

Tektronix[®]
COMMITTED TO EXCELLENCE

7834
STORAGE
OSCILLOSCOPE

WITH OPTIONS

INSTRUCTION MANUAL

BEFORE READING

*PLEASE CHECK FOR CHANGE INFORMATION
AT THE REAR OF THIS MANUAL.*

THIS MANUAL REPRINTED JULY 1979

TEKTRONIX®

**7834
STORAGE
OSCILLOSCOPE**

WITH OPTIONS

INSTRUCTION MANUAL

Tektronix, Inc.
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Serial Number _____

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WARNING

THE REMAINING PORTION OF THIS TABLE OF CONTENTS LISTS THE SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED SERVICE PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK OR OTHER PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT DESCRIBED IN THE OPERATORS INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

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OPERATORS SAFETY INFORMATION

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

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

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

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

The following safety symbols may appear on the equipment.



CAUTION—Refer to manual



DANGER—High voltage



Protective ground (earth) terminal

Other warning symbols where they apply.

WARNING

AC Power Source and Connection

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

Before making connection to the power source, determine that the instrument is adjusted to match the voltage of the power source, and has a suitable two-pole, three-terminal grounding-type connector. Refer any changes to qualified service personnel.

Grounding the Instrument

This instrument is safety class I equipment (IEC designation). All accessible conductive parts are directly connected through the grounding conductor of the power cord to the grounding contact of the power connector.

The power-input plug must be inserted only into a mating receptacle with a grounding contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Refer to qualified service personnel for verification of adequate protective grounding system to which this instrument is to be connected.

For electric-shock protection, the grounding connection must be made before making connection to the instrument's input or output terminals.

Do Not Remove Instrument Covers

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

Do Not Remove CRT Implosion Shield

Do not remove the clear plastic implosion shield covering the crt face plate. This crt implosion shield provides protection to the operator from crt implosion.

Do Not Operate in Explosive Atmosphere

To avoid explosion, do not operate this instrument in an explosive atmosphere unless it has been certified for such operation.

CAUTION

Use the Proper Fuse

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

- A. Type: Slow blow, fast blow, etc.*
- B. Voltage rating: 250 V, etc.*
- C. Current rating.*

Operating-Power Considerations

To prevent damage to the instrument always check the LINE VOLTAGE SELECTOR switch, located on the rear of the instrument, before connecting the instrument to the supply circuit.

Exercise Care with Intensity Level

Crt phosphor damage can occur under adverse conditions. Avoid any condition where an extremely bright, sharply-focused dot exists on the crt. Also, remember that the light filter reduces the apparent light output from the crt.

Prevent Instrument Damage

Plug-in units should not be installed or removed without first turning the instrument power off, to prevent instrument damage.

SERVICE SAFETY INFORMATION

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

WARNING

Do Not Service Alone

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

Exercise Care When Operating Instrument with Covers Removed

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect power before cleaning the instrument or replacing parts.

Disconnect Instrument Power

To avoid electric-shock hazard, always disconnect the 7834 from the power source before removing or replacing components.

To avoid electric-shock hazard, disconnect the instrument from the power source before soldering.

Silicone Grease Handling

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

Exercise Care When Servicing Power Unit

The power supply unit has been tested at the factory to ensure safe operation. Improper repair of this unit can result in hazardous potentials on the instrument chassis. Do not remove the plate insulator, block insulator, or transistor shield from the heat-sink. (See the exploded view drawing of the power supply unit for the location of these components.)

Disconnect the instrument from the power source and allow the line storage capacitors to discharge before removing the power-unit cover. The line storage capacitors remain charged with high-voltage dc for several minutes after the line power is disconnected unless they are manually discharged. A warning-indicator neon bulb, located on the Power-Supply Inverter board, flashes when this stored voltage exceeds about 80 volts. Do not remove the power-unit cover while this light is flashing.

Use extreme caution when troubleshooting in the power-supply unit, to avoid electric shock. Stored dc potentials on the Power-Supply Inverter circuit board remain long after the instrument is disconnected from the power source. Verify that the power-cord plug is disconnected and that the line storage capacitors (C1216 and C1217) are completely discharged before attempting any repairs or ohmic measurements. (A warning-indicator neon bulb, located on the Power-Supply Inverter board, flashes when this stored voltage exceeds about 80 volts. However, simply because the neon bulb is not flashing does not mean that the capacitors are fully discharged.)

CRT Handling

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

CAUTION

Avoid Excessive Moisture

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

Exercise Care When Checking Diodes

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

Exercise Care When Soldering on Multi-Layer Boards

Several of the circuit boards in the 7834 are multi-layer type boards with a conductive path laminated between the top and bottom board layers. All soldering on these boards should be done with extreme care to prevent breaking the connections to this center conductor. Only experienced maintenance personnel should attempt repair of these boards: A3—Main Interface, A6—Logic, A7—Trigger Amplifier, A8—Vertical Interface, A14—Cap-Rectifier, and A25—Storage circuit board.

Exercise Care When Handling CRT Anode Lead

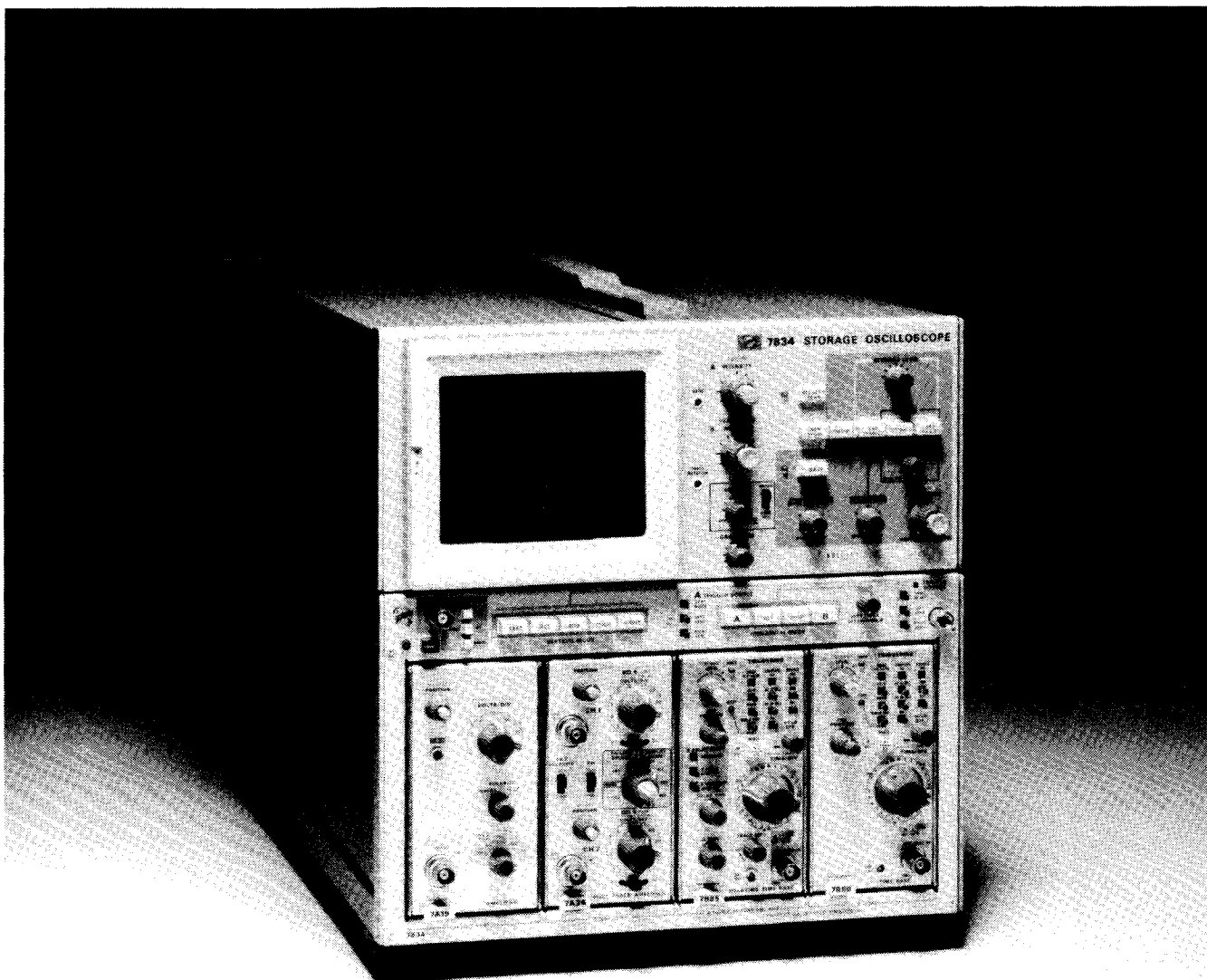
Do not touch any components with the crt anode lead until it is fully discharged.

Use Proper Cleaning Agents

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

Do Not Use Pin Sockets for Connection Points

The spring tension of the pin sockets ensures a good connection between the circuit board and the pin. This spring tension can be destroyed by using the pin sockets as a connecting point for spring-loaded probe tips, alligator clips, etc.



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7834 FEATURES

The Tektronix 7834 Storage Oscilloscope is a solid-state instrument designed for fast-writing speed storage applications. Three display modes are available at the front panel—Nonstore, Store, and Save; as well as four storage modes—Bistable, Variable Persistence, Fast Bistable, and Fast Variable Persistence. In addition, the REDUCED SCAN feature increases the stored-writing speed capability.

Power supply voltages are closely regulated to maintain instrument performance when variations in line voltage, line frequency, or plug-in load occur. The light-weight, high-efficiency, power supply operates from 115- or 230-volt nominal supply source (50 to 400 hertz).

The instrument's high vertical bandwidth (400 megahertz), fast-storage-writing speed, and four plug-in compartments which accept 7-series plug-in units, form a highly flexible measurement system.

GENERAL INFORMATION

INTRODUCTION

The Operators Manual is divided into three main sections:

Section 1—General Information; contains instrument description, electrical specifications, environmental characteristics, standard and recommended accessories, installation, and packaging for shipment instructions.

Section 2—Operating Instructions; contains information relative to operating and checking the instrument operation.

Section 3—Instrument Options; contains a description of available options and gives the location of the incorporated information for those options.

The Instruction Manual contains both operating and servicing information for the 7834 Storage Oscilloscope. Sections 1 and 2 of the Instruction Manual contain the same information as Section 1 and 2 of the Operators Manual; the remaining seven sections of the Instruction Manual are as follows:

Section 3—Theory of Operation; contains basic and general circuit analysis that may be useful for servicing or operating the instrument.

Section 4—Maintenance; describes routine and corrective maintenance procedures with detailed instructions for replacing assemblies, subassemblies, and individual components.

Section 5—Performance Check and Adjustment; contains procedures to check the operational performance and electrical characteristics of the instrument. Procedures also include methods for adjustment of the instrument to meet specifications.

Section 6—Instrument Options; contains a description of available options and locations of incorporated information for those options.

Section 7—Replaceable Electrical Parts; contains information necessary to order replaceable parts and assemblies related to the electrical functions of the instrument.

