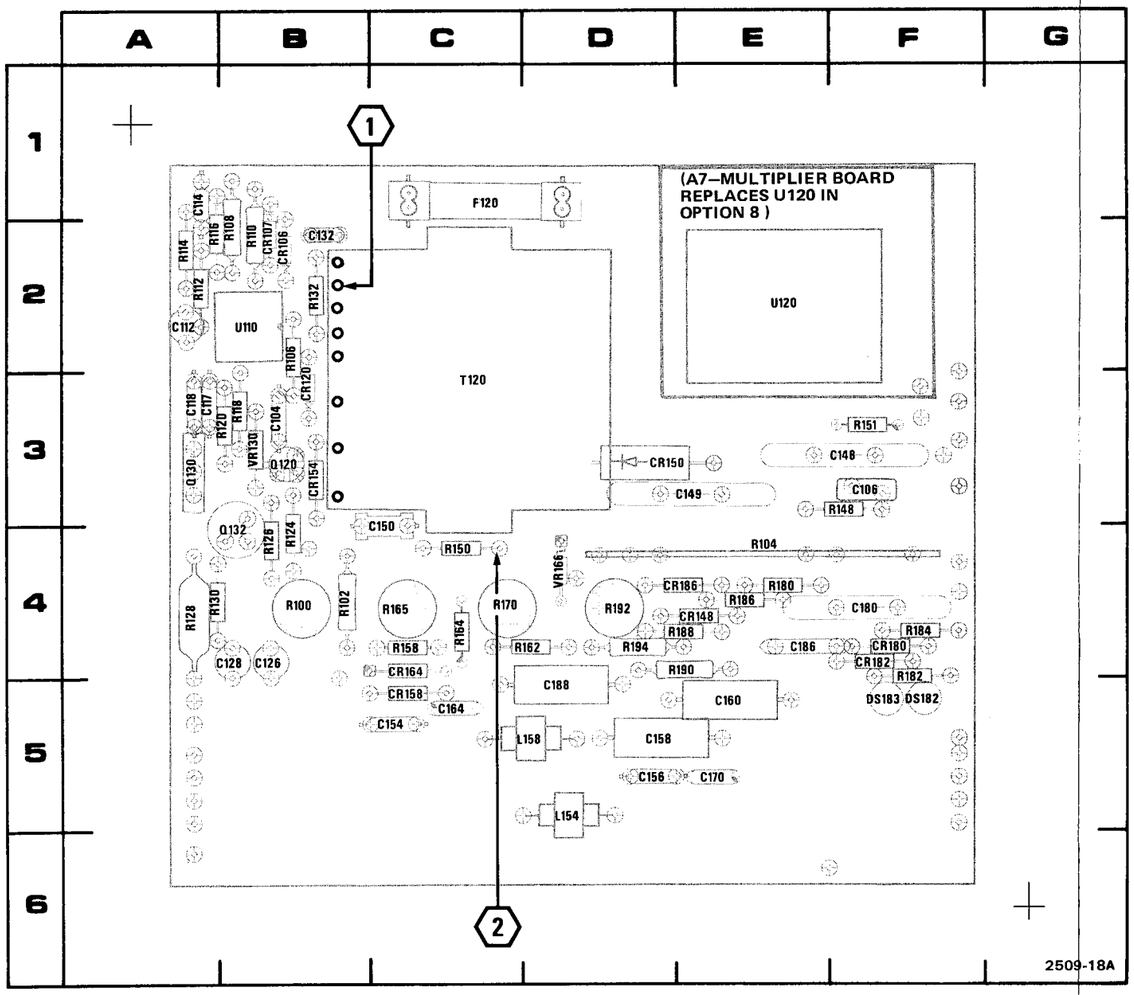


Figure 10-5. A3–High-Voltage Power Supply component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C104	3B	C158	5D	CR164	4C	Q130	3A	R124	4B	R182	4F
C106	3F	C160	5E	CR180	4F	Q132	4B	R126	4B	R184	4F
C112	2A	C164	5C	CR182	4F			R128	4A	R186	4E
C114	1A	C170	5E	CR186	4E	R100	4B	R130	4A	R188	4E
C117	3A	C180	4F			R102	4B	R132	2B	R190	4E
C118	3A	C186	4E	DS182	5F	R104	4E	R148	3F	R192	4D
C126	4B	C188	5D	DS183	5F	R106	2B	R150	4C	R194	4D
C128	4B					R108	2B	R151	3F	U110	2B
C132	2B	CR106	2B	F120	1C	R110	2B	R158	4C	U120	2E
C148	3F	CR107	2B			R112	2A	R162	4D		
C149	3E	CR120	3B	L154	5D	R114	2A	R164	4C	T120	3C
C150	3C	CR148	4E	L158	5D	R116	2A	R165	4C		
C154	5C	CR150	3D			R118	3B	R170	4C	VR130	3B
C156	5D	CR154	3B	Q120	3B	R120	3B	R180	4E	VR166	4D
		CR158	5C								

INDEX FOR FIG. 10-5.

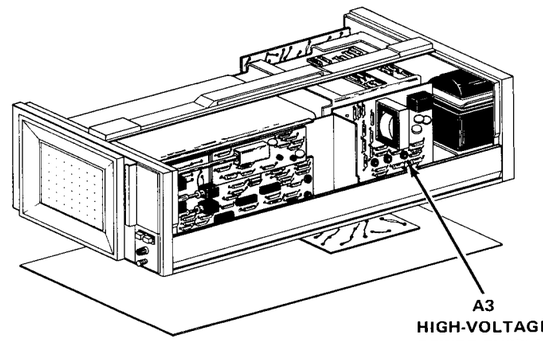


Figure 10-5A. Location of High-Voltage Power Supply board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

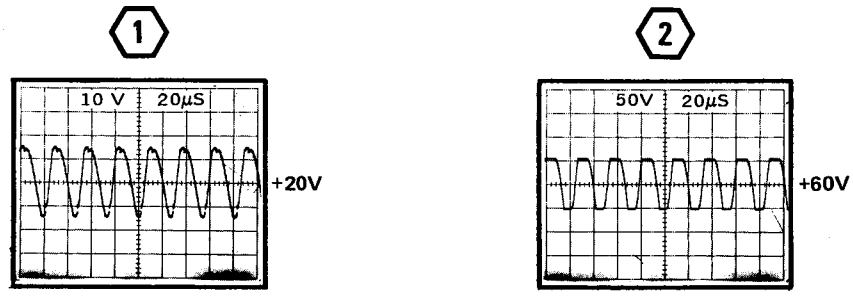
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

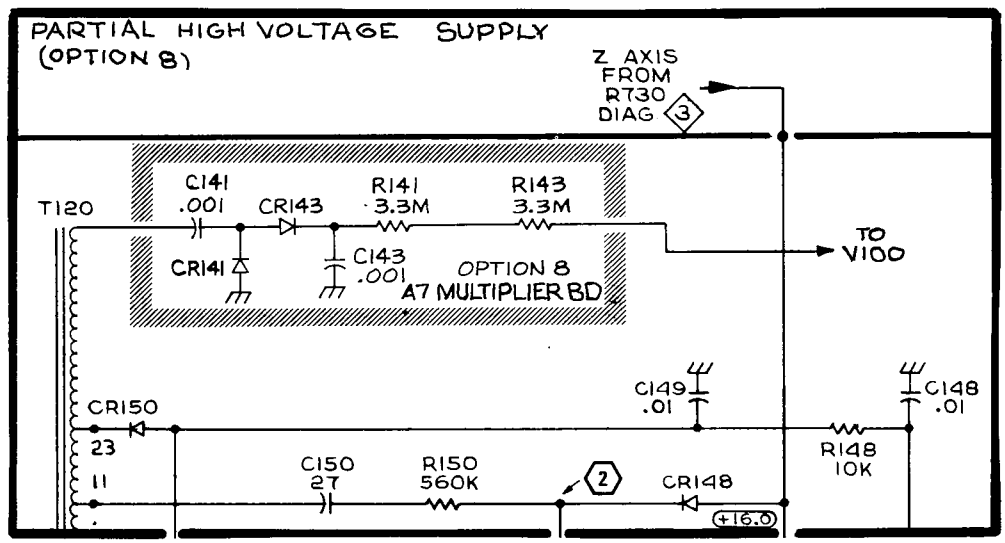
The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

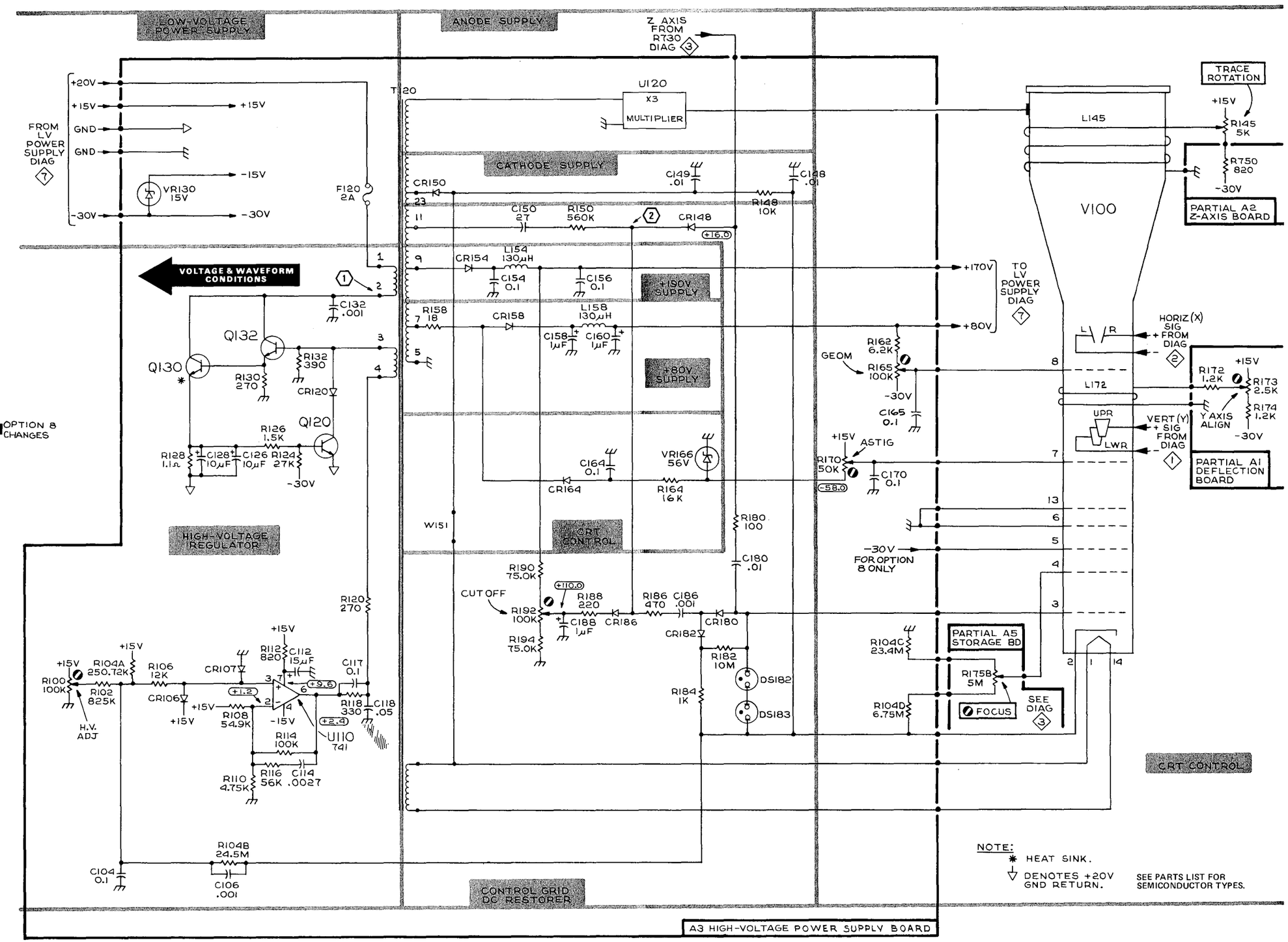
WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied, internal sweep generator disconnected (Option 4 version only), and INTENSITY control fully counterclockwise.