Section 8—Diagrams and Circuit Board Illustrations; includes detailed circuit schematics, locations of assembled boards within the instrument, voltage and waveform information, circuit board component locators, and locations of adjustments to aid in performing the Adjustment procedure.

Section 9—Replaceable Mechanical Parts; includes information necessary to order replaceable mechanical parts and shows exploded drawings which identify assemblies.

INSTALLATION

Initial Inspection

This instrument was inspected both mechanically and electrically before shipment. It should be free of marks or scratches and should meet or exceed all electrical specifications. To confirm this, inspect the instrument for physical damage incurred in transit and test the electrical performance by following the Operating Instructions in Section 2 and Performance Check Procedure in Section 5 of the Instruction Manual. If there is damage or deficiency, contact your local Tektronix Field Office or representative.

Operating-Power Information

This instrument can be operated from either a 115-volt or 230-volt nominal supply source, 48 to 440 hertz.

CAUTION

To prevent damage to the instrument, always check the LINE VOLTAGE SELECTOR switch located on the rear of the instrument before connecting the instrument to the supply circuit.

WARNING

AC POWER SOURCE AND CONNECTION.

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

Before making connection to the power source, determine that the instrument is adjusted to match the voltage of the power source, and has a suitable two-pole, three-terminal grounding-type plug. Refer any changes to qualified service personnel.

GROUNDING. *This instrument is safety class I equipment (IEC designation). All accessible conductive parts are directly connected through the grounding conductor of the power cord to the grounding contact of the power plug.*

The power input plug must only be inserted in a mating receptacle with a grounding contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric shock hazard.

For electric shock protection, the grounding connection must be made before making connection to the instrument's input or output terminals.

TABLE 1-1
Power-Cord Conductor Identification

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounded (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 1-2.

TABLE 1-2
Power-Cord Plug Configuration

Nominal Supply Voltage	Reference Standards
115 V ac	¹ ANSI C73.11 ² NEMA 5-15-P ³ IEC 83
230 V ac	¹ ANSI C73.20 ³ IEC 83 ⁴ BS 1363 ⁵ CEE 7, sheets IV, VI, and VII ⁶ AS C112 ² NEMA 6-15-P

- ¹ ANSI—American National Standards Institute
- ² NEMA—National Electrical Manufacturer's Association
- ³ IEC—International Electrotechnical Commission
- ⁴ BS—British Standards Institution
- ⁵ CEE—International Commission on Rules for the Approval of Electrical Equipment
- ⁶ AS—Standards Association of Australia

Operating Voltage

The LINE VOLTAGE SELECTOR switch (located on the rear panel) allows selection of 115-volt or 230-volt nominal line voltage operation. To convert from 115-volt to 230-volt operation, change the power cord and plug to match the power-source receptacle, then use a small screwdriver to move the LINE VOLTAGE SELECTOR switch to the desired range.

Operating Temperature

The 7834 can be operated where the ambient air temperature is between 0° and +50° C. This instrument can be stored in ambient temperatures from -55° to +75° C. After storage at temperatures outside the operating limits, allow the chassis temperature to reach a safe operating limit before applying power.

The 7834 is cooled by air drawn in through holes in the top, side, and bottom panels and blown out through the fan exhaust. To ensure proper cooling of the instrument, maintain the clearance provided by the feet on the bottom and allow at least 2 inches clearance (more if possible) at the top, sides, and rear of the instrument.

If the internal temperature exceeds a safe operating level, a thermal cutout will disconnect the power to the instrument. Power is automatically restored when the temperature returns to a safe level.

Operating Position

A bail-type stand, mounted on the bottom of the instrument, permits the instrument to be tilted up about 10° for more convenient crt viewing.

PACKAGING FOR SHIPMENT

If this instrument is to be shipped for long distances by commercial transportation, it is recommended that the instrument be packaged in the original manner. The carton and packaging material in which your instrument was shipped should be saved and used for this purpose.

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

If the original packaging is unfit for use or not available, package the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions at least six inches greater than the instrument dimensions; refer to Table 1-3 for carton test strength requirements.

2. Enclose the instrument with polyethylene sheeting or equivalent 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 each side.

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

5. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

TABLE 1-3
Shipping Carton Test Strength

Gross Weight (lb)	Carton Test Strength (lb)
0 - 10	200
10 - 30	275
30 - 120	375
120 - 140	500
140 - 160	600

SPECIFICATION

The electrical characteristics listed in Table 1-4 apply when the following conditions are met: (1) Adjustment of the instrument must have taken place at an ambient temperature between +20° and +30° C; (2) The instrument must be allowed a 30-minute warm-up period; (3) All specifications are valid at an ambient temperature of 0° to +50° C, unless otherwise stated; (4) All specifications are valid in Full Scan (0.9 cm/div) and Reduced Scan (0.45 cm/div) modes, unless otherwise stated; (5) The instrument must be in an environment that meets the limits described in Table 1-5.

Any applicable conditions not listed above are expressly stated as part of that characteristic.

TABLE 1-4
Electrical Characteristics

Characteristic	Performance Requirement
VERTICAL SYSTEM	
Deflection Factor	Compatible with all 7000-series plug-in units.
Difference Between Vertical Compartments	1% or less.
Low-Frequency Linearity	0.1 div or less compression or expansion of a center-screen 2-div display positioned anywhere vertically within graticule area.
Bandwidth	Varies with plug-in unit selected. See 7834 Oscilloscope Vertical Systems Specification, Table 1-7.
Isolation Between Vertical Compartments	
All Vertical Modes	At least 100:1 from dc to 150 MHz and at least 30:1 from 150 MHz to 400 MHz.
Delay Line	Permits viewing the leading edge of triggering signal. <i>NOTE</i> <i>Not all 7B50-series time-base units can display the leading edge of the trigger signal in the 7834. Refer to Tektronix Products catalog under the specific time-base unit for recommended mainframe use.</i>
Vertical Display Modes	Selected by front-panel VERTICAL MODE switch.
LEFT	Left vertical-unit displayed.
ALT	Display alternates between left and right vertical units.
ADD	Display shows algebraic sum of left and right vertical units.
CHOP	Display chops between left and right vertical units.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
RIGHT	Right vertical-unit displayed.
Chopped Mode Repetition Rate	1 MHz within 20%.
VERT TRACE SEPARATION (B)	Positions "B" trace at least 4 div above and below "A" trace, when 7834 operates in dual-sweep mode.

HORIZONTAL SYSTEM

Deflection Factor	Compatible with all 7000-series plug-in units.
Difference Between Horizontal Compartments	1% or less.
Fastest Calibrated Sweep Rate	1 ns/div.
Horizontal Display Mode	Selected by front-panel HORIZONTAL MODE switch.
A	A horizontal unit displayed.
ALT	Display alternates between A and B horizontal units.
CHOP	Display chops between A and B horizontal units.
B	B horizontal unit displayed.
Chopped Mode Repetition Rate	200 kHz within 20%.
Phase Shift Between Vertical and Horizontal Deflection Systems	2° or less from dc to at least 35 kHz.
With Option 2 (B HORIZ Compartment Only)	2° or less from dc to 1 MHz.
Bandwidth (7834 Horizontal Only with 10 Div Reference)	From dc to at least 1 MHz.
With Option 2 (B HORIZ Compartment Only)	From dc to at least 1 MHz.

TRIGGER SYSTEM

A and B TRIGGER SOURCE	Selected by front-panel switches.
VERT MODE	From vertical unit selected by VERTICAL MODE switch; except that in CHOP mode signals are added algebraically.
LEFT VERT	From left vertical unit only.
RIGHT VERT	From right vertical unit only.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
CALIBRATOR	
Waveshape	Square wave.
Polarity	Positive going with baseline near ground.
Source Impedance	450 Ω .
Output Voltage	(Selected by front-panel CALIBRATOR switch.)
Into 100 k Ω or greater	40 mV, 0.4 V, 4 V.
Into 50 Ω	4 mV, 40 mV, 0.4 V.
Output Current	40 mA available through CALIBRATOR output with optional BNC-to-Current Loop adapter. CALIBRATOR switch must be set to 4 V for calibrated output.
Amplitude Accuracy (P-P Voltage)	Within 1%.
Repetition Rate	1 kHz within 0.25%.
Duty Factor	49.8 to 50.2%.
Rise Time and Fall Time	250 ns or less into 100 pF or less.

SIGNAL OUTPUTS

+SAWTOOTH OUT	
Source	A HORIZ time-base unit or B HORIZ time-base unit.
Polarity	Positive going with baseline at 0 V within 1 V into 1 M Ω .
Output Voltage	
Rate of Rise	
Into 50 Ω	50 mV/unit of time selected by time-base unit time/div switch, within 15%; 100 ns/div max.
Into 1 M Ω	1 V/unit of time selected by time-base unit time/div switch, within 10%; 1 μ s/div max.
Output Resistance	Approximately 950 Ω .

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
+ GATE OUT	
Source	A HORIZ time-base unit or B HORIZ time-base unit.
A Gate	Derived from the A HORIZ time-base unit main gate.
B Gate	Derived from the B HORIZ time-base unit main gate.
Dly'd Gate	Derived from the A HORIZ time-base unit delayed gate.
Polarity	
A or B Gate	Positive going with baseline at 0 V within 1.0 V (into 1 M Ω).
A Dly'd Gate	Positive level when A time-base delayed sweep or B sweep is enabled. 0 V within 1.0 V (into 1 M Ω) when sweeps are disabled. Output is always positive when no plug-in is used or plug-in does not provide delayed gate.
Output Voltage	
Into 50 Ω	0.5 V within 10%.
Into 1 M Ω	10 V within 10% (up to 1 μ s/div).
Rise Time Into 50 Ω	20 ns or less.
Output Resistance	Approximately 950 Ω .
VERT SIG OUT	
Source	Selected by A TRIGGER SOURCE switch.
Source	Same as A TRIGGER SOURCE.
Output Voltage	
Into 50 Ω	25 mV/div of vertical deflection within 25%.
Into 1 M Ω	0.5 V/div of vertical deflection within 25%.
Bandwidth Into 50 Ω	Varies with vertical plug-in selected; see 7834-Series Oscilloscope Vertical Systems Specification, Table 1-7.
DC Centering	0 V within 1 V into 1 M Ω .
Aberrations	15% or less p-p within 50 ns of step.
Output Resistance	Approximately 950 Ω .

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Z-AXIS SYSTEM	
External Z-Axis Input	
Polarity and Sensitivity	Positive 2 V provides complete blanking from maximum-intensity condition; negative 2 V provides complete unblanking from minimum-intensity condition.
Low-Frequency Response	To dc.
Input Resistance	Approximately 470 Ω .
Input Capacitance	Less than 50 pF.
Open-Circuit Voltage	Approximately 0 V.
Maximum Input Voltage	Within 15 V (dc plus peak ac).
Maximum Repetition Rate	1 MHz.
READOUT DISPLAY	
Readout Modes	
FREE RUN	Selected by front-panel switch.
Storage Mode	
NON-STORE	Continuously displayed.
BISTABLE or VAR PERSIST	Continuously displayed, except turns off during erase cycle.
FAST BISTABLE or FAST VAR PERSIST	Continuously displayed, except turns off at beginning of erase cycle or at initiation of single sweep reset until end of transfer cycle. Also, turns off when displayed time base operates in other than single-sweep mode and MULTI TRACE DLY control is not in detent.
SAVE	Displayed for approximately 1 s after save mode is entered, then turns off.
GATED	
Storage Mode	
NON-STORE	One frame of readout is provided at end of displayed sweep.
BISTABLE	Continuously displayed except turns off from beginning of erase cycle until end of first displayed sweep.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
VAR PERSIST	One frame of readout is provided at the end of displayed sweep. Erase cycle inhibits readout display.
FAST BISTABLE	Continuously displayed except turns off at beginning of erase cycle, or at initiation of single-sweep reset until end of transfer cycle. Also, turns off when displayed time base operates in other than single sweep mode and when MULTI TRACE DLY control is not in detent.
FAST VAR PERSIST	One frame of readout is provided in end of transfer cycle; turns off when displayed time base operates in other than single sweep mode and when MULTI TRACE DLY control is not in detent.
SAVE BISTABLE or FAST BISTABLE	Displayed for approximately 1 s after save mode is entered, then turns off.
VAR PERSIST	Allows one frame of readout to be displayed at end of displayed sweep.
FAST VAR PERSIST	Allows one frame of readout to be displayed at end of transfer cycle.
Character Height	
Full Scan	0.35 div to 0.5 div.
Reduced Scan	0.2 div to 0.3 div.
DISPLAY	
Cathode Ray Tube	
Graticule	
Type	Internal; illuminated with variable edge lighting.
Area	
Full Scan	8 x 10 div; 0.9 cm/div.
Reduced Scan	8 x 10 div; 0.45 cm/div centered on faceplate.
Phosphor	P31.
Stored Vertical and Horizontal Resolution in VAR PERSIST and VAR PERSIST FAST	
Full Scan	10 lines/div.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
High Voltage Overall Accelerating Voltage	Approximately 10 kV (approximately 12 kV in reduced scan).
Geometry	Within 0.1 div of vertical and horizontal graticule lines.
BEAMFINDER	Actuating BEAMFINDER limits display to within graticule area.

STORAGE

Stored Writing Speed	
Full Scan (Center 6 x 8 div at 0.9 cm/div)	
FAST VAR PERSIST	300 div/ μ s (270 cm/ μ s).
FAST BISTABLE	50 div/ μ s (45 cm/ μ s).
VAR PERSIST	2 div/ μ s (1.8 cm/ μ s).
BISTABLE	0.03 div/ μ s (0.027 cm/ μ s).
Reduced Scan (Center 8 x 10 div at 0.45 cm/div)	
FAST VAR PERSIST	5,500 div/ μ s (2,500 cm/ μ s).
FAST BISTABLE	776 div/ μ s (350 cm/ μ s).
VAR PERSIST	12 div/ μ s (5.4 cm/ μ s).
BISTABLE	0.2 div/ μ s (0.09 cm/ μ s).
Stored View Time	
BISTABLE and FAST BISTABLE	At least 30 minutes (typically hours).
VAR PERSIST and FAST VAR PERSIST	30 s or more at maximum persistence.
AUTO ERASE VIEW TIME	
Minimum	Less than 1 s.
Maximum	Greater than 4 s.

REMOTE CONNECTORS & SWITCHES

CONTROL ILLUMINATION	High, medium and off. (Three position switch located on rear of instrument).
----------------------	--

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristics	Performance Requirement
REMOTE RESET INPUT	Input for reset of single-sweep function of time-base units installed in A and B HORIZ compartments (compatible time-base units only).
Signal Required	Switching from high level (+15 V to +10 V; sink less than 40 μ A) to low level (+0.5 V to -15 V; sink less than 10 mA), in less than 1 ms, resets the sweep.
Minimum Pulse Width	10 μ s at 50% amplitude points.
Maximum Input Voltage	+ or -15 V (dc plus peak ac).
Probe Power	2 probe power connectors.
REMOTE STORAGE GATE INPUT	Allows remote operation of high speed transfer. Low- to high-level transition enables High Speed Target to receive information to be stored. High-to-low transition initiates transfer from High Speed Target to Storage Target.
Signal Required	TTL voltage compatible.
Rise Time	1 μ s or less.
Fall Time	1 μ s or less.
Minimum Pulse Width	50 ns at 50% amplitude.
Input Resistance	Greater than 15 k Ω from -0.6 to +5 V input.
Input Capacitance	Approximately 100 pF.
Open Circuit Voltage	Approximately 0 V.
Maximum Input Voltage	+ or -15 V (dc plus peak ac)
REMOTE ERASE INPUT	Allows remote erasure of stored display. High-to-low transition initiates an erase cycle when in a storage mode.
Signal Required	TTL voltage compatible.
Rise Time	1 ms or less.
Fall Time	10 μ s or less.
Minimum Pulse Width	1 ms at 50% amplitude.
Input Resistance	Greater than 27 k Ω .
Input Capacitance	Approximately 100 pF.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Open Circuit Voltage	
In Nonstore Mode	Approximately 0 V.
In Store Mode	Approximately +5.6 V.
Max Input Voltage	+ or -15 V (dc plus peak ac).
REMOTE SAVE INPUT	Allows remote control of save mode. High state allows control from front panel. Low state holds storage circuitry in save mode when in storage mode.
Signal Required	TTL voltage compatible.
Rise Time	1 ms or less.
Fall Time	1 ms or less.
Open Circuit Voltage	Approximately 2.5 V.
Input Resistance	Approximately 10 k Ω .
Input Capacitance	Approximately 100 pF.
Maximum Input Voltage	+ or -15 V (dc plus peak ac).

POWER SOURCE

Voltage Range (ac, rms)	Selected by rear-panel LINE VOLTAGE SELECTOR switch.
115 V Nominal	From 90 V to 132 V.
230 V Nominal	From 180 V to 250 V.
Line Frequency	From 48 Hz to 440 Hz.
Maximum Power Consumption	215 W.
Maximum Current	
90 V Input	3.3 A at 60 Hz.
180 V Input	1.7 A at 60 Hz.
Fuse Data (F1200)	See Electrical Parts list.

TABLE 1-5
Environmental

Characteristic	Information
<p>NOTE</p> <p><i>This instrument will meet the electrical characteristics given in the Performance Requirement column of Table 1-4 over the following environmental limits.</i></p>	
Temperature Range Operating Nonoperating	0° to +50° C. –55° to +75° C.
Altitude Operating Nonoperating	15,000 feet. Test limit 50,000 feet.
EMC (Electro Magnetic Compatibility) in accordance with MIL-STD-462A (when equipped with Option 3)	<p>NOTE</p> <p><i>Any unused plug-in compartments must be covered with a blank plug-in panel (EMC shielded) in order to meet EMC specifications. See Instrument Options section for additional information.</i></p>
Radiated Interference	Interference radiated from the instrument under test within the given limits from 150 kHz to 1000 MHz.
Conducted Interference	Interference conducted out of the instrument under test through the power cord within the given limits from 150 kHz to 25 MHz.
Transportation (packaged instrument, without plug-ins)	Qualifies under National Safe Transit Committee test procedure 1A, Category 11.

TABLE 1-6
Physical

Characteristic	Information
Ventilation	Safe operating temperature maintained by dc fan. Automatic resetting thermal cutout protects instrument from overheating.
Warm-up Time	30 minutes for rated accuracy.
Finish	Anodized front- and rear-panel with blue-vinyl painted aluminum cabinet.
Overall Dimensions (measured at maximum points)	
Height	13.6 inches 34.5 cm
Width	12.0 inches 30.5 cm
Length	23.2 inches 58.9 cm
Net Weight (Instrument Only)	37.5 lbs. 17.0 kg

NOTE

See Fig. 1-1 for 7834 dimensional drawing.

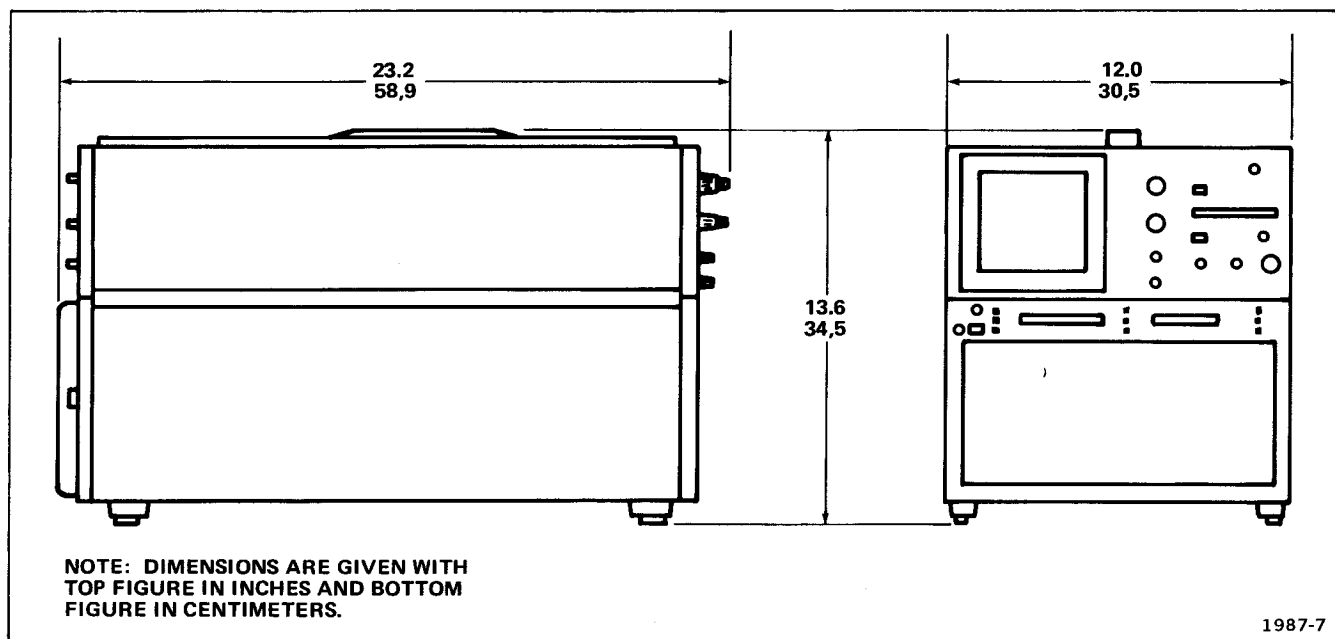


Figure 1-1. 7834 dimensional drawing.

SYSTEM ELECTRICAL SPECIFICATION

Your Tektronix 7834 Oscilloscope System provides exceptional flexibility in operation with a wide choice of general- and special-purpose plug-in units. The type number of a particular plug-in unit identifies its usage as follows:

The first digit (7) denotes the oscilloscope system for which the plug-in is designed (7000-series).

The second letter describes the purpose of the plug-in unit:

A—Amplifier	L—Spectrum Analyzer
B—Time base (real time)	M—Miscellaneous
C—Curve Tracer	S—Sampling
D—Digital	T—Time base (sampling)

The third and fourth digits of the plug-in type number do not carry any special connotation.

An "N" suffix letter added to the normal four-digit type number identifies a unit not equipped with the circuitry necessary to encode data for the 7000-series readout system.