2509-20





HIGH-VOLTAGE POWER SUPPLY 4

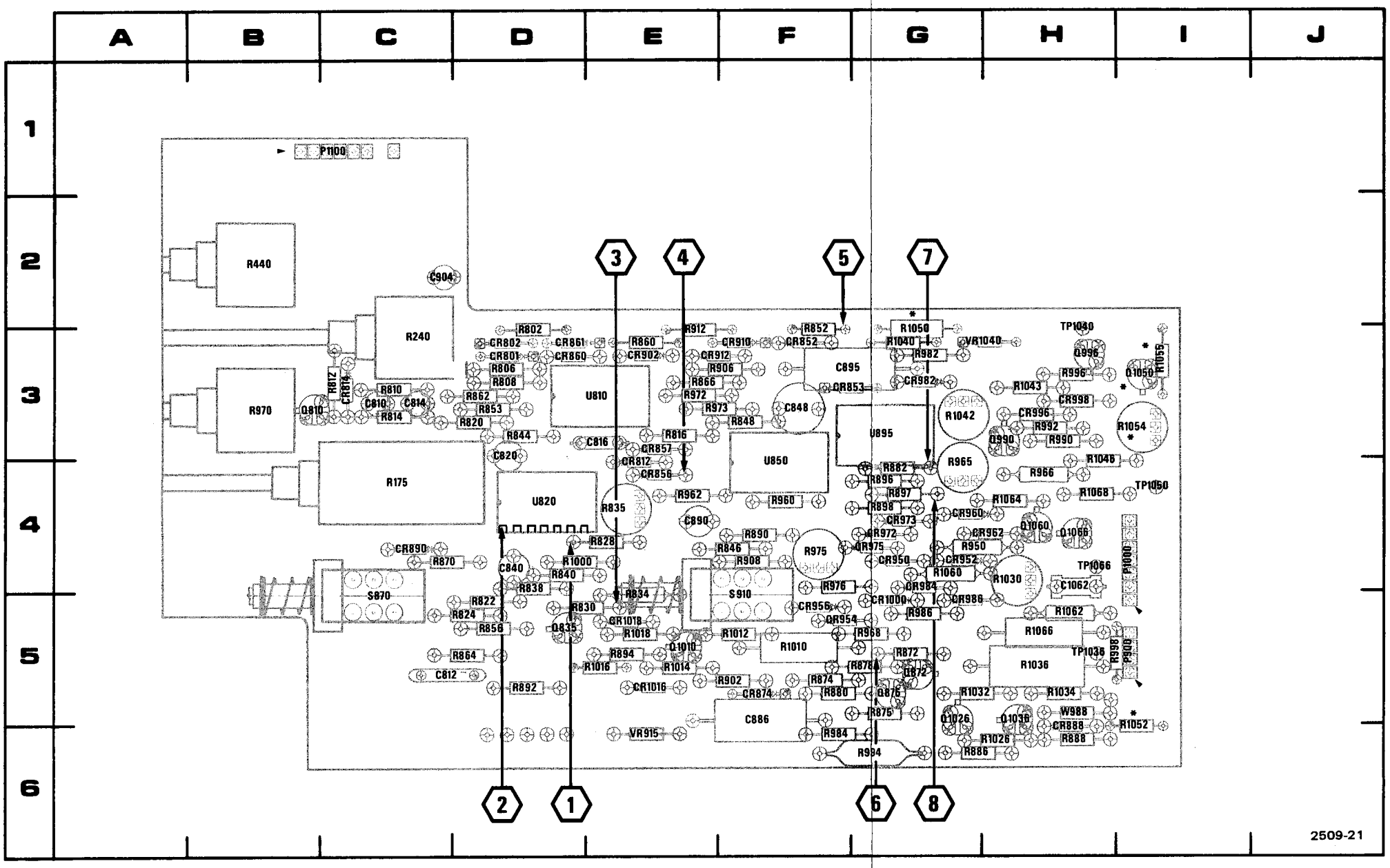


Figure 10-6. A4—Storage Control component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C810	3C	CR954	5F	Q1066	4H	R866	3E	R976	4F	R1066	5H
C812	5C	CR956	5F			R870	4C	R982	3G	R1068	4H
C814	3C	CR960	4G	R175	4C	R872	5G	R984	6F		
C816	3E	CR962	4H	R240	3C	R874	5F	R986	5G	S870	5C
C820	3D	CR972	4G	R440	2B	R875	5G	R990	3H	S910	5F
C840	4D	CR973	4G	R802	3D	R878	5G	R992	3H		
C848	3F	CR975	4G	R806	3D	R880	5F	R994	6G	TP1036	5H
C886	5F	CR982	3G	R808	3D	R882	4G	R996	3H	TP1040	2H
C890	4E	CR984	4G	R810	3C	R886	6G	R1000	4D	TP1050	4I
C895	3F	CR986	5G	R812	3C	R888	6H	R1010	5F	TP1066	4H
C904	2C	CR996	3H	R814	3C	R890	4F	R1012	5F		
C1062	4H	CR998	3H	R816	3E	R892	5D	R1014	5E	U810	3E
CR801	3D	CR1000	5G	R820	3D	R894	5E	R1016	5E	U820	4D
CR802	3D	CR1016	5E	R822	5D	R896	4G	R1018	5E	U850	5F
CR812	4E	CR1018	5E	R824	5D	R897	4G	R1026	6H	U895	3G
CR814	3C			R828	4E	R898	4G	R1030	4H		
CR852	3F	P900	5I	R830	5D	R902	5F	R1032	5G	W988	5H
CR853	3F	P1000	4I	R834	5E	R906	3E	R1034	5H		
CR856	4E			R835	4E	R908	4F	R1036	5H	VR915	6E
CR857	3E	Q810	3B	R838	4D	R912	3E	R1040	3G	VR1040	3H
CR860	3D	Q835	5D	R840	4D	R950	4G	R1042	3G		
CR861	3D	Q872	5G	R844	3D	R960	4F	R1043	3H		
CR874	5F	Q876	5G	R846	4F	R962	4E	R1046	4H		
CR888	5H	Q990	3H	R848	3F	R965	4G	*R1050	3G		
CR890	4C	Q996	3H	R852	3F	R966	4H	*R1052	6I		
CR902	3E	Q1010	5E	R853	3D	R968	5G	*R1054	3I		
CR910	3F	Q1026	5G	R856	5D	R970	3B	*R1055	3I		
CR912	3E	Q1036	5H	R860	3E	R972	3E	R1060	4G		
CR950	4G	*Q1050	3I	R862	3D	R973	3E	R1062	5H		
CR952	4G	Q1060	4H	R864	5D	R975	4F	R1064	4H		

INDEX FOR FIG. 10-6.

*Not used in Option 8 instruments.

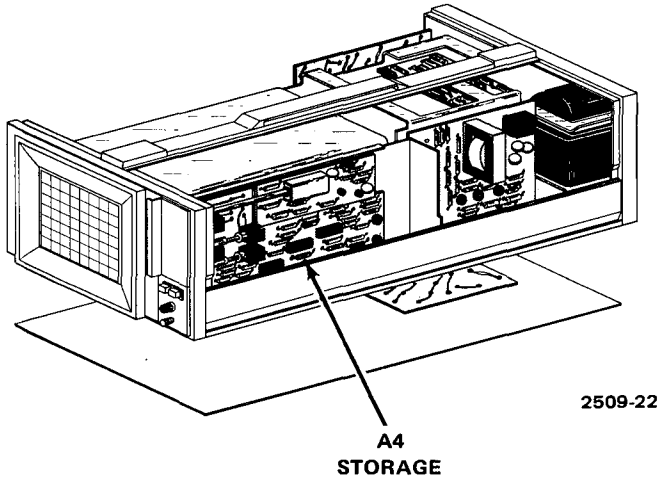


Figure 10-6A. Location of Storage board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

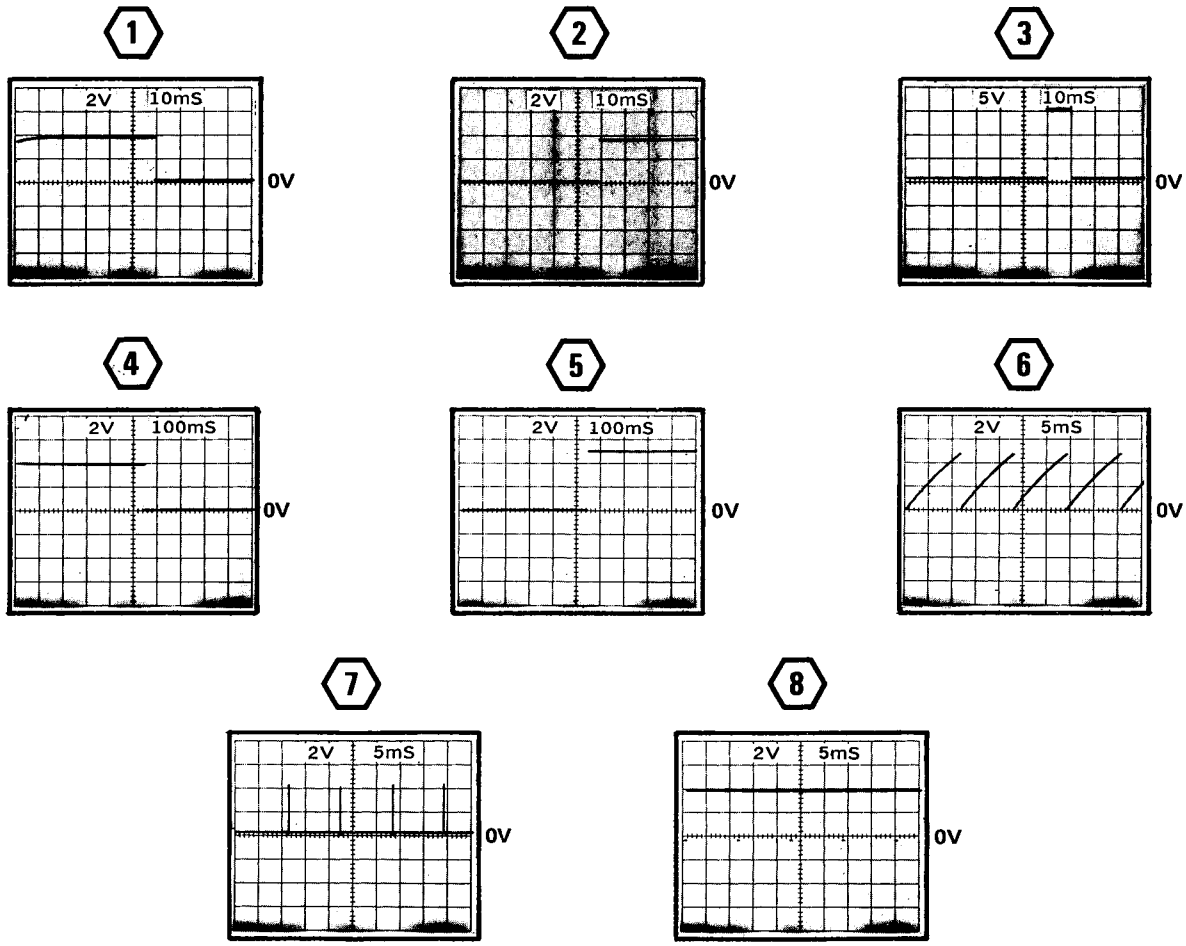
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only). The store button and the PERSISTENCE/SAVE TIME knob were pushed in.

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied. The STORE button was pushed in, INTENSITY control fully counterclockwise, and PERSISTENCE/SAVE TIME control pushed in and set to midrange. Waveforms at test points 1 through 5 were obtained when the ERASE button was pushed in; waveforms at test points 6 through 8 with the ERASE button out. The test oscilloscope sweep was triggered from test point 1.



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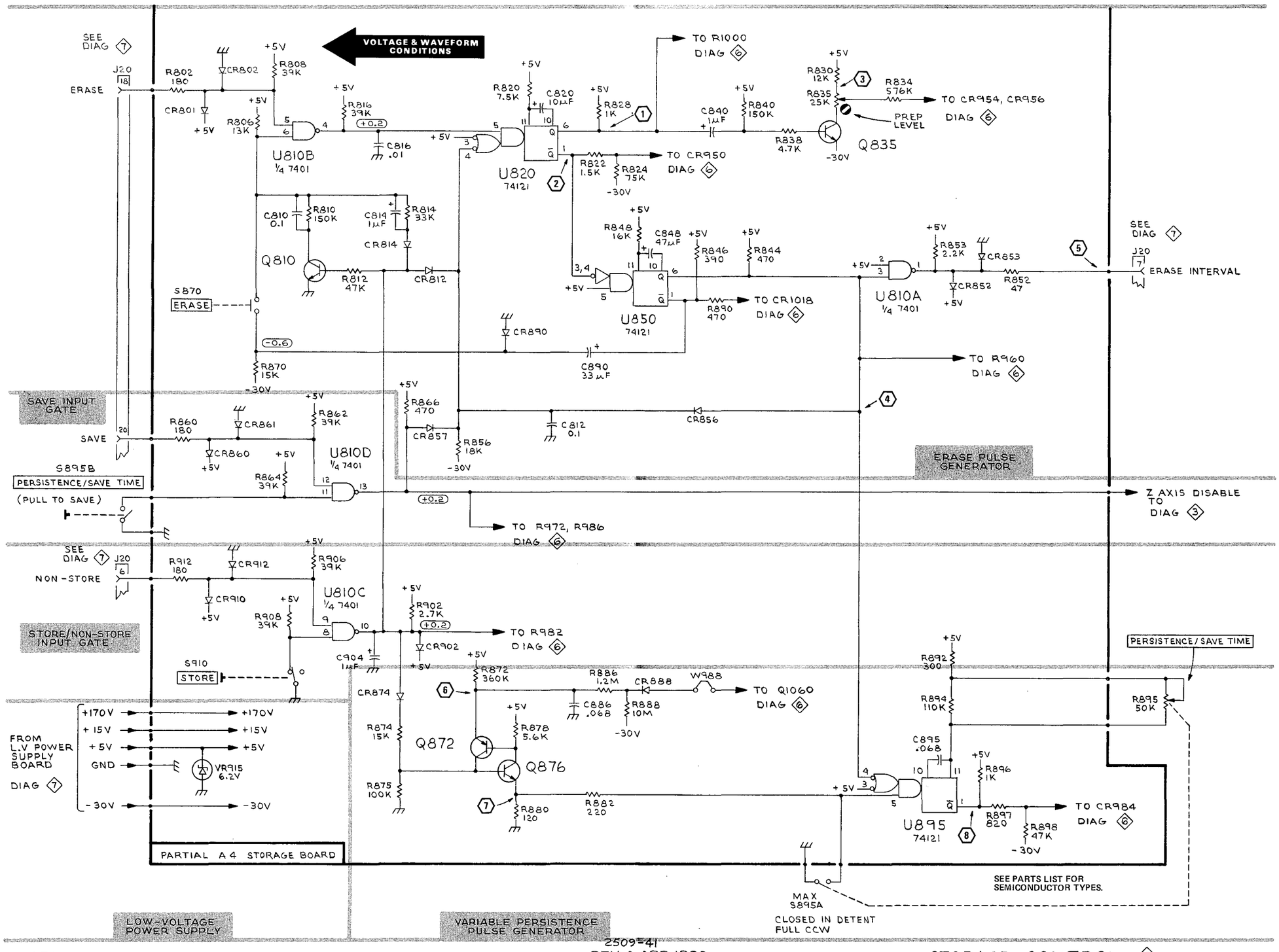
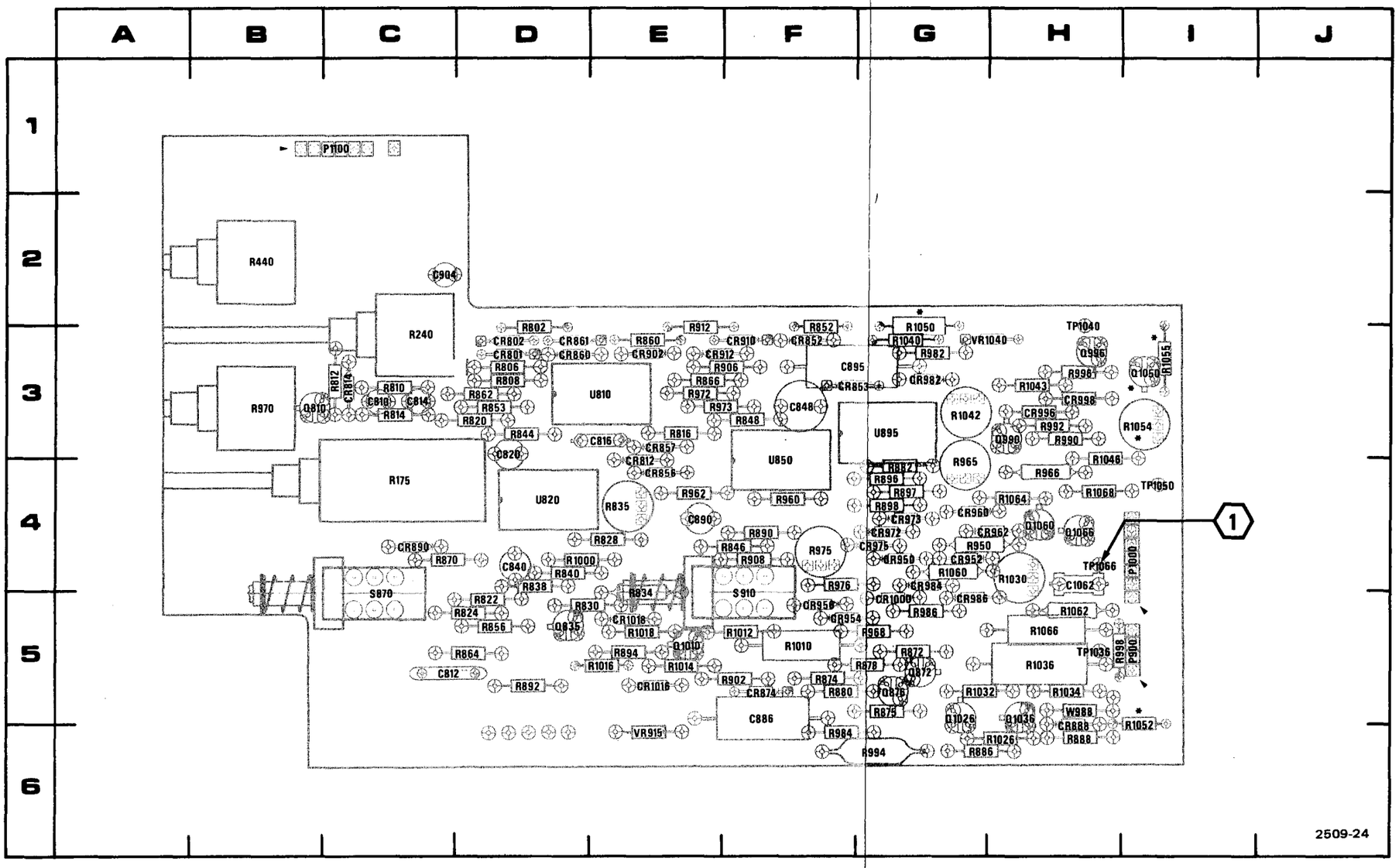