Table 1-7 lists the vertical specifications which are system dependent. For more complete specifications on plug-in units for the 7000-Series Oscilloscope System, refer to the Tektronix Products catalog.

Table 1-8 lists the horizontal specifications which are system dependent. For more complete specifications on plug-in units for the 7000-Series Oscilloscope System, refer to the Tektronix Products catalog.

TABLE 1-7
7834 Oscilloscope
Vertical System Specification

Amplifier Plug-In Unit	Probe	Bandwidth (MHz)	Rise Time (ns)	Accuracy ¹		VERT SIG OUT	
				EXT CAL 0° to +50° C (%)	INT CAL 0° to +50° C (%)	BW (MHz)	Tr (ns)
7A11	Integral	200	1.8	2	3	135 MHz	2.6 ns
7A12	None	105	3.4	2	3	105 MHz	3.4 ns
	P6053B			3	4		
7A13	None	100	3.5	1.5	2.5	100 MHz	3.5 ns
	P6053B					100 MHz	3.5 ns
	P6055	65	5.4	65 MHz	5.4 ns		
7A14	P6021	55	6.4	2	3	50 MHz	7.0 ns
	P6022	110	3.2			100 MHz	3.5 ns
7A15A/N	None	80	4.4	2	3	70 MHz	5.0 ns
	P6053A			3	4		
7A16A	None	200 ²	1.8 ²	2	3	135 MHz	2.6 ns
	P6053B			3	4		
7A17	None	150	2.4			15 MHz	24 ns
7A18	None	75	4.7	2	3	70 MHz	5.0 ns
	P6053B			3	4		
7A19	None	400 ²	0.9 ²	3	4	235 MHz	1.5 ns
	P6056			4	5		
	P6057	375 ²	1.0 ²	4	5		
	P6201			3	4		
7A19 (10 mV/Div Only)	None	325	1.1	4	5	235 MHz	1.5 ns
	P6056, P6057			4	5		
	P6201	300	1.2	4	5		
7A22	None or Any	1 MHz (within 10%)	350 (within 9%)	2	3	1.0 MHz ±10%	350 ns ±9%
7A24	None	300 ²	1.2 ²	3	4	135 MHz	2.6 ns
	P6056, P6057			4	5		
	P6201	275 ²	1.3 ²	4	5		
7A26	None	180 ²	1.9 ²	2	3	135 MHz	2.6 ns
	P6053B			3	4		

¹ Deflection Factor accuracy is checked as follows:

EXT CAL 0° to +50° C: Plug-in gain set at a temperature within 10° C of operating temperature, using an external calibrator with accuracy within 0.25%.

INT CAL 0° to +50° C: Plug-in gain set using the oscilloscope calibrator (within 10° C of the operating temperature) in a temperature range between 0° and +50° C.

² System temperature range from 0° to +35° C; derate 10% from +35° to +50° C.

TABLE 1-8
7834 Oscilloscope
System Horizontal Specification

Time-Base Unit	Performance Feature	Maximum Calibrated Sweep Rate	Triggering Frequency Range
7B50A	Delayed Sweep	5 ns/div	Dc to 150 MHz
7B70	Delayed Sweep	2 ns/div	Dc to 200 MHz
7B71	Dual Sweep Delaying and Delayed	2 ns/div	Dc to 200 MHz
7B92A	Display Switching	1 ns/div	Dc to 500 MHz
7B80	Delayed Sweep	1 ns/div	Dc to 400 MHz
7B85	Delaying Sweep	1 ns/div	Dc to 400 MHz

TABLE 1-9
Special Purpose Plug-In Units

Plug-In Unit	Performance Feature
7CT1N	Low-Power Semiconductor Curve Tracer
7D01	Logic Analyzer
7D10	Digital Events Delay
7D11	Digital Delay
7D12	A/D Converter; plug-in modules provide flexible measurement capability
7D13	Measures Temperature, Voltage, Current and Resistance
7D14	Directly Gated Counter to 525 MHz
7K11	CATV Preamplifier
7L12	100 kHz to 1.8 GHz Spectrum Analyzer
7L13	1 kHz to 1.8 GHz Spectrum Analyzer
7M11	Dual Delay Line
7M13	Readout Access Unit
7S11	Accepts Plug-In Sampling Heads
7S12	Time Domain Reflectometer and Sampling Applications
7S14	Dual Trace Delayed Sweep Sampler
7T11	Random or Sequential; equivalent or Real-Time Sampling

STANDARD ACCESSORIES

- 1 each Operators Manual
- 1 each Instruction Manual
- 1 each Grey Faceplate Filter (installed)
- 1 each Storage Green Faceplate Filter
- 1 each Power Cord

RECOMMENDED ACCESSORIES

The following accessories have been selected from our catalog specifically for your instrument. They are listed as a convenience to help you meet your measurement needs. For detailed information and prices, refer to a Tektronix Products Catalog or contact your local Tektronix Field Representative.

CAMERAS

C-5A: The C-5A is a low-cost general-purpose camera with a Polaroid Pack-Film Back, pulsed graticule illumination, and a fixed f/16 lens. Magnification may be set at 0.67 or 0.85.

Order C-5A

C-5A Opt. 1: The C-5A Opt. 1 camera is the C-5A without the pulsed graticule illumination feature.

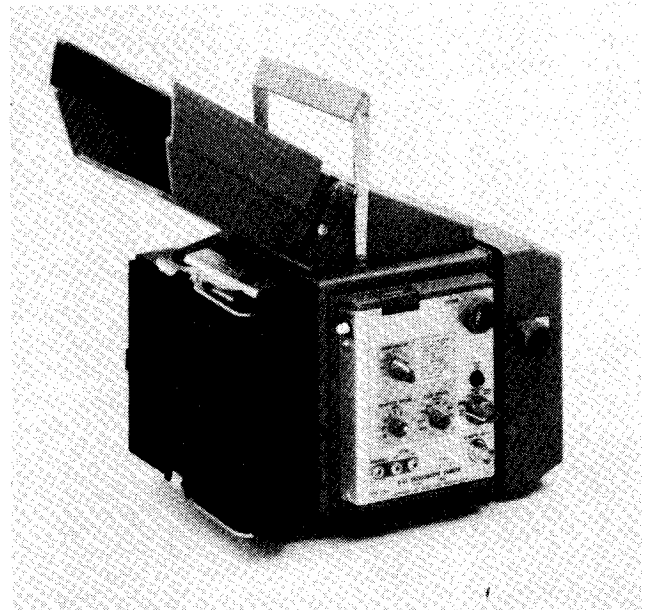
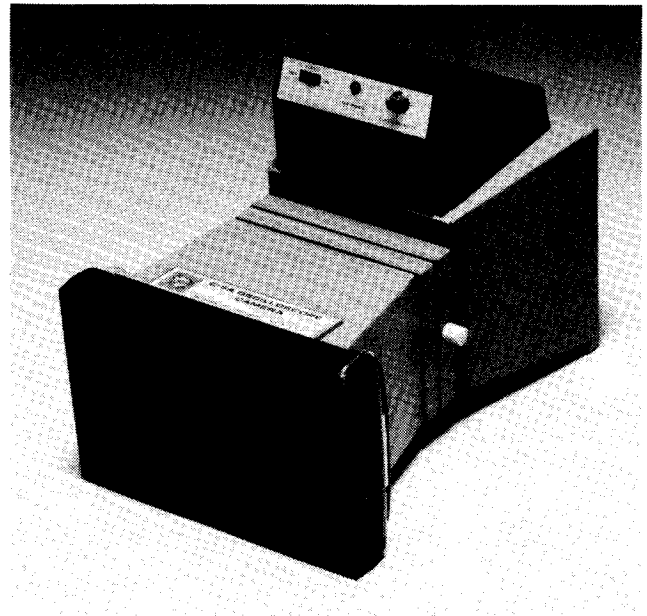
Order C-5A Opt. 1

C-52: Electronically-controlled shutter allows remote, automatic, or manual shutter actuation. Automatic single-sweep control simplifies single-event photography. Photometer exposure aid provides an easy way to estimate exposure for repetitive or stored traces. Range-finder focusing permits refocusing without removing the film.

Order, Polaroid pack film C-52P

Order, Polaroid roll film C-52R

Order, Sheet or roll film holders. C-52G

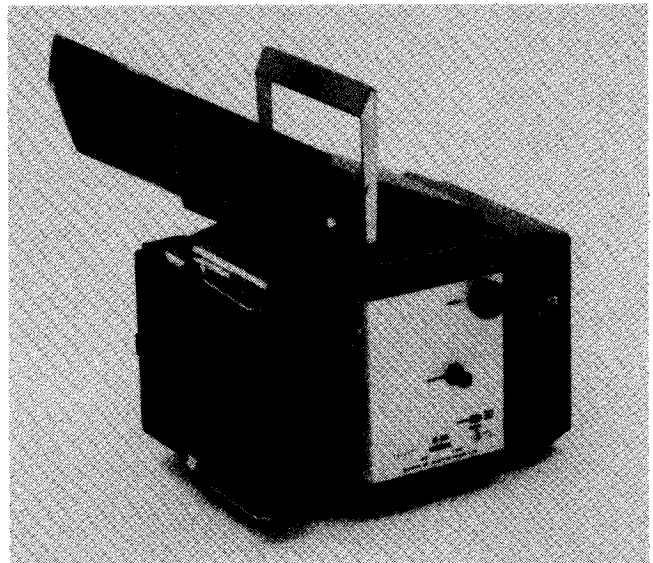


C-58: The C-58 is a general-purpose camera for full-size photos where fast writing speed is not necessary.

Order, Polaroid pack film C-58P

Order, Polaroid roll film C-58R

Order, Sheet or roll film holders. C-58G



CART

TEK LAB CART MODEL 3: Mobile equipment cart with 14" X 21" top tray, lockable storage drawer, and extra instrument tray.

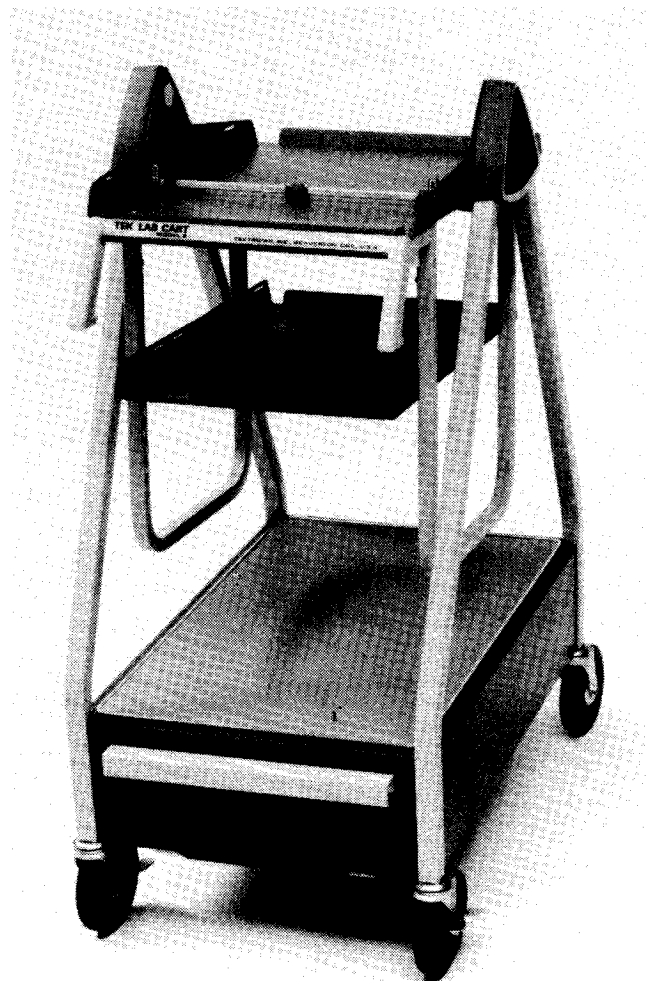
Order TEK LAB CART MODEL 3

Extra shelf.

Order 436-0132-01

Optional Safety Belt.

Order 346-0136-01



OPERATING INSTRUCTIONS

PRELIMINARY OPERATION

To operate this instrument effectively, the user must become familiar with the operation and capabilities of the instrument. This section describes how to use the front- and rear-panel controls and connectors.

WARNING

To avoid electric-shock hazard, see Installation in the General Information section of this manual before operating this instrument.

PLUG-IN UNITS

The 7834 accepts up to 4 Tektronix 7000-Series plug-in units. This feature allows selection of bandwidth, sensitivity, display mode, etc., and provides for future expansion of the system.

The overall capabilities of the system are mainly determined by the characteristics of the selected plug-ins. Some typical combinations are given under Applications, in this section, along with simplified setup instructions. For information on other plug-in units, refer to the current Tektronix Products catalog.

Installation of Plug-In Units

CAUTION

Plug-in units should not be installed or removed without first turning the instrument power off, to prevent instrument damage.

To install a plug-in unit into a compartment, align the slots in the top and bottom of the plug-in unit with the associated guide rails in the plug-in compartment. Insert the plug-in unit into the compartment until it locks into place. To remove a plug-in unit, pull out on the release latch to disengage the plug-in. To meet the EMC (electromagnetic compatibility) specifications, cover all unused plug-in compartments with an EMC shielded blank plug-in panel, Tektronix Part 016-0155-00.

The gain of the 7834 vertical and horizontal systems has been normalized to allow plug-in units to be interchanged among plug-in compartments without adjustment of the system. The basic calibration of the plug-in units should be checked when installed to verify their accuracy (refer to the operating instructions in the plug-in manual).

CONTROLS AND CONNECTORS

The 7834 front and rear panels are shown in Figure 2-1 and Figure 2-2. A brief, functional description of each control and connector is included in the illustration. Refer to Detailed Operating Information for additional information.

Front-Panel Color Coding

The 7834 front panel has color coded areas. These colors define areas by function. Blue identifies controls that affect the display mode; green identifies triggering controls.

Other colors such as gray, orange and yellow, have no functional assignment, but indicate the relationships among controls and/or connectors.

FUNCTIONAL CHECK

The following Functional Check procedure can be used for incoming inspection to verify proper operation, and may also be used by the operator for instrument familiarization. Only instrument functions (not measurement quantities or specifications) are checked in the procedure; 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.

Test Equipment Required

The following test equipment was used in preparing the Functional Check procedure. Other test equipment which meets these requirements may be substituted. When other equipment is substituted, the control settings or setup may need to be altered.

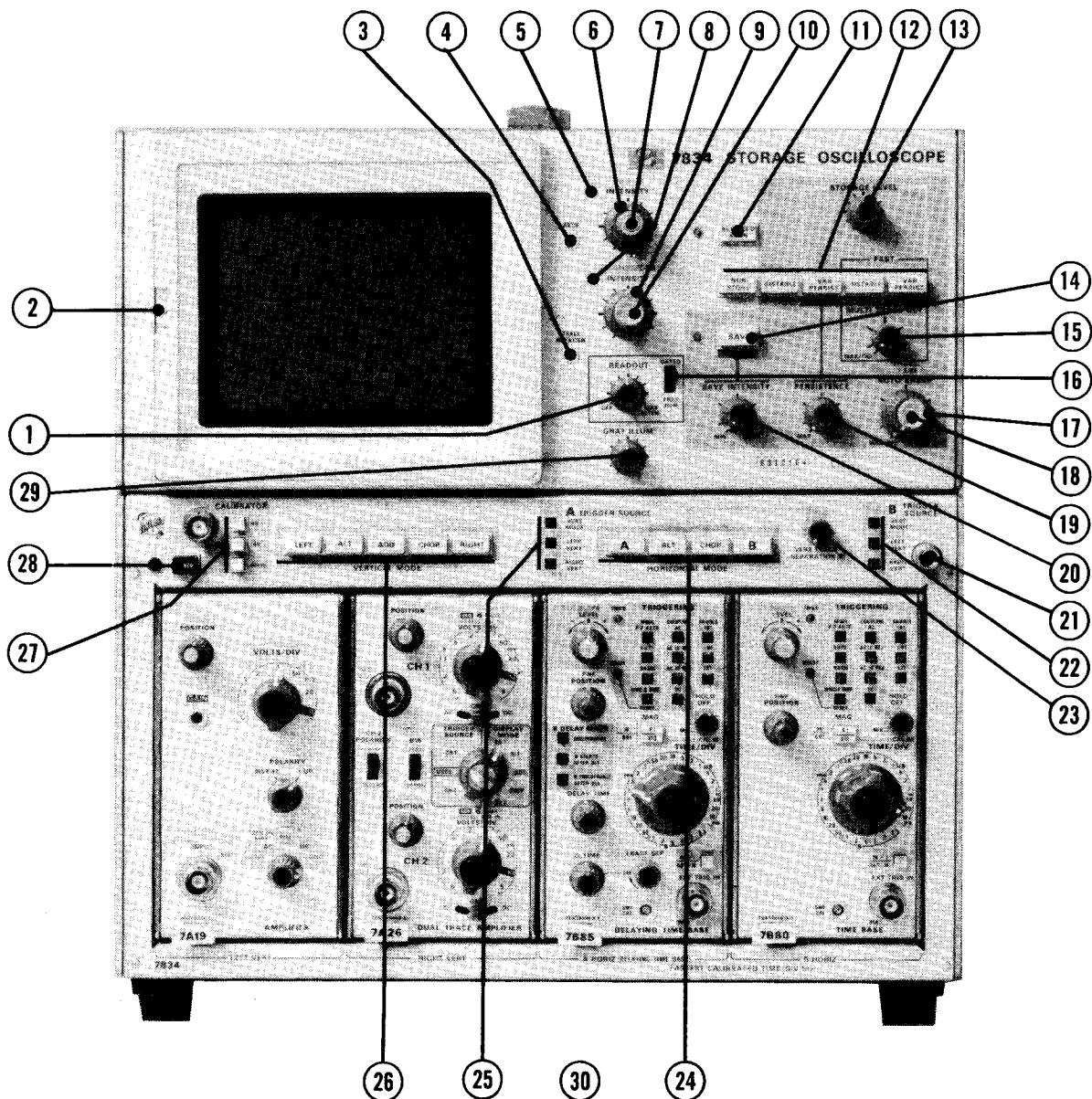


Figure 2-1. Front-panel controls, connectors and indicators.

FRONT-PANEL CONTROLS, CONNECTORS AND INDICATORS

- 1 READOUT Intensity (Option 1 deletes Readout System)—Controls brightness of the readout display. Disables Readout System in counterclockwise detent position.
- 2 Camera Power Connector (not labeled)—Three-pin connector provides power for camera operation and receives single-sweep-reset signal.
- 3 TRACE ROTATION—Screwdriver adjustment to align trace(s) with graticule lines.
- 4 ASTIG—Screwdriver adjustment used in conjunction with FOCUS control to obtain a well defined display.
- 5 A INTENSITY (Indicator)—Illuminates when selected by HORIZONTAL MODE switch.
- 6 A INTENSITY—Controls brightness of trace produced by the plug-in unit installed in the A HORIZ compartment.
- 7 FOCUS—Control optimizes crt trace definition.
- 8 B INTENSITY (Indicator)—Illuminates when selected by the HORIZONTAL MODE switch.
- 9 B INTENSITY—Controls brightness of the trace produced by the plug-in unit installed in the B HORIZ compartment.
- 10 BEAMFINDER—When pressed compresses and defocuses display within graticule area.
- 11 REDUCED SCAN—Calibrated area of crt is reduced to inner half-size graticule and stored writing speed is increased.
- 12 Storage Mode Switch (not labeled)—Selects 1 of 4 storage display modes or the NON-STORE display mode.
- 13 STORAGE LEVEL—Varies writing speed of FAST BISTABLE, VAR PERSIST, and FAST VAR PERSIST storage modes.
- 14 SAVE—Retains storage display in a nonerasable mode with continuously variable intensity.
- 15 MULTI TRACE DLY—Controls time between successive sweeps when operating in FAST BISTABLE and FAST VAR PERSIST storage modes.
- 16 READOUT Mode—Switch selects FREE RUN or GATED readout modes.
- 17 AUTO ERASE—Controls time of automatic erase viewtime.
- 18 ERASE—Erases stored display.
- 19 PERSISTENCE—Controls rate of continuous erasure of FAST VAR PERSIST and VAR PERSIST storage displays.
- 20 SAVE INTENSITY—Controls intensity of the SAVE display.
- 21 Ground (not labeled)—Binding post to establish common ground between associated equipment.
- 22 B TRIGGER SOURCE—Selects internal trigger source for B HORIZ plug-in unit.
- 23 VERT TRACE SEPARATION (B)—Vertically positions the B HORIZ trace with respect to the A HORIZ trace (dual-sweep modes only).
- 24 HORIZONTAL MODE—Selects input source for horizontal deflection.
- 25 A TRIGGER SOURCE—Selects internal trigger source for A HORIZ plug-in unit.
- 26 VERTICAL MODE—Selects input source for vertical deflection.
- 27 CALIBRATOR—Provides 1 kHz calibrated square-wave voltages.
- 28 POWER (Switch and Indicator)—Switch controls power to instrument; indicator illuminates when power is on.
- 29 GRAT ILLUM—Controls illumination of graticule lines.
- 30 Horizontal Selector—Three position Switch A, B, and Normal; A and B positions modify operation of HORIZONTAL MODE switch for FAST BISTABLE and FAST VAR PERSIST X-Y storage displays.

1987-1

Figure 2-1. Front-panel controls, connectors and indicators (continued).