ASSEMBLY A4

Figure 10-7. A4—Storage Output component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C810	3C	CR954	5F	Q1066	4H	R866	3E	R976	4F	R1066	5H
C812	5C	CR956	5F			R870	4C	R982	3G	R1068	4H
C814	3C	CR960	4G	R175	4C	R872	5G	R984	6F		
C816	3E	CR962	4H	R240	3C	R874	5F	R986	5G	S870	5C
C820	3D	CR972	4G	R440	2B	R875	5G	R990	3H	S910	5F
C840	4D	CR973	4G	R802	3D	R878	5G	R992	3H		
C848	3F	CR975	4G	R806	3D	R880	5F	R994	6G	TP1036	5H
C886	5F	CR982	3G	R808	3D	R882	4G	R996	3H	TP1040	2H
C890	4E	CR984	4G	R810	3C	R886	6G	R1000	4D	TP1050	4I
C895	3F	CR986	5G	R812	3C	R888	6H	R1010	5F	TP1066	4H
C904	2C	CR996	3H	R814	3C	R890	4F	R1012	5F		
C1062	4H	CR998	3H	R816	3E	R892	5D	R1014	5E	U810	3E
CR801	3D	CR1000	5G	R820	3D	R894	5E	R1016	5E	U820	4D
CR802	3D	CR1016	5E	R822	5D	R896	4G	R1018	5E	U850	5F
CR812	4E	CR1018	5E	R824	5D	R897	4G	R1026	6H	U895	3G
CR814	3C			R828	4E	R898	4G	R1030	4H		
CR852	3F	P900	5I	R830	5D	R902	5F	R1032	5G	W988	5H
CR853	3F	P1000	4I	R834	5E	R906	3E	R1034	5H		
CR856	4E			R835	4E	R908	4F	R1036	5H	VR915	6E
CR857	3E	Q810	3B	R838	4D	R912	3E	R1040	3G	VR1040	3H
CR860	3D	Q835	5D	R840	4D	R950	4G	R1042	3G		
CR861	3D	Q872	5G	R844	3D	R960	4F	R1043	3H		
CR874	5F	Q876	5G	R846	4F	R962	4E	R1046	4H		
CR888	5H	Q990	3H	R848	3F	R965	4G	*R1050	3G		
CR890	4C	Q996	3H	R852	3F	R966	4H	*R1052	6I		
CR902	3E	Q1010	5E	R853	3D	R968	5G	*R1054	3I		
CR910	3F	Q1026	5G	R856	5D	R970	3B	*R1055	3I		
CR912	3E	Q1036	5H	R860	3E	R972	3E	R1060	4G		
CR950	4G	*Q1050	3I	R862	3D	R973	3E	R1062	5H		
CR952	4G	Q1060	4H	R864	5D	R975	4F	R1064	4H		

INDEX FOR FIG. 10-7.

***Not used in Option 8 instruments.**

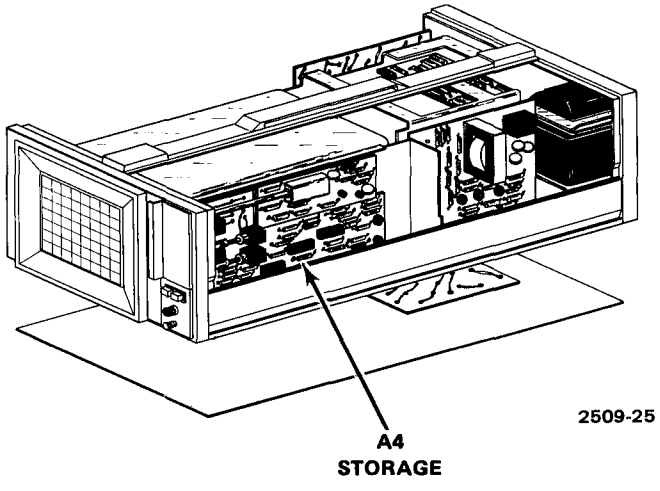


Figure. 10-7A. Location of Storage board.

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

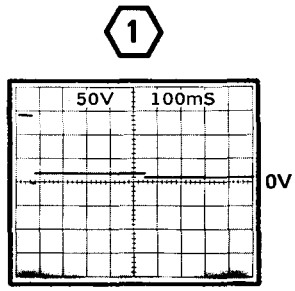
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only). The STORE button was pushed in, OPERATE LEVEL control fully clockwise, and PERSISTENCE/SAVE TIME control pushed in and set fully counterclockwise (MAX).

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied. The STORE button was pushed, INTENSITY control fully counterclockwise, and PERSISTENCE/SAVE TIME control pushed in and set to midrange. Waveform was obtained when the ERASE button was pushed in. The test oscilloscope sweep was triggered from test point 1 shown on the Storage Control schematic (diagram 5).



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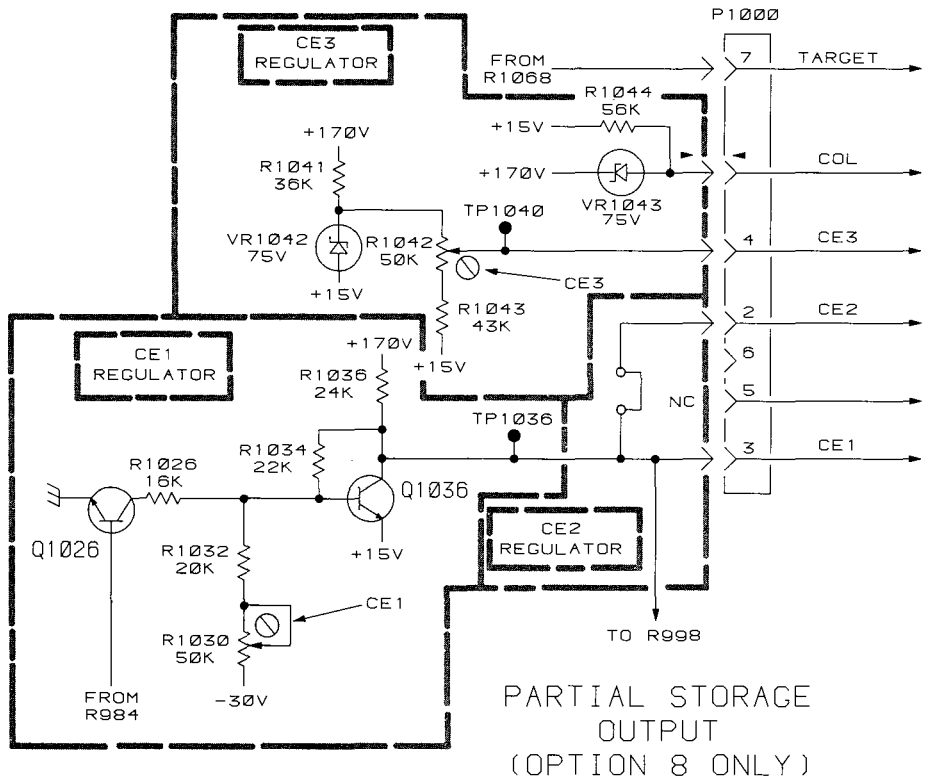

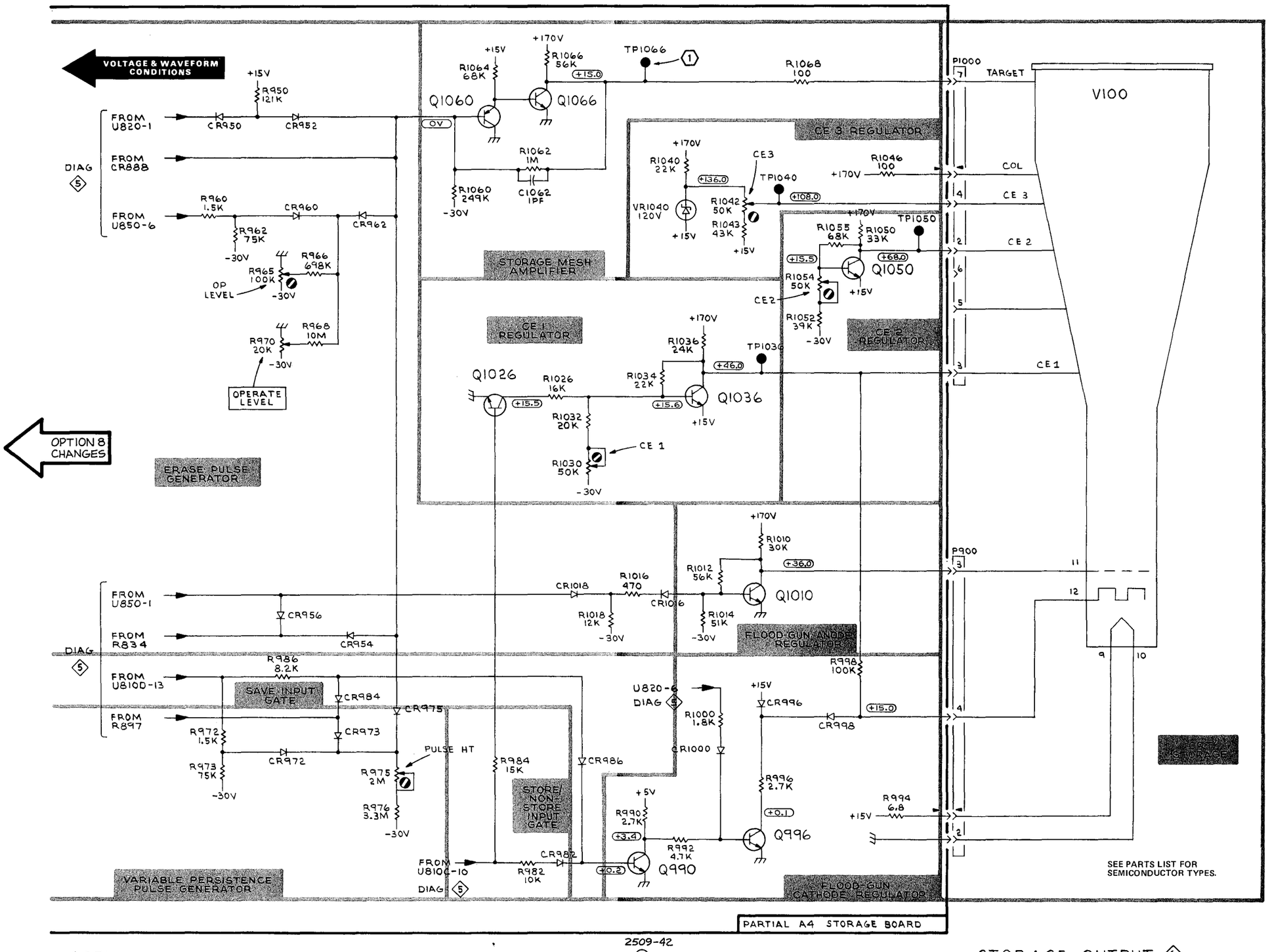

607A

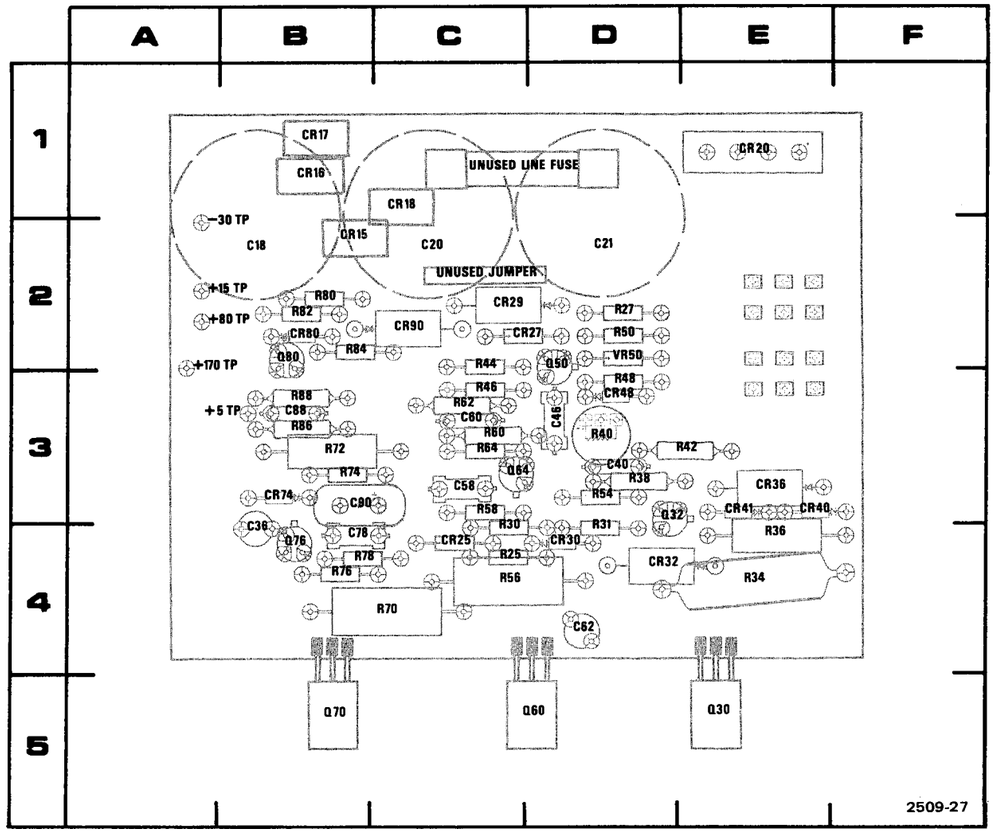

Figure 10-8. A5—Low-Voltage Power Supply component locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C18	2B	CR15	2B	CR41	3E	Q76	4B	R80	2B
C20	1C	CR16	1B	CR48	3D	Q80	2B	R82	2B
C21	2D	CR17	1B	CR74	3B			R84	2B
C36	4B	CR18	1C	CR80	2B	R25	4C	R86	3B
C40	3D	CR20	1E	CR90	2C	R27	2D	R88	3B
C46	3D	CR25	4C			R30	4C		
C53	3C	CR27	2C	Q30	5E	R31	4D	VR50	2D
C60	3C	CR29	2C	Q32	3D	R34	4E		
C62	4D	CR30	4D	Q50	2D	R36	4E		
C78	4B	CR32	4D	Q60	5D	R74	3B		
C88	3B	CR36	3E	Q64	3C	R76	4B		
C90	3B	CR40	3E	Q70	5B	R78	4B		

INDEX FOR FIG. 10-8.

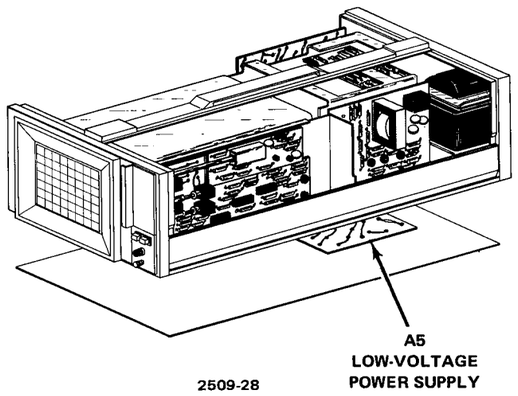

Figure 10-8A. Location of Low-Voltage Power Supply board.