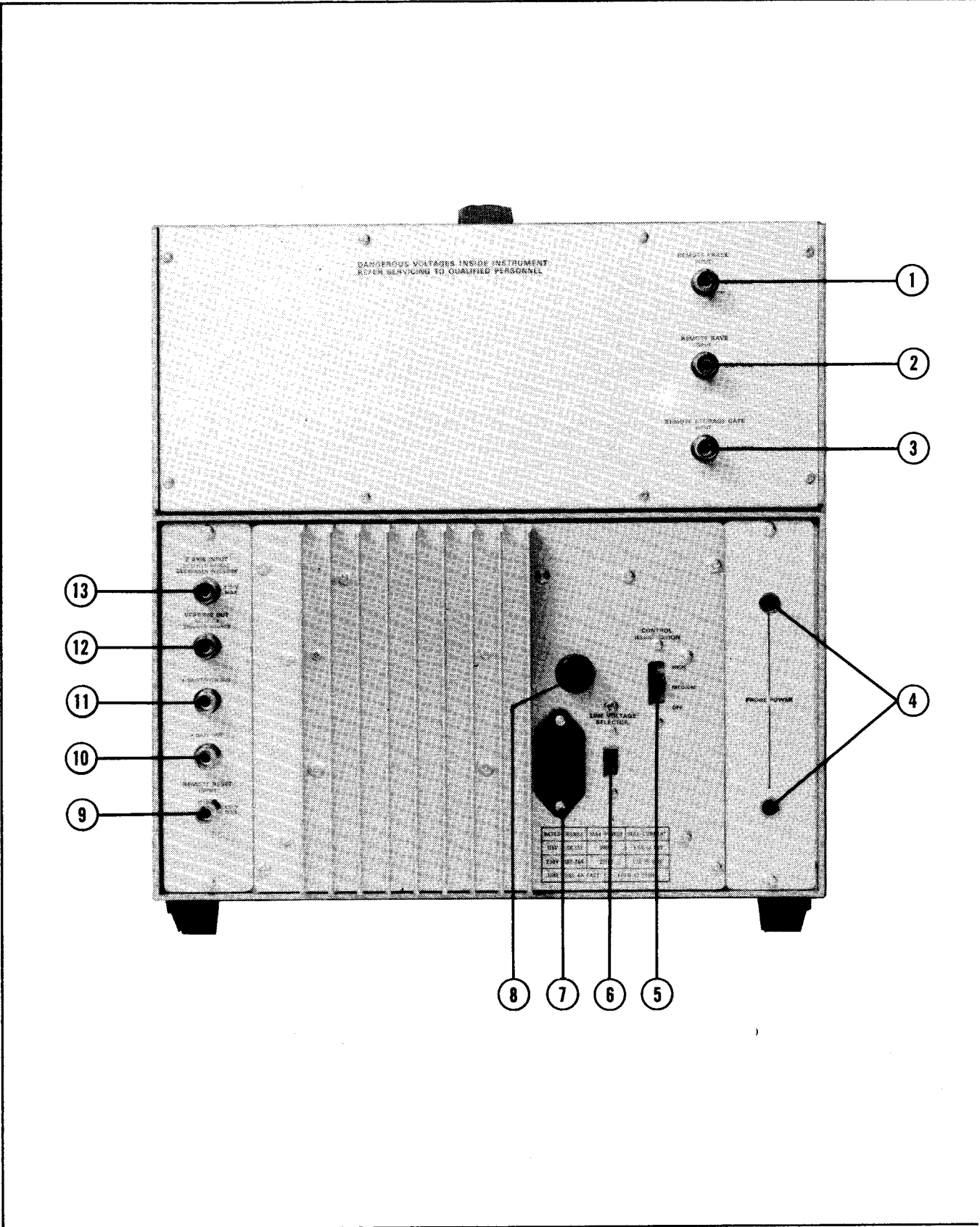


Figure 2-2. Rear-panel controls and connectors.

REAR-PANEL CONTROLS AND CONNECTORS

- ① REMOTE ERASE INPUT—Input for external operation of the ERASE function.
- ② REMOTE SAVE INPUT—Provides access for external operation of the SAVE function.
- ③ REMOTE STORAGE GATE INPUT—Input for external operation of the transfer function (FAST BISTABLE and FAST VAR PERSIST only).
- ④ PROBE POWER (2)—Connectors provide power to active probe system (deleted by Option 1).
- ⑤ CONTROL ILLUMINATION—Sets illumination level of the A and B INTENSITY indicators and of the lighted push-button switches on associated plug-in units.
- ⑥ LINE VOLTAGE SELECTOR—Sets instrument to 115-volt or 230-volt nominal line operation.
- ⑦ Power-input receptacle.
- ⑧ Line fuse receptacle.
- ⑨ REMOTE RESET INPUT—Input for activating single-sweep function of time-base unit(s).
- ⑩ +GATE OUT—Output signal derived from either the A Gate, B Gate, or the A Dly'd Gate.
- ⑪ +SAWTOOTH OUT—Sawtooth output signal derived from the A or B time-base unit.
- ⑫ VERT SIG OUT—Output signal derived from vertical signal as selected by A TRIGGER SOURCE switch.
- ⑬ Z-AXIS INPUT—Input for external intensity modulation of the crt display.

WARNING

The power-input plug must be inserted only into a mating receptacle with a grounding contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric shock hazard. Refer to qualified service personnel for verification of adequate protective grounding system to which this instrument is to be connected.

1987-2A

Figure 2-2. Rear-panel controls and connectors (continued).

Operating Instructions—7834

1. Function Generator

Description: Frequency range, 250 kilohertz to 1 megahertz; output amplitude, two volts peak-to-peak into 50 ohms; waveform, sine wave.

Type Used: Tektronix SG503 (used with TM500 power module).

2. Cables (2 Required)

Description: Length, 42 inches; connectors, BNC.

Type: Type RG-58/U, 50-ohm coaxial, Tektronix Part 012-0057-01.

3. T Connector

Description: Connectors, BNC to BNC.

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

4. Adapter

Description: Connectors, BNC female to BNC female.

Type Used: BNC female-to-BNC female, Tektronix Part 103-0028-00.

Preliminary Set Up

1. Set the front-panel controls as follows:

A INTENSITY counterclockwise

FOCUS midrange

B INTENSITY counterclockwise

READOUT OFF

GRAT ILLUM counterclockwise

POWER off

CALIBRATOR 4 V

VERTICAL MODE LEFT

A TRIGGER SOURCE . . . VERT MODE

HORIZONTAL MODE . . . A

VERT TRACE
SEPARATION (B) midrange

B TRIGGER SOURCE . . . VERT MODE

NON-STORE button in

REDUCED SCAN button out

HORIZONTAL

SELECTOR NORM (located at the rear of the A HORIZ compartment)

2. Connect the 7834 to a power source that meets the voltage and frequency requirements of this instrument. If the available line voltage is outside the limits of the Line Voltage Selector switch setting (on rear panel), see Operating Power Information under Installation (General Information Section).

3. Install Tektronix 7A-Series amplifier units in the LEFT VERT and RIGHT VERT compartments. Install Tektronix 7B-Series time-base units in the A HORIZ and B HORIZ compartments.

4. Press the POWER switch to the on (locked in) position.

5. Set both time-base units to 1 millisecond/division and triggering to auto mode with ac coupling from the internal source.

6. Rotate the A INTENSITY control until the trace is at a desirable viewing level (near midrange).

7. Connect the CALIBRATOR output to the input of the left amplifier unit with a 42-inch BNC cable.

8. Set the left amplifier deflection factor to display a signal amplitude of 2 divisions on the crt.

9. Set the A horizontal time-base triggering for a stable display.

Display Focus

10. Rotate the FOCUS and ASTIG controls and observe the square-wave display. Notice that the thickness of the trace varies. Set the FOCUS and ASTIG controls for a well-defined trace.

Trace Alignment

11. Disconnect the input signal. Use the left amplifier position control to align the trace with the center horizontal graticule line. If necessary use the TRACE ROTATION control to align the trace with the center graticule line.

Graticule Illumination

12. Rotate the GRAT ILLUM control throughout its range and notice that the graticule lines are illuminated as the control is turned clockwise.

Control Illumination

13. Notice that the A INTENSITY indicator and the lighted push-button switches are illuminated. Sequentially press all of the HORIZONTAL MODE switch positions and notice the A and B INTENSITY lights; these lights indicate which intensity control is active. Set the CONTROL ILLUM switch to the MEDIUM position. Observe that the selected intensity indicator and the lighted push-button switches on the plug-in units are dimmed.

14. Set the rear-panel CONTROL ILLUMINATION switch to the HIGH position. Return the HORIZONTAL MODE switch to A.

Vertical Deflection System

15. Connect the 4 V CALIBRATOR output to the input connectors of both amplifier units with two 42-inch BNC cables and a BNC T connector. Set the deflection factor of the left amplifier unit to display about 2 divisions of signal on the crt.

16. Notice that the position control of only the left amplifier unit affects the vertical position of the displayed trace. Position the trace to the upper half of the graticule.

17. Set the VERTICAL MODE switch to RIGHT. Set the deflection factor of the right amplifier unit to display about 2 divisions of signal on the crt.

18. Notice that the position control of only the right amplifier unit affects the vertical position of the displayed trace. Position the trace to the lower half of the graticule.

19. Set the VERTICAL MODE switch to ALT. Notice that 2 traces are displayed on the crt. The top trace is produced by the left amplifier unit and the bottom trace is produced by the right amplifier unit; the sweep for both traces is produced by the A time-base unit. Set the sweep rate of the A time-base unit to 50 milliseconds/division; notice that the

display alternates between the left and right amplifier plug-in units after each sweep. Turn the A time-base sweep rate switch throughout its range; notice that the display alternates between amplifier units at all sweep rates.

20. Set the VERTICAL MODE switch to CHOP. Turn the A time-base unit sweep rate switch throughout its range. Notice that a dual-trace display is presented at all sweep rates, and that both amplifier units are displayed by the A time-base unit on a time-sharing basis. Set the A time-base unit sweep rate switch to 0.5 millisecond/division.

21. Set the VERTICAL MODE switch to ADD. The display should be four divisions in amplitude. Notice that the position control of either amplifier unit moves the display. Set the VERTICAL MODE switch to LEFT.

Horizontal Deflection System

22. Notice that the position control of only the A time-base unit affects the horizontal position of the displayed trace. Position the start of the trace to the left graticule line with the A time-base unit position control.

23. Set the HORIZONTAL MODE switch to B. Advance the B INTENSITY control until the display becomes defocused. The defocused display indicates that the B INTENSITY control is set too high. Reduce the setting of the B INTENSITY control to obtain a bright, well-defined display.

24. Notice that the position control of only the B time-base unit affects the horizontal position of the displayed trace. Position the start of the trace to the left graticule line with the B time-base unit position control.

25. Set the HORIZONTAL MODE switch to ALT. Two traces should be presented on the crt. If the traces overlap, adjust the VERT TRACE SEPARATION (B) control to position one trace to the bottom of the graticule area. Turn the sweep rate switches of both time-base units throughout their range. Observe that each time-base unit controls one of the traces independently of the other time-base unit. Also notice that when one of the time-base units is set to a slow sweep rate (below about 50 milliseconds/division), sweep alternation is evident (only 1 of the traces is presented on the crt at a time). Set the sweep rates of both time-base units to 0.5 millisecond/division. Adjust the A INTENSITY control; notice that it changes the intensity of the trace produced by the A time-base unit only. Likewise, the B INTENSITY control changes the intensity of the trace produced by the B time-base unit only. Return both intensity controls to desirable levels.

26. Set the HORIZONTAL MODE switch to CHOP. Notice that two traces are displayed on the crt in a manner similar to that of the ALT display. Turn the sweep rate switches of both time-base units throughout their ranges. Observe that two traces are displayed on the crt at all sweep rates. Also notice that when both time-base units are set to a slow sweep rate (50 milliseconds/division or slower), both traces are visible on the crt at the same time. Return the sweep rate switches of both time-base units to 0.5 millisecond/division.

27. Set the CALIBRATOR switch to 0.4 V. Set the VERTICAL MODE switch to CHOP. Four traces should be displayed on the crt. If not, adjust the position controls of the amplifier units and the VERT TRACE SEPARATION (B) control to position the four traces into view. Set the position controls of the plug-in units to identify which trace is produced from each plug-in unit (if amplifier units have the identify feature, it can be used to identify the traces). Set the A time-base unit for a sweep rate of 1 millisecond/division. Notice that the left-amplifier unit is displayed at the sweep rate of both the A and B time-base units and that the right-amplifier unit is also displayed at the sweep rate of both time-base units.

28. Set the HORIZONTAL MODE switch to ALT. Observe that the display is very similar to that obtained in the previous step. The main difference in this display is that the traces are now displayed alternately (noticeable only at slow sweep rates).

29. Set the VERTICAL MODE switch to ALT. Set the CALIBRATOR switch to 4 V. Notice that the trace produced by the left amplifier unit is displayed at the sweep rate of the B time-base unit and the trace produced by the right amplifier unit is displayed at the A time-base unit sweep rate. This feature is called independent-pairs operation and is obtained only when the VERTICAL MODE switch is in the ALT position and the HORIZONTAL MODE switch is in either the ALT or the CHOP position.

Triggering

30. Set the VERTICAL MODE switch to LEFT and the HORIZONTAL MODE switch to A. Center the display on the crt with the left amplifier unit position control. Disconnect the input signal from the right amplifier unit input connector. Sequentially select all of the VERTICAL MODE switch positions. Notice that a stable display is obtained for all positions of the VERTICAL MODE switch (straight line in RIGHT switch position).

31. Set the A TRIGGER SOURCE switch to LEFT VERT. Again, sequentially select all of the VERTICAL MODE switch positions. Notice that the display is again stable in all positions, as in the previous step.

32. Set the A TRIGGER SOURCE switch to RIGHT VERT. Sequentially select all of the VERTICAL MODE switch positions and notice that a stable display cannot be obtained in any position (this is because there is no input signal connected to the right vertical unit). Return the A TRIGGER SOURCE switch to VERT MODE.

33. The B TRIGGER SOURCE switch operates in a manner similar to the A TRIGGER SOURCE switch when the B time-base unit is selected to provide the display. Set the B TRIGGER SOURCE switch to VERT MODE.

34. Set the HORIZONTAL MODE switch to ALT or CHOP. Notice that this is the same display obtained in step 29 (independent-pairs operation).

Readout

NOTE

The following 3 steps apply only to instruments equipped with Readout; for Option 1 instruments proceed to step 38.

35. Turn the READOUT control clockwise until an alphanumeric display is visible within the top or bottom division of the crt. Change the deflection factor of the amplifier unit that is selected for display; notice that the readout position of the display changes as the deflection factor is changed. Likewise, change the sweep rate of the time-base unit which is selected for display; notice that the readout display for the time-base unit changes as the sweep rate is changed.

36. Set the time-base unit for X10 magnification. Notice that the readout display changes to indicate the correct magnified sweep rate. If a readout-coded 10X probe is available for use with the amplifier unit, install it on the input connector of the right amplifier plug-in unit. Notice that the deflection factor indicated by the readout is increased by 10 times when the probe is added. Return the time-base unit to normal sweep operation and disconnect the probe.

37. Sequentially select all of the VERTICAL MODE and HORIZONTAL MODE switch positions. Notice that the readout from a particular plug-in occupies a specific location on the display area. If either of the vertical plug-in units is a dual-trace unit, notice that the readout for channel 2 appears within the lower division of the crt. Return the VERTICAL MODE switch to LEFT and the HORIZONTAL MODE switch to A. Set the READOUT control to OFF.

Beamfinder

38. Set the deflection factor of the left amplifier unit to 0.1 volt/division. Notice that a square-wave display is not visible, since the deflection exceeds the scan area of the crt.

39. Press the BEAMFINDER push-button switch; notice that the display is returned to the viewing area in compressed form. Release the BEAMFINDER switch and notice that the display again disappears from the viewing area.

40. With the BEAMFINDER switch pushed in, increase the amplifier-unit deflection factor until the display is reduced to about 2 divisions vertically. Adjust the position control of the displayed amplifier unit to position the compressed display near the center of the graticule. Release the BEAMFINDER switch and notice that the display remains within the viewing area.

Calibrator

41. Connect the CALIBRATOR output to both the left and right vertical units with two BNC cables and a BNC T connector. The display amplitude should be approximately 2 divisions. If not, adjust the deflection factor accordingly.

42. Select different CALIBRATOR push buttons (labeled 4 V, 0.4 V, 40 mV, and 4 mV) and notice that the displayed signal changes accordingly (CALIBRATOR output must be terminated into more than a 100 kilohm load for stated output). When the CALIBRATOR output is terminated into 50 ohms, the output is 0.1 times the stated output.

Z-Axis Input

43. If an external signal is available (2 volts peak-to-peak minimum), the function of the Z-AXIS INPUT can be demonstrated. Connect the external signal to both the input connector of the displayed amplifier unit and the Z-AXIS INPUT connector. Set the sweep rate of the displayed time-base unit to display about 5 cycles of the signal. Set the amplitude of the signal generator until intensity modulation is visible on the display (change the amplifier unit deflection factor as necessary to produce an on-screen display). The positive peaks of the waveform should be blanked out and the negative peaks intensified. Notice that the setting of the intensity controls determines the amount of intensity modulation that is visible. Disconnect the cables.

Storage Operation

44. Connect the 4 V CALIBRATOR output to the input connector of the left amplifier unit and set the deflection factor for a 2-division display. Set the time-base unit triggering mode to single sweep and set the sweep rate for 0.5 millisecond/division.

45. Press the BISTABLE push button and set the AUTO ERASE control fully counterclockwise into the detent position.

46. Press the ERASE push button. The calibrator signal should be stored on the crt. If not, increase the A INTENSITY control slightly and press the ERASE button again. Repeat this sequence until a stored display is obtained.

47. Press the SAVE push button. The signal stored in the previous step should remain on the crt; it may be necessary to adjust the SAVE INTENSITY control to view the display. Turn the SAVE INTENSITY control throughout its range and observe the effect on the display.

48. Press the ERASE button and notice that the display cannot be erased (the SAVE mode inhibits the erase function). Press and release the SAVE push button.

49. Set the STORAGE LEVEL and the PERSISTENCE controls fully counterclockwise. Press the VAR PERSIST push button. Observe that an erase cycle and sweep occurs (when switching between the BISTABLE and VAR PERSIST modes) and that the screen goes dark except for the stored display.

50. Slowly turn the PERSISTENCE control clockwise and notice that the stored display fades into the background (background lighting will be observed as the PERSISTENCE control is advanced clockwise). The PERSISTENCE control determines the time interval during which the stored display is retained in the VAR PERSIST mode. Set the PERSISTENCE control fully counterclockwise.

51. Press the ERASE push button, then set the PERSISTENCE control to midrange just long enough for the display to fade out. Quickly turn the PERSISTENCE control fully counterclockwise. Slowly increase the STORAGE LEVEL (clockwise) and notice that the faded display again becomes visible, against the background.

Operating Instructions—7834

52. Turn the PERSISTENCE, STORAGE LEVEL, and A INTENSITY controls fully counterclockwise and set the time-base unit for auto triggering at a sweep rate of 0.5 second/division.

53. Set the PERSISTENCE control to midrange and slowly increase the A INTENSITY (clockwise) until the trace appears. Vary the PERSISTENCE control setting and notice that the trace can be made to build up or to fade more quickly, depending on the control setting. Varying the A INTENSITY control also affects the display in the same manner. Return the PERSISTENCE control to midrange and slowly decrease the A INTENSITY control to the point where the trace is just extinguished; then set the STORAGE LEVEL control fully clockwise and notice that the trace becomes visible again.

54. Turn the PERSISTENCE, STORAGE LEVEL, and A INTENSITY controls fully counterclockwise and set the time-base unit for auto triggering at a sweep rate of 0.5 millisecond/division.

55. Press the FAST BISTABLE push button.

56. Press the ERASE push button and notice that the screen background appears to alternate between bright and dim. This indicates that the sweep and transfer functions are operating.

57. Set the MULTI TRACE DLY control fully clockwise; then, slowly increase the A INTENSITY control (clockwise) until the display stores. Notice that each sweep is stored without erasing the previously stored sweep. This is easily observed if the vertical position control is varied between sweeps.

58. Press the ERASE push button and notice that the display is erased.

59. Set the time-base unit for single sweep and press the ERASE push button. Notice that only one sweep is stored (trigger time-base unit if necessary).

60. Change the setting of the vertical position control and initiate another sweep by pressing the reset button on the time-base unit. Notice that the new sweep is stored along with the one stored in the previous step.

61. Alternately press the ERASE push button and reduce the A INTENSITY control to the point where the display just fails to store.

62. Alternately increase the STORAGE LEVEL (clockwise) and press the ERASE push button. Notice that as the STORAGE LEVEL is increased, the display begins to store.

63. The FAST VAR PERSIST mode operates exactly as outlined for the VAR PERSIST mode except that the sweep and transfer functions are operative as described for FAST BISTABLE operation.

64. Set the time-base unit for auto triggering and set the 7834 for BISTABLE operation.

65. Set the A INTENSITY control to its 1 o'clock position. Turn the ERASE control out of the detent position and notice that erase cycles occur automatically and with increasing frequency as the control is turned clockwise.

66. Return the ERASE control to the detent (OFF) position and set the time-base unit for single sweep and external triggering. Turn the SAVE INTENSITY control fully counterclockwise.

67. Press the ERASE push button; notice that no sweep occurs.

68. Press the SAVE push button; notice that no sweep occurs (this is the "Auto Save" mode). Since no trigger was available, the sweep did not run; therefore, the system waits in a ready-to-store mode.

69. Set the time-base unit to internal trigger and notice that the screen goes dark. This indicates that a sweep has occurred and that the system has entered the SAVE mode.

70. Turn the SAVE INTENSITY control clockwise and notice that the stored display becomes visible.

71. Press the NON-STORE push button and set the time-base unit for auto triggering.

DETAILED OPERATING INFORMATION

Graticule

The graticule is marked on the inside of the crt faceplate, providing accurate, parallax-free measurements. The graticule is divided into eight vertical and ten horizontal divisions. Each Full Scan division is a 0.9-centimeter square divided into five minor divisions. A Reduced Scan graticule is etched in the center of the Full Scan graticule. Each Reduced Scan division is exactly one-half of a Full Scan division (0.45 centimeter). The vertical gain and horizontal timing of the plug-in units are calibrated to the graticule so that accurate measurements can be made from the crt. The illumination of the graticule lines can be varied with the GRAT ILLUM control.

Figure 2-3 shows the graticule and defines the various measurement lines. The terminology defined here will be used in all discussions involving measurements from the graticule. Notice the 0%, 10%, 90%, and 100% markings on the left side of the graticule. These markings are provided to facilitate rise-time measurements.