VOLTAGE CONDITIONS

NOTE

The test equipment used to obtain the voltages is listed in Table 4-1, Test Equipment.

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible dot at near center screen with the internal sweep generator disconnected (Option 4 version only).

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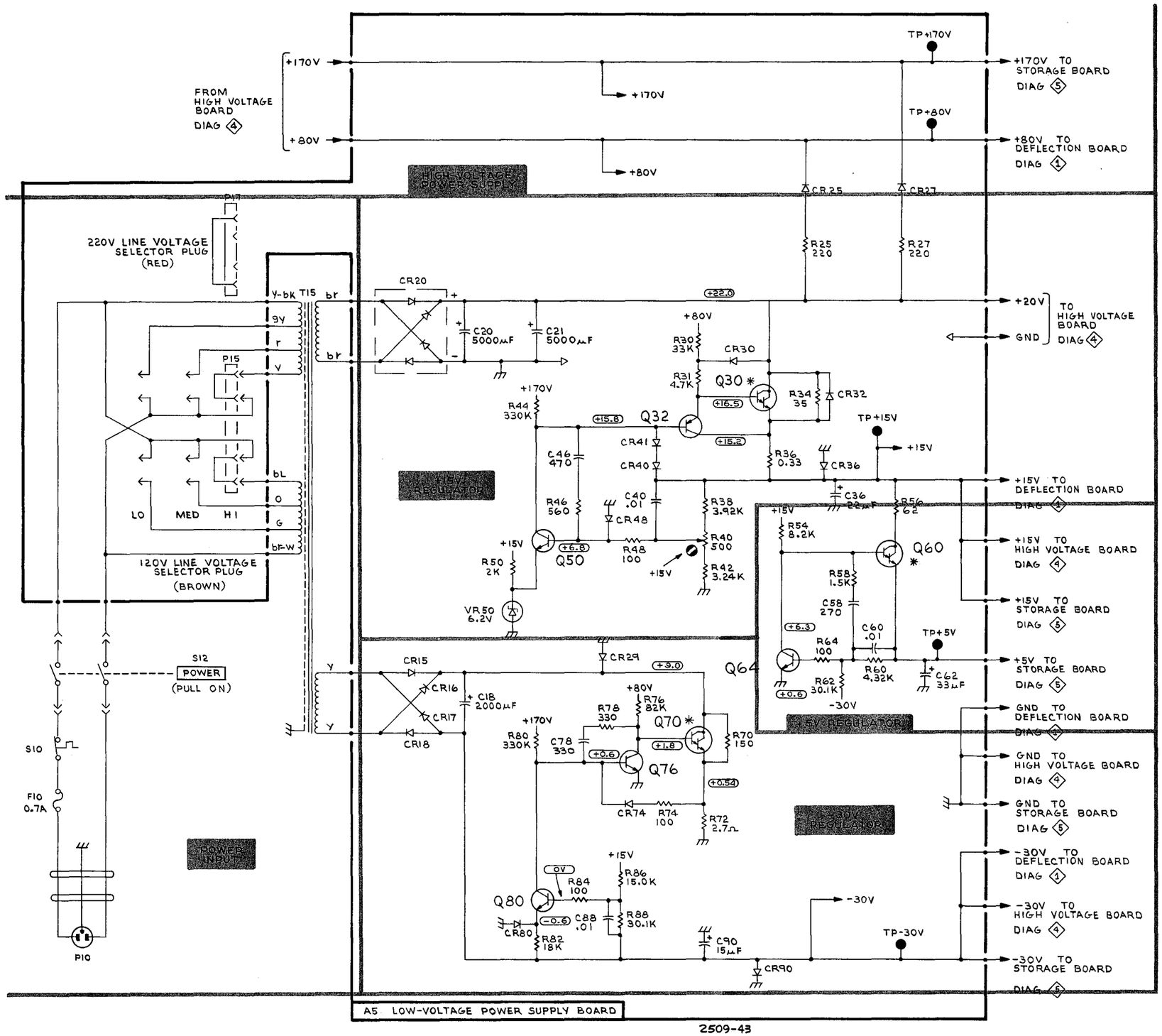

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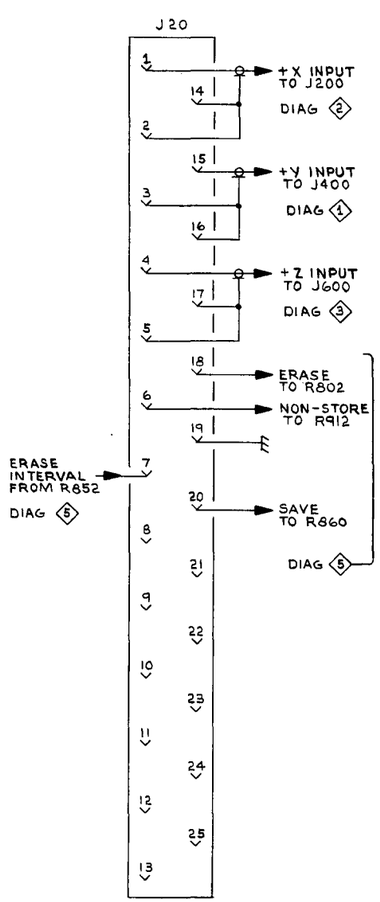
@

OPTION 10
REMOTE PROGRAM



NOTE:

▽ DENOTES +20V GND RETURN

✱ HEAT SINK

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

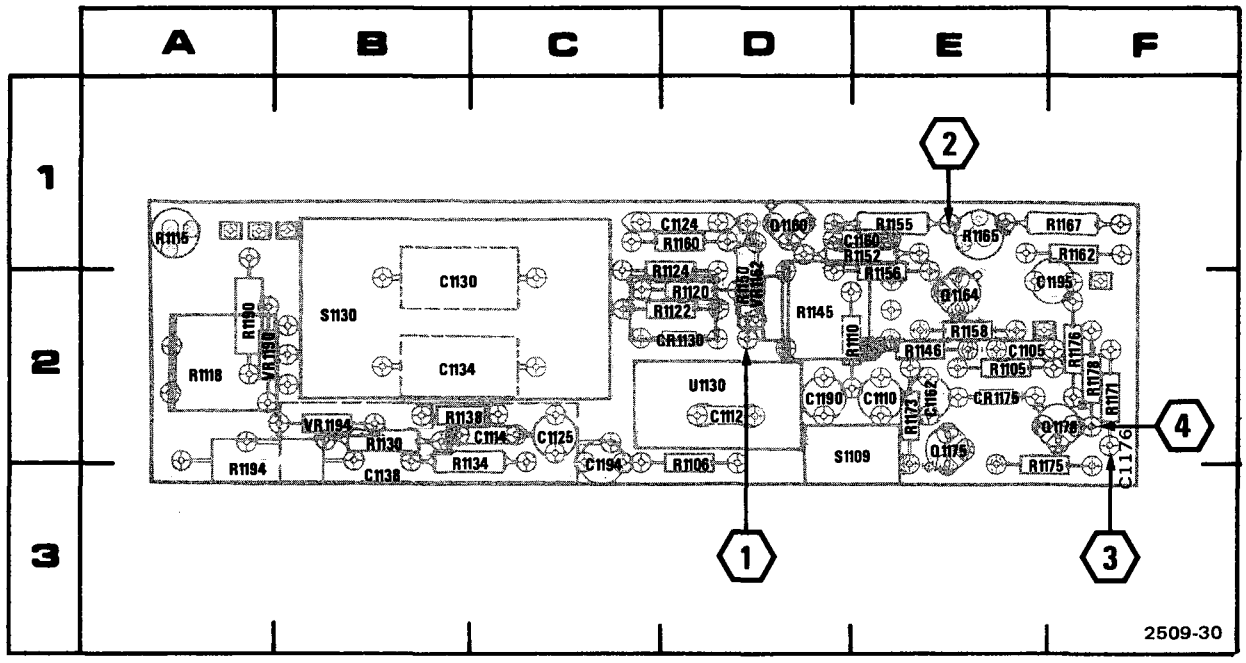


Figure 10-9. A6—Sweep board (Option 4) component and waveform test point locations.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C1105	2E	CR1175	2E	R1134	2C	R1178	2F
C1110	2E			R1138	2C	R1190	2A
C1112	2D	Q1160	1D	R1145	2D	R1194	3A
C1114	2C	Q1164	2E	R1146	2E		
C1124	1D	Q1175	2E	R1150	2D	S1109	2D
C1125	2C	Q1178	2F	R1152	1E	S1130	2B
C1130	2B			R1155	1E		
C1134	2B	R1105	2E	R1156	2E	U1130	2D
C1138	3B	R1106	3D	R1158	2E		
C1160	1E	R1110	2E	R1160	1D	VR1162	2D
C1162	2E	R1115	1A	R1162	1F	VR1190	2A
C1190	2D	R1118	2A	R1165	1E	VR1194	2B
C1194	3C	R1120	2D	R1167	1F		
C1176	3F	R1122	2D	R1171	2F		
		R1124	2D	R1173	2E		
CR1130	2D	R1130	2B	R1175	3F		
				R1176	2F		

INDEX FOR FIG. 10-9.

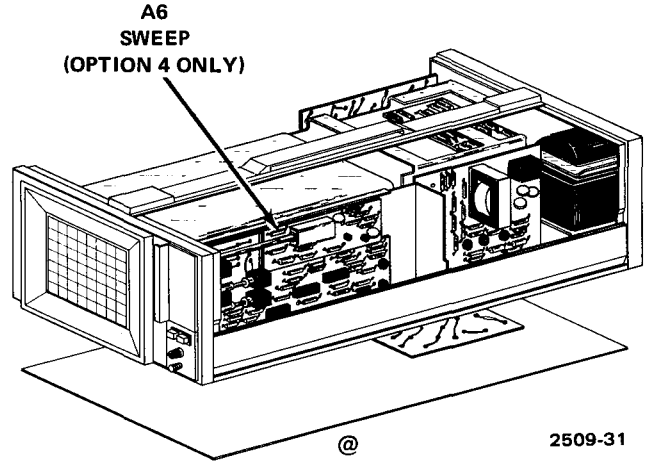


Figure 10-9A. Location of Sweep board (Option 4 only).

VOLTAGE AND WAVEFORM CONDITIONS

NOTE

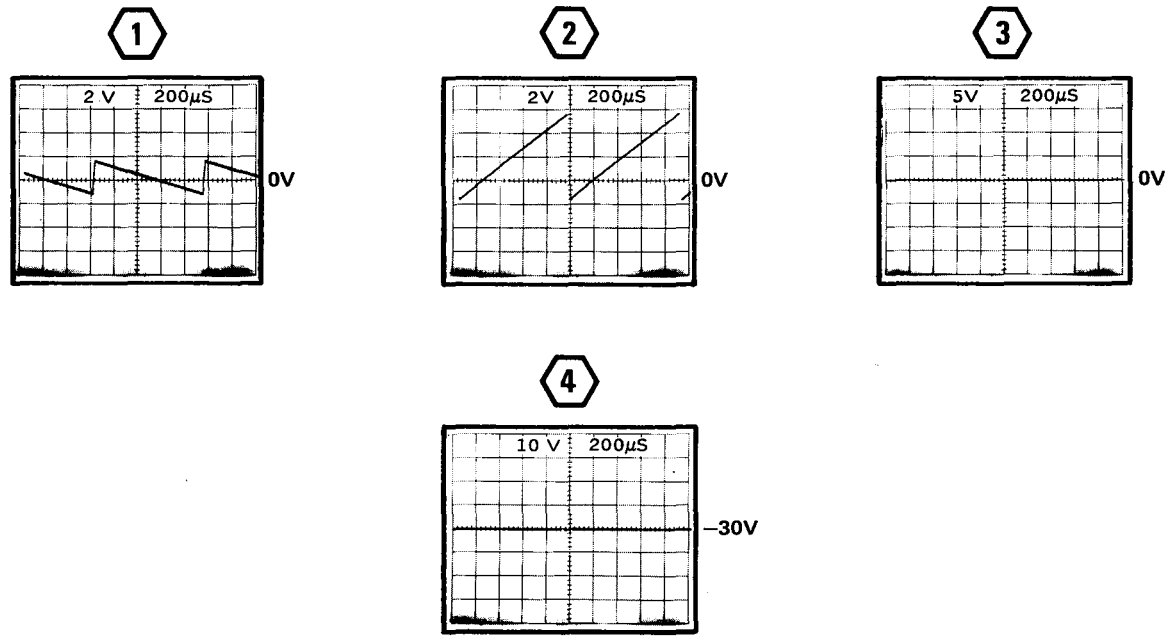
The test equipment used to obtain the voltages and waveforms is listed in Table 4-1, Test Equipment.

VOLTAGE CONDITIONS

The dc voltages indicated on the schematic diagram were obtained with no test signal input using a digital multimeter. The INTENSITY and Position controls were set for a barely visible trace at near center screen with the internal sweep generator connected. The internal Trig Mode switch (S1109) was set to the Normal position.

WAVEFORM CONDITIONS

The following waveforms were monitored by a test oscilloscope and a 10X probe with no test signal applied and the internal sweep generator connected. The internal Trig Mode switch (S1109) was set to the Auto position, SEC/DIV switch to .1 m, and VARIABLE control fully clockwise (calibrated).



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P1100
+15V
R1190 240
+8.2V
VR1190 8.2V
C1190 1μF
VR1194 8.2V
C1194 1μF
-8.2V
R1194 820
C1195 0.1
-30V
LOW VOLTAGE POWER SUPPLY
VOLTAGE & WAVEFORM CONDITIONS
S1130
SEC/DIV
.1
10 m
1 m
.1 m
10 μ
1 μ
7 1 4 2 5 3 6
VARIABLE
+15V
R1145 2.5K
R1146 220
+8.2V
R1130 49.9K
R1134 499K
R1138 4.99M
R1124 22K
C1124 .0033
C1125 1μF
TRIG (SLOPE LEVEL)
R1122 1.2K
R1120 33K
C1114 .02
-8.2V
R1118 2K
SWP LENGTH
R1115 10K
TRIG HO
SWP CAL
+REG VOLT
TRIG SLP & LVL
-REG VOLT
MILLER NULL
SWP TMG VOLT SWP
SAW-TOOTH OUT
TRIG DIFF
C1112 33
OV
CR1130
C1130 .001
C1134 .01
C1138 1μF
R1150 24.9K
R1105 36K
C1105 8
R1106 22K
TRIG SIG
U1130
TRIG & SWP
R1110 3.3K
C1110 1μF
NORM
AUTO
-8.2V
(S1109) TRIG MODE
FREE RUN HO
CRT UNBLKG
+8.4
+8.2V
R1171 27K
R1173 1K
Q1175
-30.0
CR1175
R1175 1K
C1176 68
R1176 470
-30V
R1178 13K
-5.0
Q1178
TRIGGER & SWEEP GENERATOR
+15V
R1152 16.9K
+14.5
R1162 100
Q1160
+8.5
VR1162 6.2V
C1162 0.1
R1158 2.2K
C1160 2.2
-0.7
R1160 33K
Q1164
-1.3
R1155 68.1K
R1156 8.1K
R1165 1K
R1167 2.43K
SWP CAL
P1100
PARTIAL A4 STORAGE BOARD
INT SWP (S220)
+HORIZ (X) SIG FROM COLLECTOR OF Q220
DIAG 2
XY
YT
+HORIZ (X)/ INT SWP SIG TO R228
DIAG 2
-HORIZ (X) SIG FROM COLLECTOR OF Q320
-HORIZ (X) SIG TO R328
PARTIAL A1 DEFLECTION AMPLIFIER BOARD
INT BLANK SIG TO R735
DIAG 3
(S735) INT BLANK
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
PARTIAL A2 Z AXIS AMPLIFIER BOARD
TRIG SIG FROM COLLECTOR OF Q420
DIAG 1
PARTIAL A1 DEFLECTION AMPLIFIER BOARD
A6 SWEEP BOARD

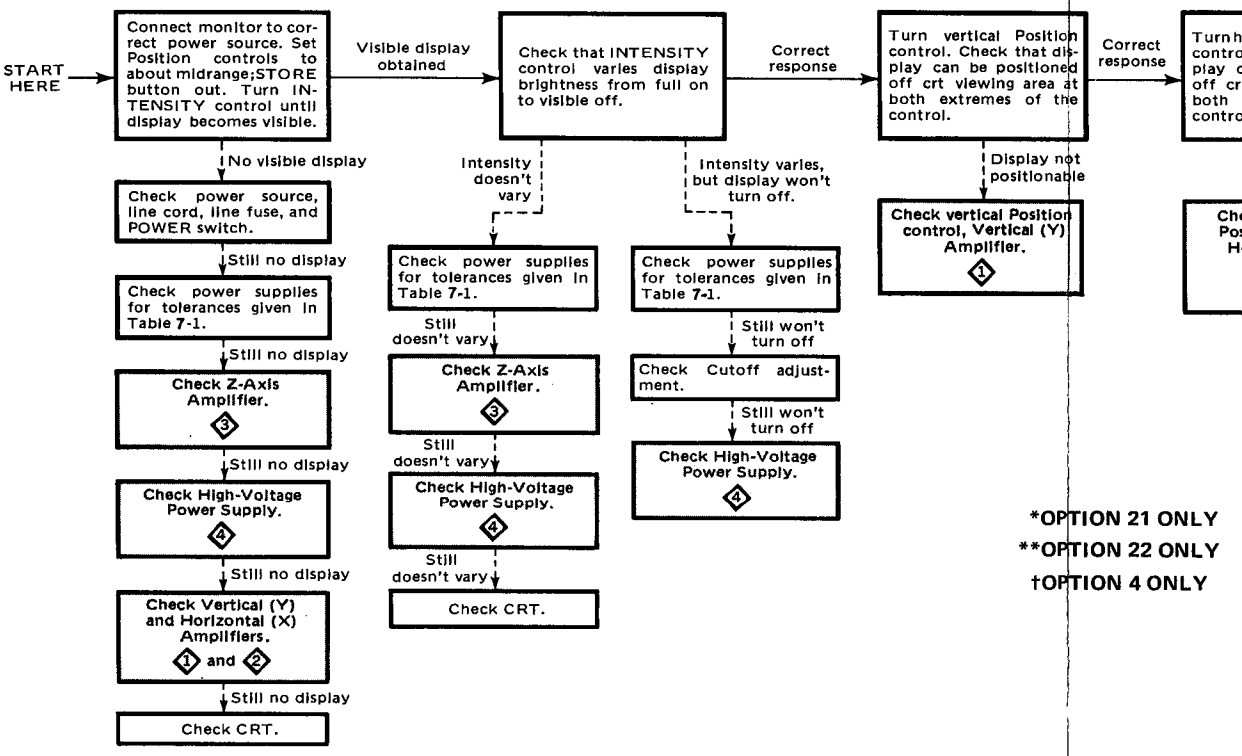
TROUBLESHOOTING CHART INSTRUCTIONS:

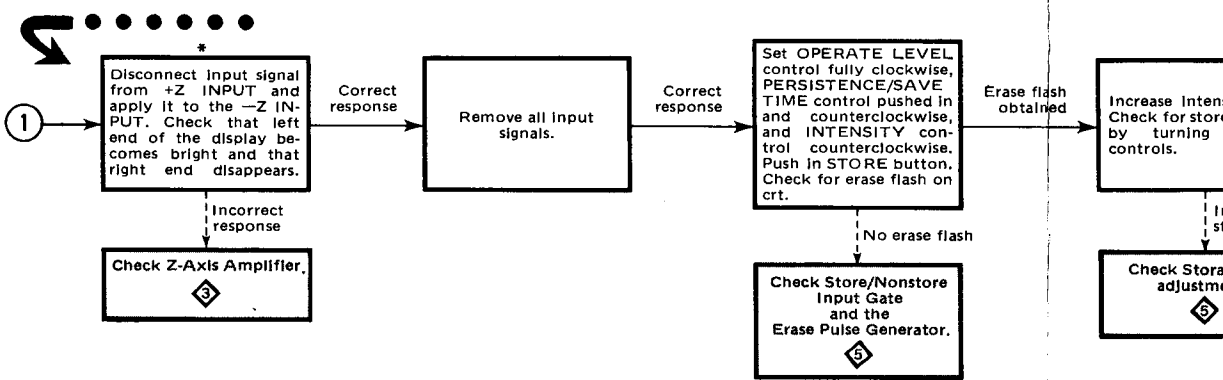
1. Beginning at the top left block of the chart proceed to the right until the Monitor does not perform as indicated.

2. Then follow the dashed line as the symptom indicates. Each shaded block indicates a circuit or a stage which may be the cause of the malfunction. Refer to section 6, Theory of Operation, for a detailed discussion.

NOTE

For instruments equipped with the Option 4 Sweep circuit, disconnect the sweep (by reversing the procedure given in section 5, Installation) before beginning this procedure.





or does not perform as

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on, for a detailed

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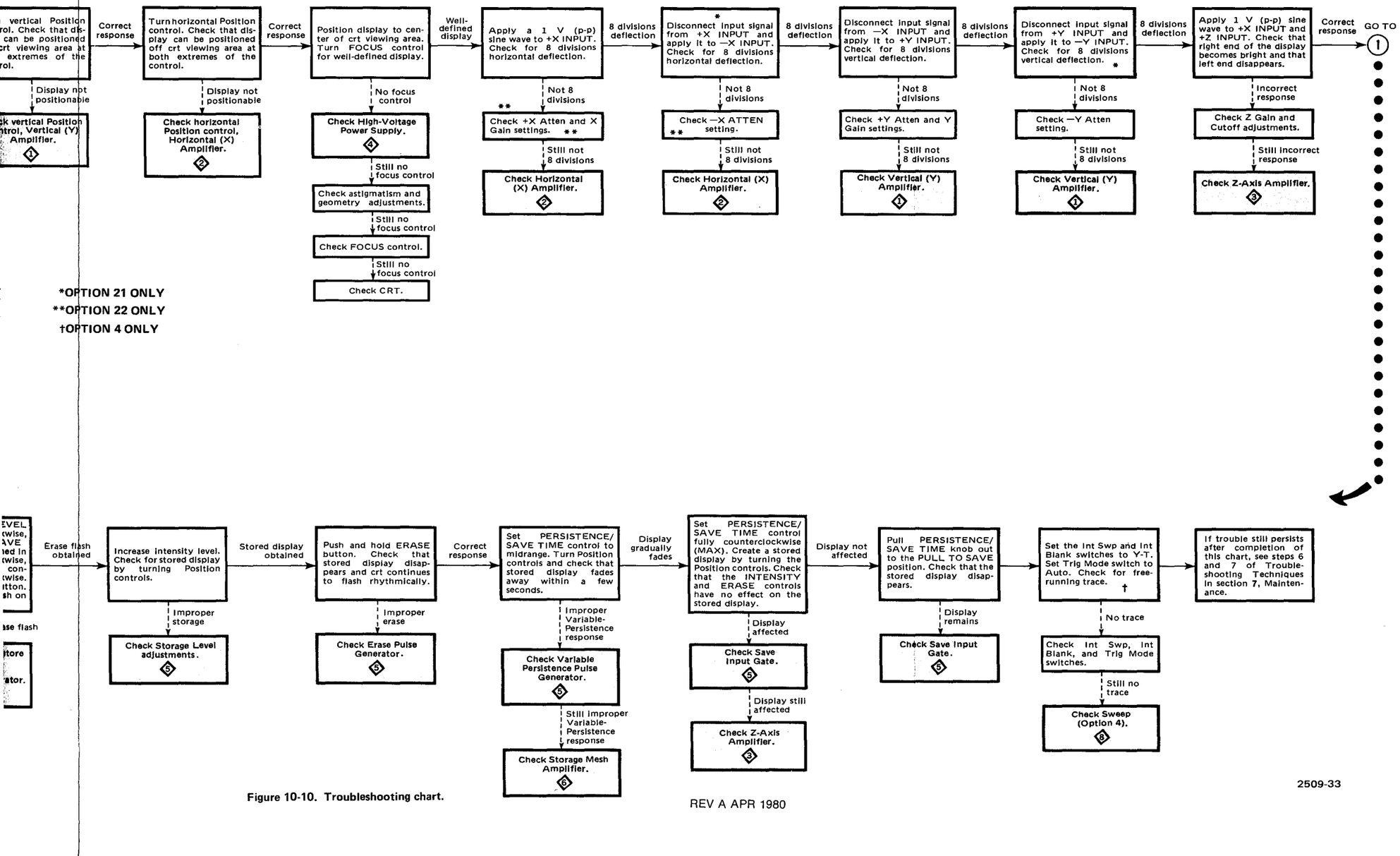
)



*OPTION 21 ONLY
**OPTION 22 ONLY
†OPTION 4 ONLY

Figure 10-10. Troubleshooting chart.

2509-33

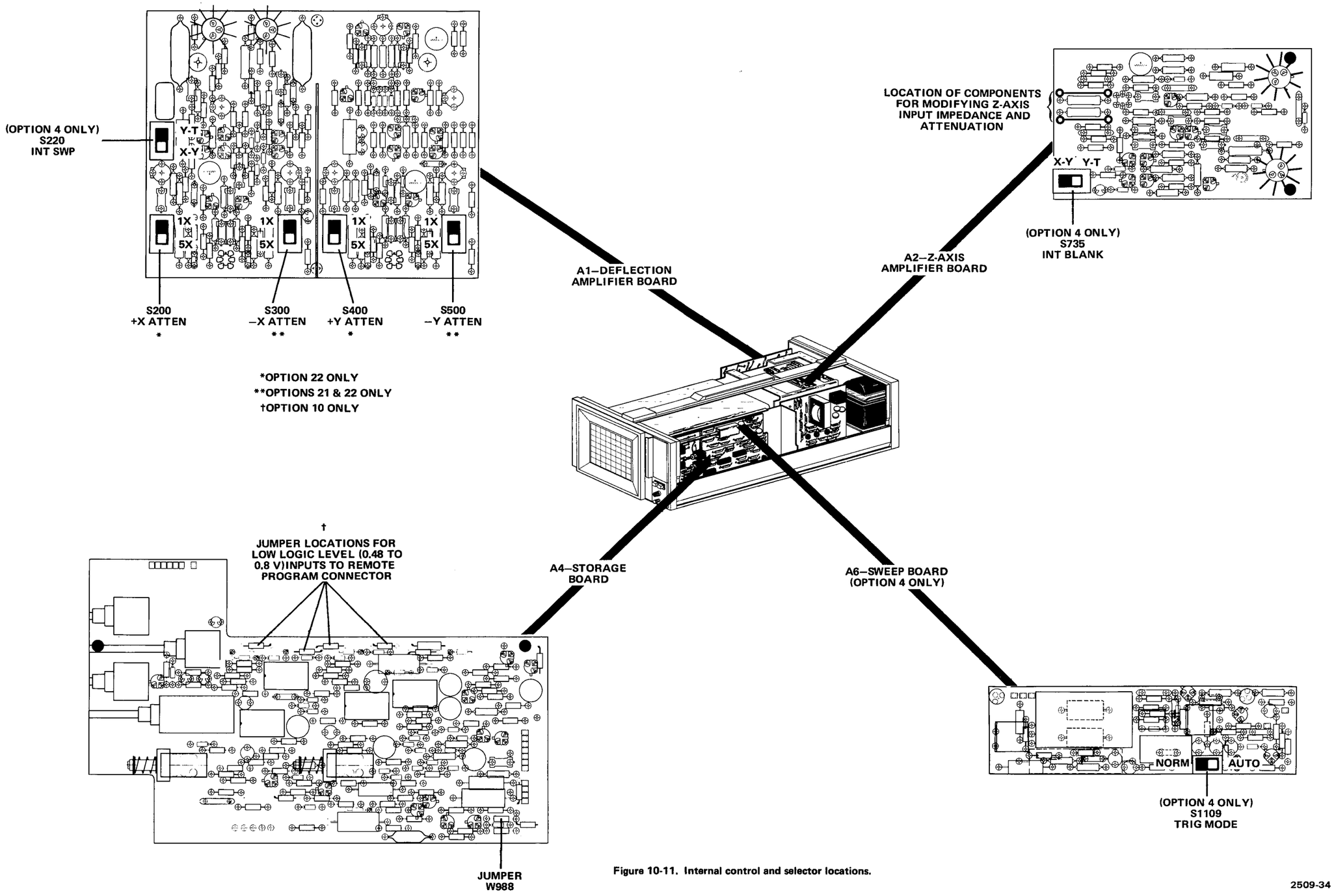
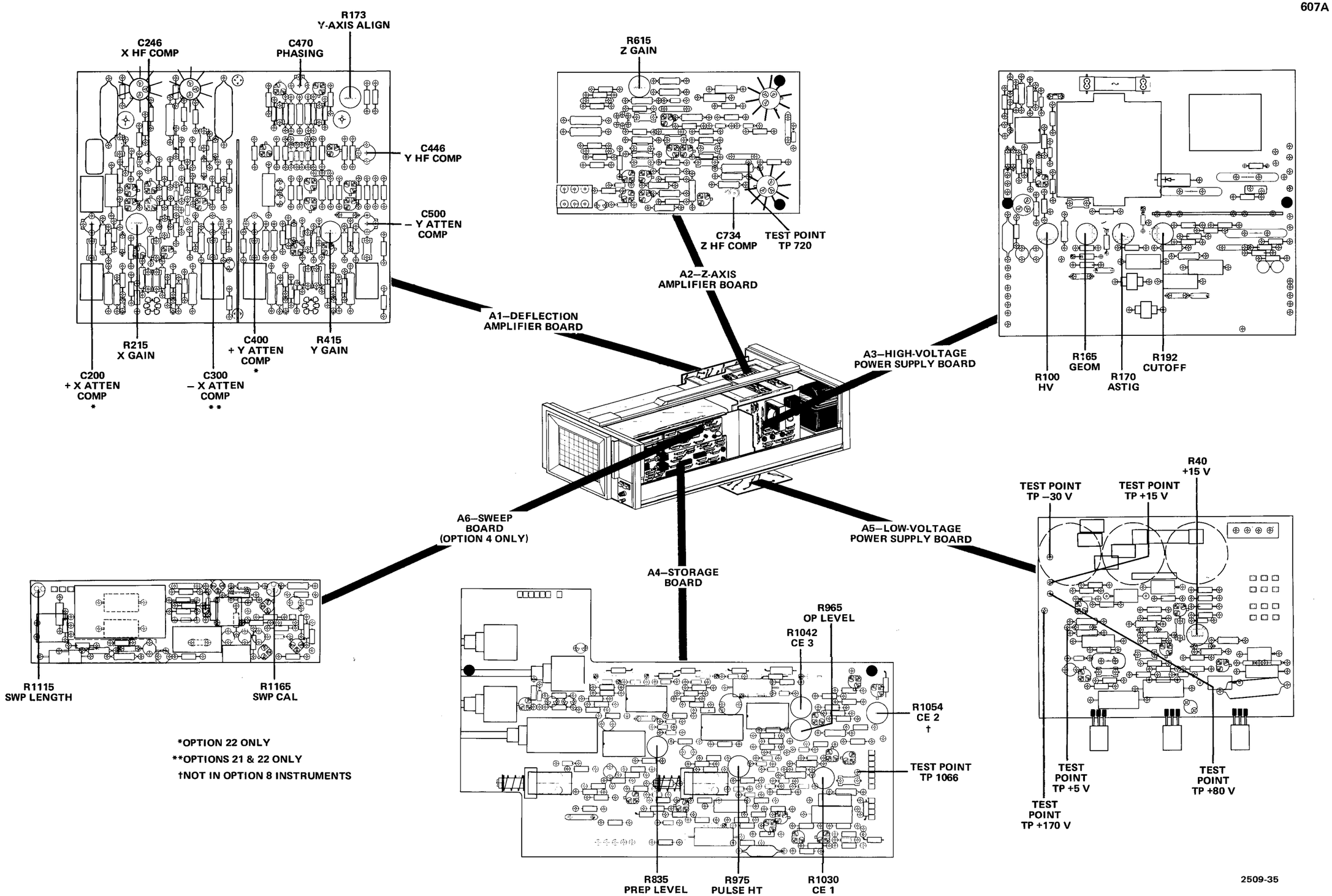


Figure 10-11. Internal control and selector locations.

2509-34

@



*OPTION 22 ONLY

**OPTIONS 21 & 22 ONLY

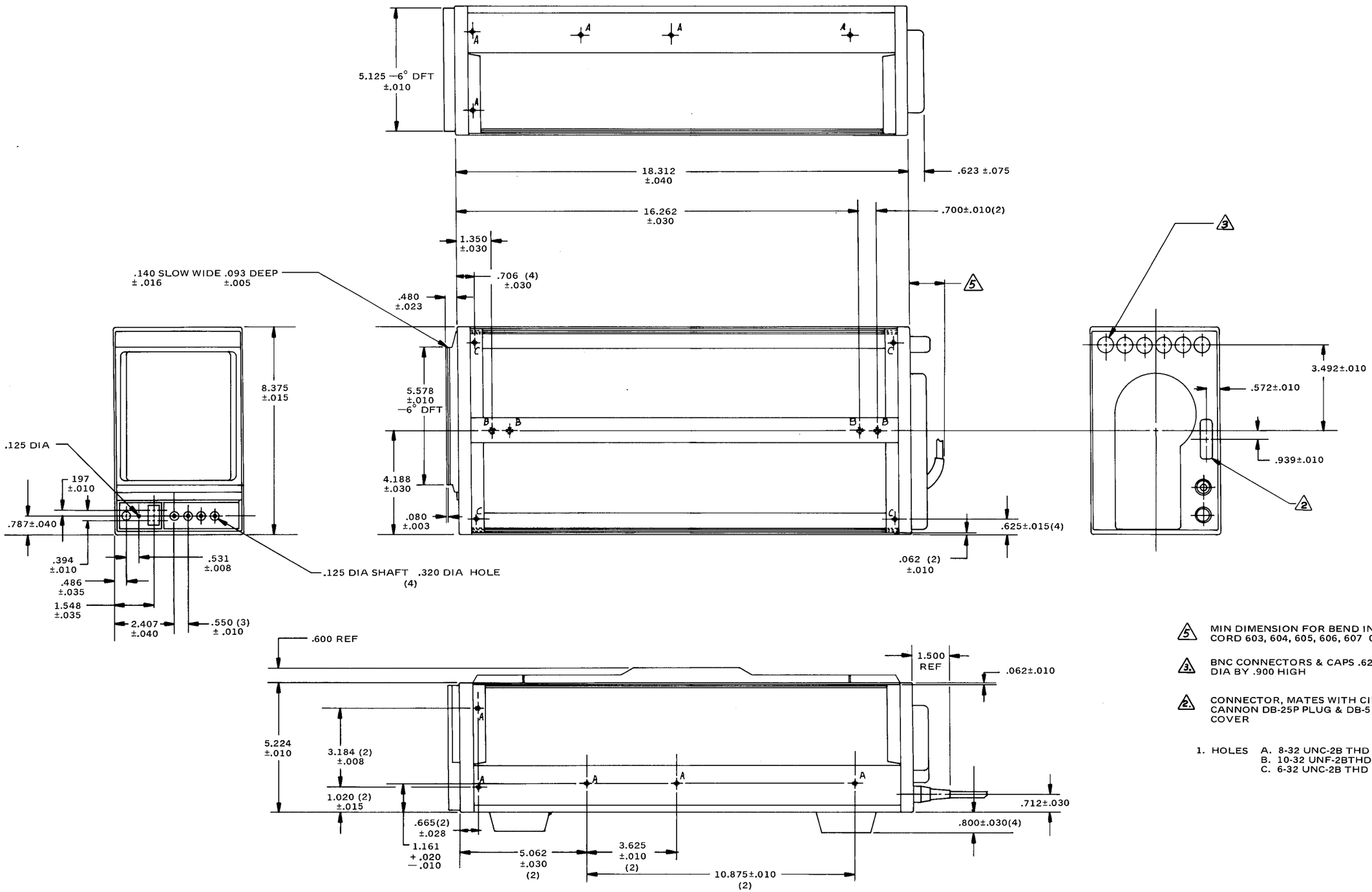
†NOT IN OPTION 8 INSTRUMENTS

Figure 10-12. Test point and adjustment locations.

@

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



5 MIN DIMENSION FOR BEND IN POWER CORD 603, 604, 605, 606, 607 0.900 1.250

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

2 CONNECTOR, MATES WITH CINCH OR CANNON DB-25P PLUG & DB-51226-1A COVER

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

2091-38

Figure 10-13. Detailed dimensional drawing.

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
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OREGON 97005
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
01009	ALDEN PRODUCTS COMPANY	117 N MAIN STREET	BROCKTON, MA 02403
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12136	PHILADELPHIA HANDLE COMPANY, INC.	1643 HADDON AVENUE	CAMDEN, NJ 08103
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
12360	ALBANY PRODUCTS CO., DIV. OF PNEUMO DYNAMICS CORPORATION	145 WOODWARD AVENUE	SOUTH NORWALK, CT 06586
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
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
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
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
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
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
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
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
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641

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	390-0270-00			1		COVER,MONITOR:LEFT	80009	390-0270-00
	----- -----			-		(OPTION 23 & 28 ONLY)		
	390-0543-00			1		CAB.SIDE,MON:	80009	390-0543-00
	----- -----			-		(OPTION 6 ONLY)		
	214-0812-00			2		. FASTENER,PAWL:	80009	214-0812-00
-2	386-0226-00			2		. . CLAMP,RIM CLENC:SPG STL CD PL	80009	386-0226-00
-3	386-0227-00			2		. . STOP,CLP,RIM CL:ACETAL	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
	----- -----			-		(OPTION 23 & 28 ONLY)		
	390-0543-00			1		CAB.SIDE,MON:	80009	390-0543-00
	----- -----			-		(OPTION 6 ONLY)		
	214-0812-00			2		. FASTENER,PAWL:	80009	214-0812-00
-7	386-0226-00			2		. . CLAMP,RIM CLENC:SPG STL CD PL	80009	386-0226-00
-8	386-0227-00			2		. . STOP,CLP,RIM CL:ACETAL	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
-11	348-0275-00			1		FLIPSTAND,CAB.:	80009	348-0275-00
	----- -----			-		(OPTION 6 ONLY)		
	342-0127-00			1		INSULATOR,PLATE:POWER SUPPLY,POLYESTER	80009	342-0127-00
	----- -----			-		(OPTION 6 ONLY)		
-12	390-0280-00			1		COVER,SCOPE:BOTTOM	80009	390-0280-00
	----- -----			-		(OPTION 23 ONLY)		
	390-0523-00			1		COVER,SCOPE:BOTTOM	80009	390-0523-00
	----- -----			-		(OPTION 6 ONLY)		
	214-0812-00			4		. FASTENER,PAWL:	80009	214-0812-00
-13	386-0226-00			4		. . CLAMP,RIM CLENC:SPG STL CD PL	80009	386-0226-00
-14	386-0227-00			4		. . STOP,CLP,RIM CL:ACETAL	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		. HINGE BLOCK,STA:R FR,L REAR,BLACK ACETAL	80009	348-0074-00
						(ATTACHING PARTS)		
-18	211-0532-00			4		. SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL	83385	OBD
-19	210-0457-00			4		. NUT,PL,ASSEM WA: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
-21	348-0073-00			2		. HINGE BLOCK,STA:L FR,R REAR,BLACK ACETAL	80009	348-0073-00
						(ATTACHING PARTS)		
-22	211-0532-00			4		. SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL	83385	OBD
-23	210-0457-00			4		. NUT,PL,ASSEM WA: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
	342-0127-00			1		INSULATOR,PLATE:POWER SUPPLY,POLYESTER	80009	342-0127-00
	----- -----			-		(OPTION 28 ONLY)		
	390-0281-00			1		COVER,SCOPE:BOTTOM	80009	390-0281-00
	----- -----			-		(OPTION 28 ONLY)		
	214-0812-00			4		. FASTENER,PAWL:	80009	214-0812-00
	386-0226-00			4		. . CLAMP,RIM CLENC:SPG STL CD PL	80009	386-0226-00
	386-0227-00			4		. . STOP,CLP,RIM CL:ACETAL	80009	386-0227-00
	214-0603-01			4		. . PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
	214-0604-00			4		. . WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-25	200-0728-00			2		COV,HANDLE END:	80009	200-0728-00
	----- -----			-		(OPTION 6 & 23 ONLY)		
-26	367-0116-00			1		HANDLE,CARRYING:	12136	OBD
	----- -----			-		(OPTION 6 & 23 ONLY)		
						(ATTACHING PARTS)		
-27	212-0597-00			4		SCREW,MACHINE:10-32 X 0.50 INCH,STL	93907	OBD
	----- -----			-		(OPTION 6 & 23 ONLY)		
-28	386-1624-00			2		PLATE,HDL RTNG:STAINLESS STEEL	80009	386-1624-00
	----- -----			-		(OPTION 6 & 23 ONLY)		
-29	386-1283-00			2		PLATE,HDL MTG:FRONT	80009	386-1283-00
	----- -----			-		(OPTION 6 & 23 ONLY)		
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-30	200-1661-00	B010100	B010232	1		RTNR,CRT SCALE:	80009	200-1661-00
	200-1661-04	B010233		1		RTNR,CRT SCALE:5.598 X 5.125,NYLON,WHITE	80009	200-1661-04
	200-1661-02			1		RTNR,CRT SCALE:605 OPT 06	80009	200-1661-02
	----- -----			-		(OPTION 6 ONLY)		
						(ATTACHING PARTS)		
-31	211-0188-00			2		SCREW,MACHINE:4-40 X 0.30 INCH,SST	83385	OBD
						- - - * - - -		
-32	337-1674-06			1		SHLD,ELCTRN TUB:CRT	80009	337-1674-06
-33	386-2340-00			4		SUPPORT,CRT:FRONT	80009	386-2340-00
-34	386-2899-00			1		SUPPORT,CRT:FRONT	80009	386-2899-00
-35	384-1270-00			1		EXTENSION SHAFT:	80009	384-1270-00
-36	385-0033-00			1		SPACER,POST:0.625 L W/6-32 THD THRU,NYL	80009	385-0033-00
						(ATTACHING PARTS)		
-37	211-0538-00			1		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-38	376-0127-00			1		COUPLER,SHAFT:PLASTIC	80009	376-0127-00
-39	358-0216-00			1		BUSHING,PLASTIC:0.257 ID X 0.412 INCH OD	80009	358-0216-00
-40	366-1023-01			1		KNOB:GRAY	80009	366-1023-01
	213-0246-00			1		. SETSCREW:5-40 X 0.093 ITL BK OXD,HEX SKT	71159	OBD
-41	----- -----			1		RESISTOR,VAR:(SEE R895 EPL)		
						(ATTACHING PARTS)		
-42	210-0583-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-43	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-44	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-45	426-0681-00			2		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-46	333-1876-00			1		PANEL,FRONT:	80009	333-1876-00
-47	200-1282-00			1		DOOR,ACCESS:	80009	200-1282-00
-48	333-1875-00			1		PANEL,FRONT:	80009	333-1875-00
-49	386-2067-03			1		SUBPANEL,FRONT:	80009	386-2067-03
						(ATTACHING PARTS)		
-50	210-0406-00			3		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-51	210-0054-00			3		WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
						- - - * - - -		
-52	200-1308-01			1		COVER,CRT,REAR:	80009	200-1308-01
						(ATTACHING PARTS)		
-53	211-0097-00			5		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
-54	358-0529-00			1		BSHG,STRAIN RLF:FOR 0.3-0.36 OD CABLE,STR	28520	1207 (UL 6P3-4)
	334-2551-00			1		MARKER,IDENT:MKD WARNING POWER PLUG	80009	334-2551-00
	----- -----			-		(OPTION 6 ONLY)		
-55	161-0017-10			1		CABLE ASSY,PWR:3,18 AWG,125V,96.0 L	80009	161-0017-10
	161-0106-00			1		CABLE ASSY,PWR,:3,18 AWG,115V,70.0 L	80009	161-0106-00
	----- -----			-		(OPTION 6 ONLY)		
-56	346-0045-00			3		STRAP,CONN COV:BNC ONE END,POLYPROPYLENE	80009	346-0045-00
-57	200-0991-00			3		COV,ELEC CONN:BNC ,W/CTR GND	77820	2096-5
-58	----- -----			6		CONN,RCPT,:(SEE J200,300,400,500,600,650 EPL)		
-59	210-0255-00			6		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
-60	342-0117-00			12		INSULATOR,BSHG:0.375 ID X 0.065 L,DELRIN	80009	342-0117-00
-61	----- -----			1		RESISTOR,VAR:(SEE R145 EPL)		
						(ATTACHING PARTS)		
-62	210-0583-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-63	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-64	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-65	----- -----			1		TRANSFORMER:(SEE T15 EPL)		
-66	343-0267-00			2		BRACKET,XFMR:	80009	343-0267-00
						(ATTACHING PARTS)		
-67	212-0100-00			4		SCREW,MACHINE:8-32 X 0.625 INCH,HEX.HD,STL	83385	OBD
-68	210-0804-00			4		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
-69	210-0458-00			4		NUT,PL,ASSEM WA:8-32 X 0.344 INCH,STL	78189	511-081800-00
						- - - * - - -		
	334-3379-00			1		MARKER,IDENT:MARKED GROUNDSYMBOL	80009	334-3379-00
-70	333-1829-02	B010100	B010232	1		PANEL,REAR:	80009	333-1829-02
	333-1829-04	B010233		1		PANEL,REAR:	80009	333-1829-04

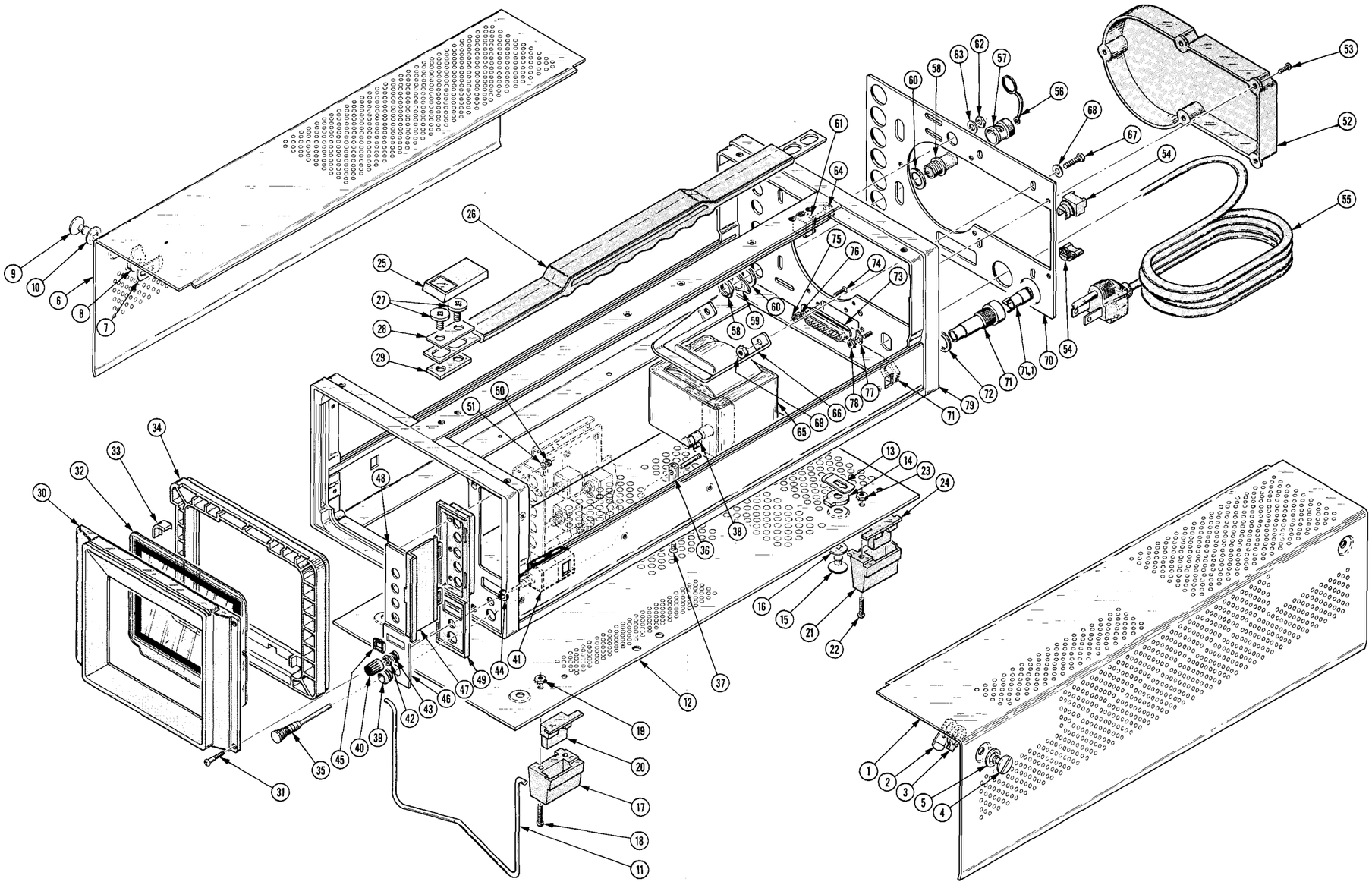


FIG. 1 CABINET & CHASSIS

FIG. 2 CRT &
CIRCUIT BOARDS

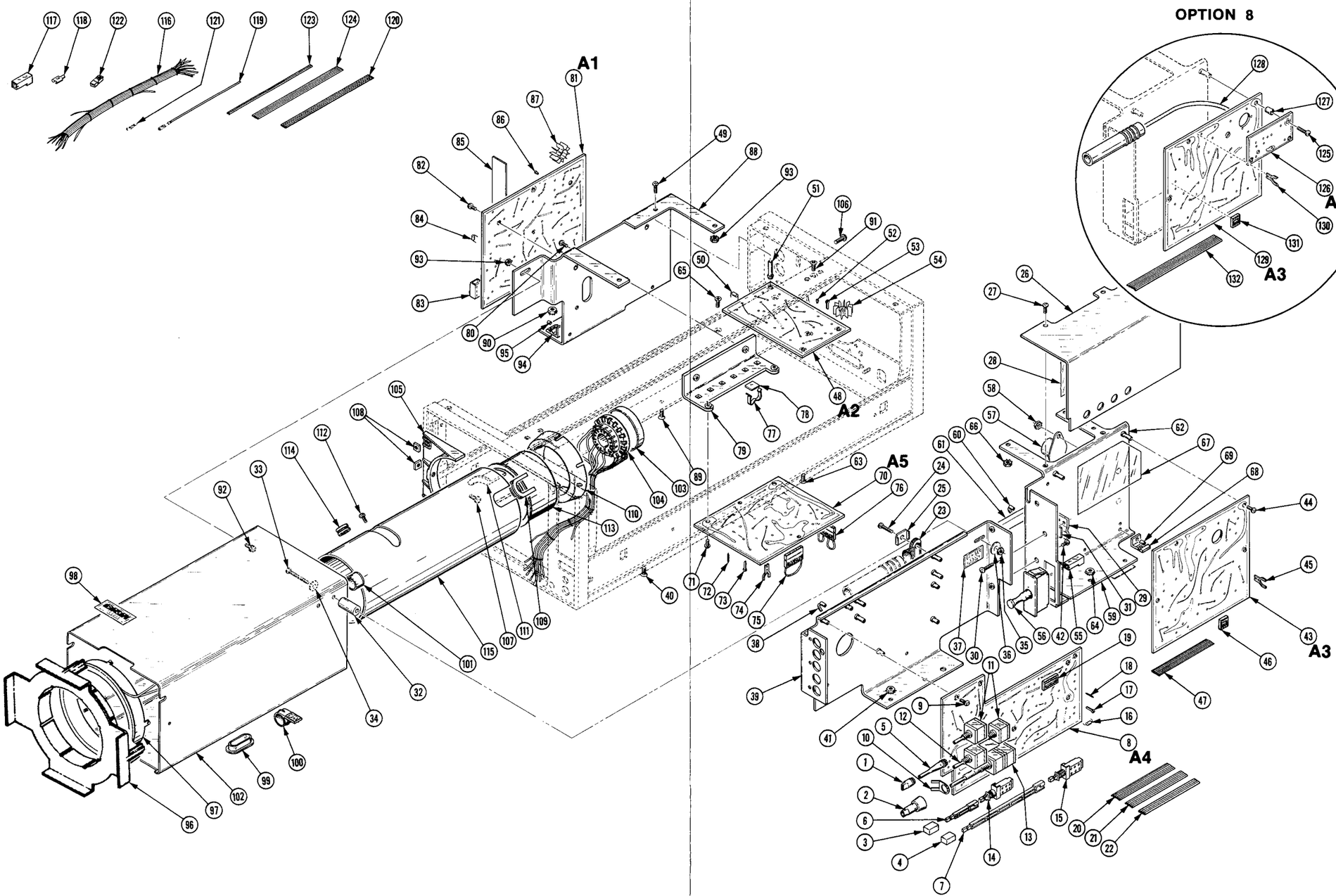


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	333-1829-03			1		PANEL,REAR:	80009	333-1829-03
	----- -----			-		(OPTION 6 ONLY)		
-71	352-0076-00			1		FUSEHOLDER:W/HARDWARE	75915	342012-L
-72	210-0873-00			1		WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
-73	----- -----			1		CONTACT,ELEC:(SEE J20 EPL)		
						(ATTACHING PARTS)		
-74	211-0101-00			2		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
-75	210-0406-00			2		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-76	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-77	210-0202-00			1		TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
						(ATTACHING PARTS)		
-78	210-0457-00			1		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-79	426-1301-01			1		FRAME,MONITOR:	80009	426-1301-01

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-1	366-1432-00			3		KNOB:GRAY,W/SPRING	80009	366-1432-00
-2	366-1369-00			1		KNOB:GRAY	80009	366-1369-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-3	366-1257-84			1		PUSH BUTTON:GRAY--ERASE	80009	366-1257-84
-4	366-1257-85			1		PUSH BUTTON:GRAY--STORE	80009	366-1257-85
-5	384-1099-00			1		EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG	80009	384-1099-00
-6	384-1061-00			1		EXTENSION SHAFT:3.981 INCH LONG	80009	384-1061-00
-7	----- -----			1		CKT BOARD ASSY:STORAGE(SEE A4 EPL)		
						(ATTACHING PARTS)		
-8	211-0008-00			6		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-9	131-1635-00			1		. CONTACT,ELEC:GND	80009	131-1635-00
-10	384-1121-00			1		. EXTENSION SHAFT:1.41 INCH LONG	80009	384-1121-00
-11	----- -----			2		. RESISTOR,VAR:(SEE R240 & R440 EPL)		
-12	----- -----			1		. RESISTOR,VAR:(SEE R970 EPL)		
-13	----- -----			1		. RESISTOR,VAR:(SEE R175 EPL)		
-14	----- -----			1		. SWITCH,PUSH:(SEE S870 EPL)		
-15	----- -----			1		. SWITCH,PUSH:(SEE S910 EPL)		
-16	131-0566-00			1		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
-17	214-0579-00			4		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-18	131-0608-00			11		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-19	136-0269-02			4		. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
	198-3043-00			1		. WIRE SET,ELEC:	80009	198-3043-00
-20	175-0829-00			FT		. . WIRE,ELECTRICAL:6 WIRE RIBBON	08261	SS-0626-710610C
-21	175-0828-00			FT		. . WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
-22	175-0827-00			FT		. . CABLE,SP,ELEC:4,26 AWG,STRD,PVC JKT,RBN	08261	SS04267(1061)0C
	342-0393-00			1		INSUL,CKT BD:STORAGE	80009	342-0393-00
	----- -----			-		(OPTION 6 ONLY)		
-23	343-0006-00			1		CLAMP,LOOP:0.50 INCH DIAMETER,PLSTC	95987	1-2-6B
						(ATTACHING PARTS)		
-24	211-0114-00			1		SCREW,MACHINE:4-40 X 0.438 INCH,FLH STL	83385	OBD
	210-0994-00			1		WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5714-147-20N
-25	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
						- - - * - - -		
-26	337-2006-00			1		SHLD,ELECTRICAL:HIGH VOLTAGE	80009	337-2006-00
						(ATTACHING PARTS)		
-27	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. SHIELD INCLUDES:		
-28	342-0264-00			1		. INSULATOR,SHLD:HV	80009	342-0264-00
	342-0249-00			1		. INSULATOR,SHLD:3.82 X 1.87 IN,POLYEST FILM	80009	342-0249-00
-29	343-0521-00			1		CLAMP,XSTR:750 WIDE W(2)4-40 THD HOLE	80009	343-0521-00
						(ATTACHIG PARTS)		
-30	211-0014-00			1		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
						- - - * - - -		
-31	342-0082-00			1		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
-32	384-0539-00			1		ROD,SPACER:0.375 X 0.750 INCH	80009	384-0539-00
						(ATTACHING PARTS)		
-33	211-0231-00			1		SCREW,MACHINE:4-40 X 1.0 PNH,SST,PSVT,POZ	83385	OBD
-34	210-1001-00			1		WASHER,FLAT:0.119 ID X 0.375" OD,BRS	12360	OBD
-35	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	211-041800-00
-36	210-0958-00			1		WASHER,FLAT:0.115 ID X 0.469 INCH OD,STL	78471	OBD
						- - - * - - -		
-37	334-2360-00			1		MARKER,IDENT:WARNING	80009	334-2360-00
	334-2363-00			1		MARKER INDENT:WARNING,DANGER,HV	80009	334-2363-00
-38	343-0213-00			1		CLAMP,LOOP:PRESS MT,PLASTIC	80009	343-0213-00
-39	441-1413-00			1		CHAS,DSPL UNIT:	80009	441-1413-00
						(ATTACHING PARTS)		
-40	211-0538-00			2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-41	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-42	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-43	----- -----			1		CKT BOARD ASSY:HIGH VOLTAGE(SEE A3 EPL)		
						(ATTACHING PARTS)		
-44	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		

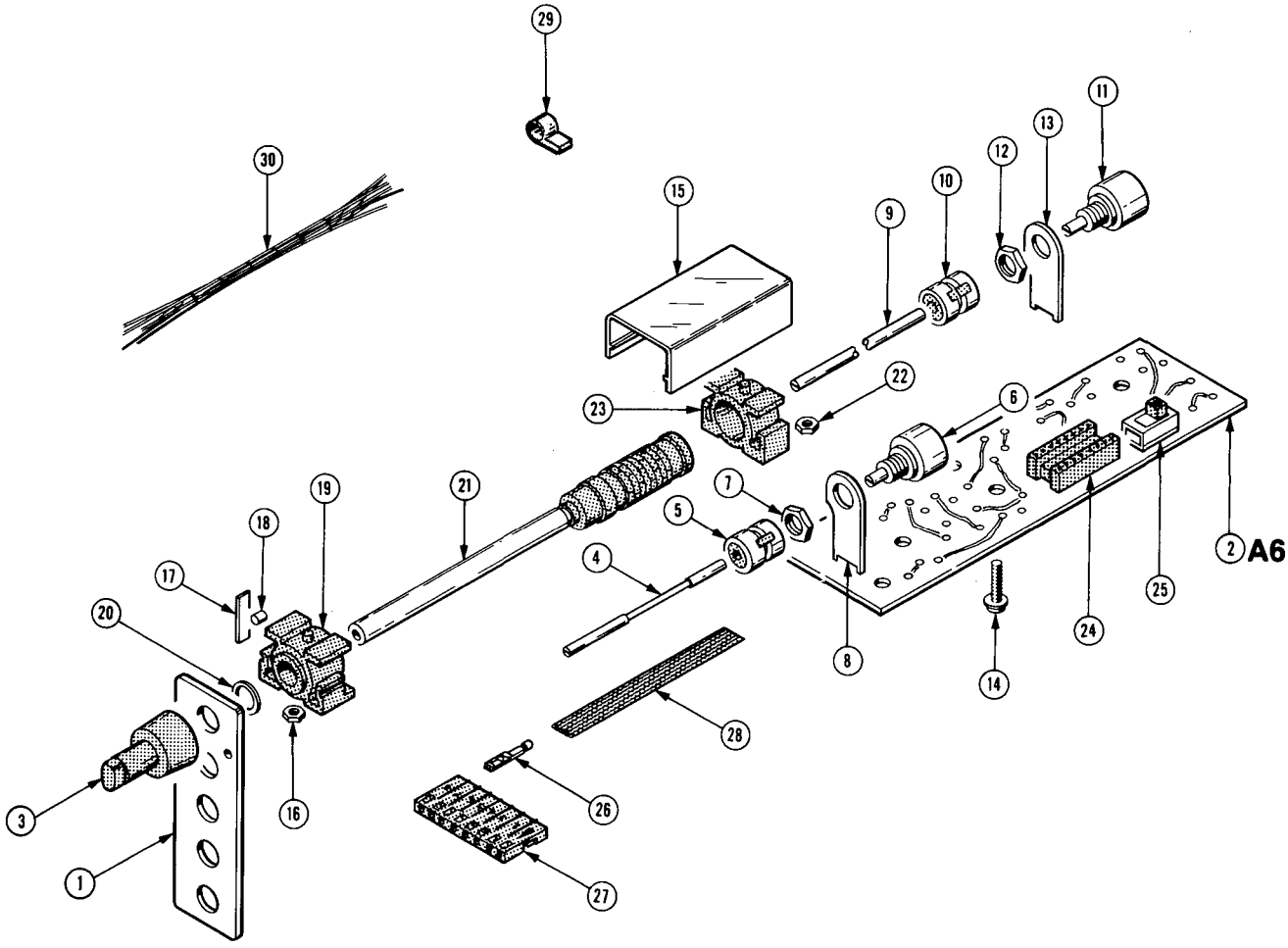
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	----- -----			-		. CKT BOARD ASSY INCLUDES:		
	131-0566-00			1		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
-45	344-0154-00			2		. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-46	136-0514-00			1		. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
	198-3042-00			1		. WIRE SET,ELEC:	80009	198-3042-00
-47	175-0830-00			FT		. . WIRE,ELECTRICAL:7 WIRE RIBBON	08261	SS-0726-710610C
	342-0412-00			1		INSUL,CKT BD:HIGH VOLTAGE	80009	342-0412-00
-48	----- -----			1		CKT BOARD ASSY:Z AXIS(SEE A2 EPL)		
						(ATTACHING PARTS)		
-49	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-50	131-0566-00			1		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	131-0589-00			4		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-1334-00			1		. BUS CONDUCTOR:	80009	131-1334-00
-51	351-0280-00			2		. GUIDE-POST,LOCK:0.620 INCH LONG	80009	351-0280-00
-52	136-0252-04			6		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-53	214-0579-00			9		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-54	214-1291-00			2		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
-55	200-1075-00			1		COVER,TERM:QUICK DISCONNECT	00779	1-480435-0
-56	----- -----			1		SWITCH PP:(SEE S12 EPL)		
-57	----- -----			1		SWITCH,THRMSTIC:(SEE S10 EPL)		
						(ATTACHING PARTS)		
-58	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	211-041800-00
						- - - * - - -		
-59	334-2359-00			1		MARKER,IDENT:WARNING	80009	334-2359-00
	334-2360-00			1		MARKER,IDENT:WARNING	80009	334-2360-00
-60	343-0088-00			1		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-61	351-0087-00			1		GUIDE,CKT CARD:4.75 INCH LONG,PLASTIC	80009	351-0087-00
						(ATTACHING PARTS)		
-62	441-1327-00			1		CHAS,ELEC EQPT:HIGH VOLTAGE	80009	441-1327-00
						(ATTACHING PARTS)		
-63	211-0538-00			3		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-64	210-0457-00			3		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-65	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
	211-0114-00			1		SCREW,MACHINE:4-40 X 0.438 INCH,FLH STL	83385	OBD
-66	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	211-041800-00
						- - - * - - -		
	----- -----			-		. CHASSIS INCLUDES:		
-67	342-0248-00			1		. INSULATOR,SHLD:3.23 X 2.23 IN,POLYEST FILM	80009	342-0248-00
-68	344-0131-00			2		. CLIP,SPG TENS:CIRCUIT CARD MOUNTING	80009	344-0131-00
						(ATTACHING PARTS)		
-69	210-0659-01			2		. EYELET,METALLIC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01
						- - - * - - -		
-70	----- -----			1		CKT BOARD ASSY:POWER SUPPLY(SEE A5 EPL)		
						(ATTACHING PARTS)		
-71	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-72	131-0608-00			14		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-73	214-0579-00			5		. TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-74	344-0154-00			2		. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-75	131-1895-00			1		. LINK,TERM. CONN:8,22 AWG,1.5 L	80009	131-1895-00
-76	131-1896-00			1		. LINK,TERM. CONN:8,22 AWG,1.5 L	80009	131-1896-00
-77	344-0236-00			3		CLIP,SPR TNSN:	80009	344-0236-00
-78	342-0082-00			3		INSULATOR,PLATE:0.52 SQ X 0.015 INCH THK,AL	80009	342-0082-00
-79	407-1498-00			1		BRACKET,ANGLE:POWER SUPPLY	80009	407-1498-00
						(ATTACHING PARTS)		
-80	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-81	----- -----			1		CKT BOARD ASSY:DEFLECTION(SEE A1 EPL)		
						(ATTACHING PARTS)		
-82	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-83	----- -----			4		. SWITCH,SLIDE:(SEE S200,S300,S400 & S500 EPL)		
-84	131-0566-00			6		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	131-0589-00			8		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-1334-00			2		. BUS CONDUCTOR:	80009	131-1334-00
-85	337-1995-00			1		. SHLD,ELECTRICAL:DEFLECTION CIRCUIT CARD	80009	337-1995-00
-86	136-0252-04			12		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-87	214-1291-00			2		. HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
	342-0394-00			1		INSUL,CKT BD:DEFLECTION	80009	342-0394-00
	----- -----			-		(OPTION 6 ONLY)		
	334-2361-00			1		MARKER,IDENT:WARNING UP TO80V ON THIS BD	80009	334-2361-00
	348-0233-00			1		GROMMET,PLASTIC:GRAY,OVAL SHAPE,0.927 ID	80009	348-0233-00
	----- -----			-		(OPTION 6 ONLY)		
-88	441-1222-00			1		CHAS,ELEC EQUIP:DEFLECTION	80009	441-1222-00
						(ATTACHING PARTS)		
-89	211-0538-00			2		SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
-90	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-91	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
-92	211-0116-00			1		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-93	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	211-041800-00
						- - - * - - -		
	----- -----			-		. CHASSIS ASSY INCLUDES:		
-94	344-0133-00			2		. CLIP,SPR,TNSN:CIRCUIT CARD MOUNTING	80009	344-0133-00
						(ATTACHING PARTS)		
-95	210-0659-01			1		. EYELET,METALLIC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01
						- - - * - - -		
-96	386-2876-00			1		SUPPORT,CRT:CENTER	80009	386-2876-00
-97	----- -----			1		COIL,TBUE DEFL:(SEE L145 EPL)		
-98	334-1379-00			1		LABEL:CRT,ADHESIVE BACK	80009	334-1379-00
	334-1951-00			1		MARKER,IDENT:CRT WARNING	80009	334-1951-00
-99	348-0253-00			1		GROMMET,PLASTIC:BLACK,OBLONG,3.OXO.925	80009	348-0253-00
-100	343-0298-00			1		CLAMP,LOOP:PLASTIC,W/ADHESIVE BACK	95987	HPC25
-101	348-0518-00			1		GROMMET,PLASTIC:BLACK,ROUND,0.5 ID	28520	SB-625-8
-102	337-2081-00			1		SHIELD,CRT:FRONT	80009	337-2081-00
-103	200-0616-02			1		COVER,CRT SKT:	80009	200-0616-02
-104	136-0596-02			1		SKT,PL-IN ELEK:ELECTRON TUBE,14 CONT	80009	136-0596-02
	136-0301-01			1		. SKT,PL-IN ELEK:ELCTN TUBE,14CONTACT	80009	136-0301-01
-105	407-1128-00			1		BRKT,CRT SHIELD:REAR,NYLON	80009	407-1128-00
						(ATTACHING PARTS)		
-106	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-107	211-0589-00			1		SGREW,MACHINE:6-32 X 0.312 INCH,PNH BRS	83385	OBD
-108	220-0419-00			3		NUT,PLAIN,SQ:6-32 X 0.312 INCH,STL	83385	OBD
						- - - * - - -		
-109	348-0145-00			1		GROMMET,PLASTIC:U-SHP,1.0 X 0.42 INCH	80009	348-0145-00
-110	386-2246-00			1		SUPPORT,CRT:REAR	80009	386-2246-00
-111	343-0217-00			1		CLAMP,COIL:Y-AXIS	80009	343-0217-00
						(ATTACHING PARTS)		
-112	211-0147-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-113	----- -----			1		COIL,TUBE DEFL:(SEE L172 EPL)		
-114	348-0517-00			1		GROMMET,PLASTIC:BLACK,ROUND,0.25 ID	28520	SB-375-4
-115	337-1986-00			1		SHLD,ELCTRN TUB:REAR	80009	337-1986-00
	334-2361-00			1		MARKER,IDENT:WARNING UP TO80V ON THIS BD	80009	334-2361-00
-116	179-2163-00			1		WIRING HARNESS,:POWER	80009	179-2163-00
-117	200-1075-00			3		. COVER,TERM:QUICK DISCONNECT	00779	1-480435-0
-118	131-0861-00			3		. TERM,QIK DISC:16-20 AWG,0.22 W X 0.02 THK	00779	42617-2
-119	195-0165-00			FT		LEAD SET,ELEC:CRT DEFLECTION	80009	195-0165-00
	131-1538-00			4		. CONTACT,ELEC:CRIMP-ON,22-26 AWG WIRE	22526	75369-002
	198-2949-00			1		WIRE SET,ELEC:	80009	198-2949-00
-120	175-0827-00			FT		. CABLE,SP,ELEC:4,26 AWG,STRD,PVC JKT,RBN	08261	SS04267(1061)0C
	198-4016-00			1		WIRE SET,ELEC:	80009	198-4016-00
-121	131-0622-00			3		. CONTACT,ELEC:0.577"L,28-32 AWG WIRE	22526	46241
	131-0792-00			3		. CONNECTOR,TERM:18-20 AWG,CU BE GOLD PL	22526	46221
	131-1963-00			4		. TERM.,QIK DISC.:FOR 0.038 DIACRT PIN	00779	42428-9
-122	352-0198-00			3		. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0198-00
-123	175-0825-00			FT		WIRE,ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-124	175-0828-00			FT		WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
	672-0654-00			1		CKT BOARD ASSY:HV/MULTIPLIER	80009	672-0654-00
	----- -----			-		(OPTION 8 ONLY)		
						(ATTACHING PARTS)		
	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-125	211-0014-00			1		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-126	----- -----			1		. CKT BOARD ASSY:MULTIPLIER(SEE A7 EPL)		
-127	166-0025-00			1		. . SPACER,SLEEVE:0.25 L X 0.125 ID,AL	71590	P07608-51
-128	131-0773-00			1		. . LEAD,ELECTRICAL:18.0 INCH LONG	01009	8111LFD
-129	----- -----			1		. CKT BOARD ASSY:HIGH VOLTAGE(SEE A3 EPL)		
-130	344-0154-00			2		. . CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-131	136-0514-00			1		. . SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-132	175-0830-00			FT		. . . WIRE,ELECTRICAL:7 WIRE RIBBON	08261	SS-0726-710610C
	131-0566-00			1		. . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	198-3042-00			1		. . WIRE SET,ELEC:	80009	198-3042-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
						OPTION 4		
3-1	333-2001-00			1		PANEL,FRONT:	80009	333-2001-00
-2	----- -----			1		CKT BOARD ASSY:SWEEP GENERATOR(SEE A6 EPL)		
						(ATTACHING PARTS)		
	211-0008-00			4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-3	366-1369-00			1		KNOB:GRAY	80009	366-1369-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-4	384-1156-00			1		. EXTENSION SHAFT:2.20 INCH LONG	80009	384-1156-00
-5	376-0051-01			1		. CPLG,SHAFT,FLEX:0.127 ID X 0.375 OD	80009	376-0051-01
	213-0022-00			1		. . SETSCREW:4-40 X 0.188 INCH,HEX SOC STL	74445	OBD
-6	----- -----			1		. RESISTOR,VAR:(SEE R1118 EPL)		
						(ATTACHING PARTS)		
-7	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
	210-0590-00			1		. NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
						- - - * - - -		
-8	386-2351-00			1		. PL,VAR RES MTG:HORIZ CKT BD	80009	386-2351-00
-9	384-0284-00			1		. EXTENSION SHAFT:5.688 INCH LONG	80009	384-0284-00
-10	376-0051-01			1		. CPLG,SHAFT,FLEX:0.127 ID X 0.375 OD	80009	376-0051-01
	213-0048-00			4		. . SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-11	----- -----			1		. RESISTOR,VAR:(SEE R1145 EPL)		
						(ATTACHING PARTS)		
-12	210-0583-00			1		. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
	210-0590-00			1		. NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
						- - - * - - -		
-13	387-0794-00			1		. PLATE,CMPNT MTG:VAR RESISTOR,BRASS	80009	387-0794-00
	----- -----			1		. ACTR ASSY,CAM S:(SEE S1130 EPL)		
						(ATTACHING PARTS)		
-14	211-0116-00			4		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . DRUM ASSEMBLY INCLUDES:		
-15	200-1441-00			1		. . COVER,CAM SW.:7 ELEMENTS	80009	200-1441-00
-16	210-0406-00			2		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-17	214-1704-01			2		. . SPRING,FLAT:CAM SW DETENT,0.008 INCH THK	80009	214-1704-01
-18	214-1127-00			2		. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-19	401-0155-00			1		. . BEARING,CAM SW:FRONT	80009	401-0155-00
						(ATTACHING PARTS)		
-20	354-0219-00			1		. . RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
						- - - * - - -		
-21	105-0388-00			1		. . ACTUATOR,CAM SW:	80009	105-0388-00
-22	210-0406-00			2		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-23	401-0156-00			1		. . BEARING,CAM SW:REAR	80009	401-0156-00
-24	136-0260-02			1		. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-25	----- -----			1		. SWITCH,SLIDE:(SEE S1109 EPL)		
	198-2861-00			1		. WIRE SET,ELEC:	80009	198-2861-00
-26	131-0707-00			6		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-27	352-0166-05			1		. . CONN BODY,PL,EL:8 WIRE GREEN	80009	352-0166-05
-28	175-0828-00			FT		. . WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
-29	343-0298-00			1		CLAMP,LOOP:PLASTIC,W/ADHESIVE BACK	95987	HPC25
-30	179-1739-01			1		WIRING HARNESS:COAX	80009	179-1739-01

OPTION 4



STANDARD ACCESSORIES

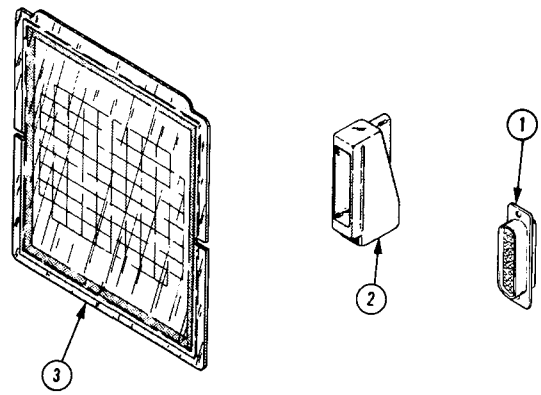


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
	070-2508-00			1		MANUAL,TECH:OPERATORS	80009	070-2508-00
	070-2509-00			1		MANUAL,TECH:INSTRUCTION	80009	070-2509-00
-1[1]	131-0570-00			1		CONNECTOR,RCPT:25 PIN,MALE	71468	DB25P
-2[1]	200-0821-00			1		COV,ELEC CONN:25 PIN	09133	DB-51213-1
-3	331-0391-00			1		SCALE,CRT:	80009	331-0391-00

[1]Option 10 only.