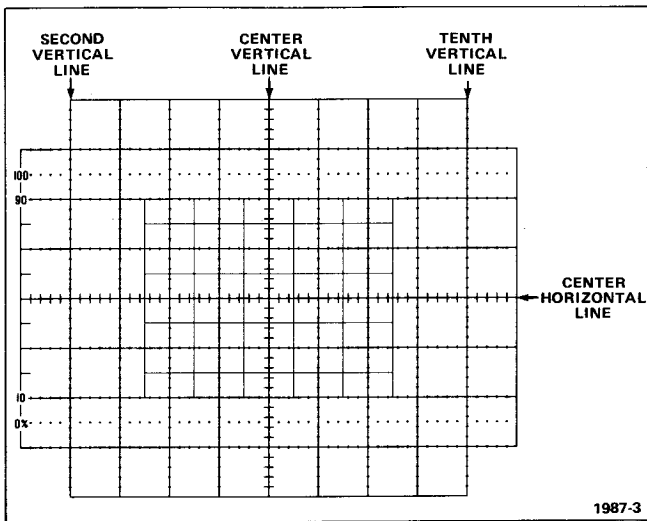


Figure 2-3. Definition of graticule measurement lines.

Light Filter

The tinted crt face-plate filter minimizes light reflections from the face of the crt to improve contrast when viewing the display under high-ambient-light conditions. This filter may be removed for waveform photographs or for viewing high-writing-rate displays. To remove the filter, pull outward on the bottom of the plastic crt mask and remove it from the crt bezel. Remove the tinted filter; leave the clear plastic face-plate protector installed and replace the mask. The face-plate protector should be left in place at all times to protect the crt face plate from scratches.

WARNING

Do not remove the clear plastic implosion shield covering the crt face plate; the crt implosion shield provides protection to the operator from crt implosion.

An optional mesh filter is available from Tektronix (included with Option 3). This filter provides shielding against radiated EMC (electromagnetic compatibility) from the face of the crt. It also serves as a light filter to make the trace more visible under high-ambient-light conditions. The mesh filter fits in place of the plastic tinted filter. Order the filter by Tektronix Part 378-0603-00.

Control Illumination

The CONTROL ILLUMINATION switch sets the illumination level of the A and B INTENSITY indicators, the A and B TRIGGER SOURCE switches, and of the lighted push button switches on the plug-in units. The positions available are OFF, MEDIUM, and HIGH. This switch is located on the rear panel of the 7834. The CONTROL ILLUMINATION switch does not affect the function-indicator lights (such as triggered or single-sweep ready lights).

Intensity Controls

The A INTENSITY control determines the brightness of the display produced by the plug-in unit installed in the A HORIZ compartment; the B INTENSITY control determines the brightness of the display produced by the plug-in unit installed in the B HORIZ compartment. The READ-OUT intensity control affects the brightness of only the readout portion of the crt display.

CAUTION

Crt phosphor damage can occur under adverse conditions. Avoid any condition where an extremely bright, sharply-focused dot exists on the crt. Also, remember that the light filter reduces the apparent light output from the crt.

The beam current is limited during X-Y mode operation or when either, or both, time-base units being displayed are set for a slow sweep rate. This reduces the danger of damaging the crt phosphor with a stationary or slowly moving spot.

Display Focus

This instrument contains an automatic-focusing circuit which maintains optimum focus for all intensity settings after a correct setting of the FOCUS control is established. The easiest way to obtain the correct setting of the FOCUS control is to set the READOUT intensity control so that the readout portion of the display is clearly visible. Then adjust the FOCUS control for best definition of the readout display. If the instrument does not contain the Readout System (Option 1), set the FOCUS control for best definition of the crt display at a low intensity setting.

Astigmatism-Focus Adjustments

If a well-defined display cannot be obtained with the FOCUS control, adjust the ASTIG adjustment as follows:

NOTE

To check for proper setting of the ASTIG adjustment, slowly turn the FOCUS control through the optimum setting. If the ASTIG adjustment is correctly set, the vertical and horizontal portions of the display will focus at the same position of the FOCUS control. This setting of the ASTIG adjustment should be correct for any display.

1. Install an amplifier unit in the LEFT VERT compartment and a time-base unit in the A HORIZ compartment.
2. Set the VERTICAL MODE switch to LEFT and the HORIZONTAL MODE switch to A.
3. Connect the output of a sine-wave generator to the input of the amplifier unit. Set the sine-wave generator repetition rate to 1 kilohertz and the vertical amplifier deflection factor for a 2-division display.
4. Set the time-base unit sweep rate for 0.2 millisecond/division and the triggering for a stable display. Set the A INTENSITY control so the display is at a usable intensity level (about midrange).
5. Turn the FOCUS control fully counterclockwise and set the ASTIG adjustment to midrange.
6. Set the FOCUS control so the thickness of the sine-wave trace is as thin as possible.

7. Adjust the ASTIG adjustment so the width of the sine-wave trace is as thin as possible.

8. Repeat steps 6 and 7 for the best overall focus.

Beamfinder

The BEAMFINDER helps to locate a display that overscans the crt viewing area vertically and/or horizontally. When the BEAMFINDER button is pressed, the display is compressed and defocused within the graticule area. To locate and reposition an overscanned display, use the following procedure:

1. Press the BEAMFINDER push button while the display is compressed, change the vertical and horizontal deflection factors until the vertical deflection is about two divisions high and the horizontal deflection is about four divisions wide (the horizontal deflection needs to be reduced only when operating in an X-Y mode).
2. Adjust the vertical and horizontal position controls to center the display on the graticule.
3. Release the BEAMFINDER push button; the display should remain within the graticule area.

Trace Alignment

The TRACE ROTATION control allows the trace to be aligned with the horizontal graticule lines. To set the control, position the trace to the center horizontal line and adjust the TRACE ROTATION control so that the trace is parallel with the center horizontal graticule line.

Readout Display

NOTE

Option 1 deletes the Readout System and probe power connectors from the instrument; disregard the following information for Option 1 instruments.

The Readout System provides an alpha-numeric display of information on the crt along with the analog waveform display. The information displayed by the Readout System is obtained from the plug-in units installed in the plug-in compartments.

Display Focus

This instrument contains an automatic-focusing circuit which maintains optimum focus for all intensity settings after a correct setting of the FOCUS control is established. The easiest way to obtain the correct setting of the FOCUS control is to set the READOUT intensity control so that the readout portion of the display is clearly visible. Then adjust the FOCUS control for best definition of the readout display. If the instrument does not contain the Readout System (Option 1), set the FOCUS control for best definition of the crt display at a low intensity setting.

Astigmatism-Focus Adjustments

If a well-defined display cannot be obtained with the FOCUS control, adjust the ASTIG adjustment as follows:

NOTE

To check for proper setting of the ASTIG adjustment, slowly turn the FOCUS control through the optimum setting. If the ASTIG adjustment is correctly set, the vertical and horizontal portions of the display will focus at the same position of the FOCUS control. This setting of the ASTIG adjustment should be correct for any display.

1. Install an amplifier unit in the LEFT VERT compartment and a time-base unit in the A HORIZ compartment.
2. Set the VERTICAL MODE switch to LEFT and the HORIZONTAL MODE switch to A.
3. Connect the output of a sine-wave generator to the input of the amplifier unit. Set the sine-wave generator repetition rate to 1 kilohertz and the vertical amplifier deflection factor for a 2-division display.
4. Set the time-base unit sweep rate for 0.2 millisecond/division and the triggering for a stable display. Set the A INTENSITY control so the display is at a usable intensity level (about midrange).
5. Turn the FOCUS control fully counterclockwise and set the ASTIG adjustment to midrange.
6. Set the FOCUS control so the thickness of the sine-wave trace is as thin as possible.

7. Adjust the ASTIG adjustment so the width of the sine-wave trace is as thin as possible.

8. Repeat steps 6 and 7 for the best overall focus.

Beamfinder

The BEAMFINDER helps to locate a display that overscans the crt viewing area vertically and/or horizontally. When the BEAMFINDER button is pressed, the display is compressed and defocused within the graticule area. To locate and reposition an overscanned display, use the following procedure:

1. Press the BEAMFINDER push button while the display is compressed, change the vertical and horizontal deflection factors until the vertical deflection is about two divisions high and the horizontal deflection is about four divisions wide (the horizontal deflection needs to be reduced only when operating in an X-Y mode).
2. Adjust the vertical and horizontal position controls to center the display on the graticule.
3. Release the BEAMFINDER push button; the display should remain within the graticule area.

Trace Alignment

The TRACE ROTATION control allows the trace to be aligned with the horizontal graticule lines. To set the control, position the trace to the center horizontal line and adjust the TRACE ROTATION control so that the trace is parallel with the center horizontal graticule line.

Readout Display

NOTE

Option 1 deletes the Readout System and probe power connectors from the instrument; disregard the following information for Option 1 instruments.

The Readout System provides an alpha-numeric display of information on the crt along with the analog waveform display. The information displayed by the Readout System is obtained from the plug-in units installed in the plug-in compartments.

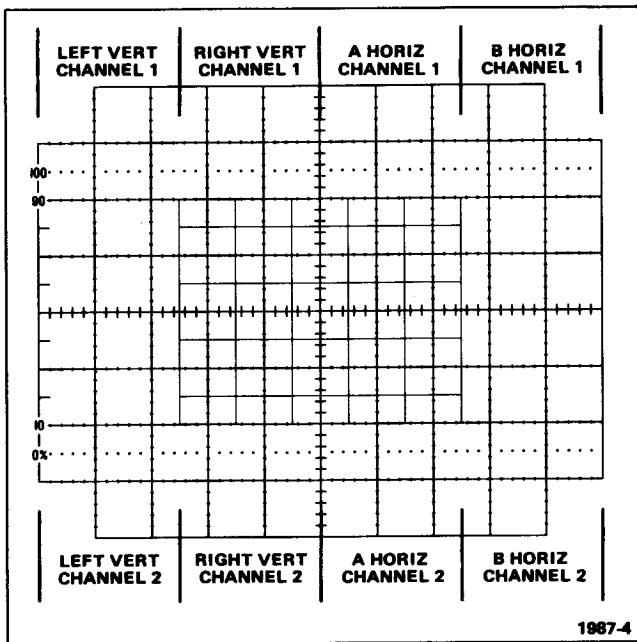


Figure 2-4. Location of readout on the crt identifying the originating plug-in and channel.

The readout information from each channel of each plug-in unit is called a word. Up to eight words of readout information can be displayed on the crt (two channels from each of the four plug-in compartments). The location of each readout word is fixed and is directly related to the plug-in unit and channel from which it originated. Figure 2-4 shows the area of the graticule where the readout from each plug-in unit and/or channel is displayed. Notice that the readout from channel 1 of each plug-in unit is displayed in the top division of the graticule and the readout from channel 2 is displayed directly below in the bottom division of the graticule. The REDUCED SCAN mode changes the location of the readout display. Figure 2-5 shows the correct readout location for the REDUCED SCAN mode. Notice that the readout display is positioned outside the half-size inner graticule and that the location of the readout words is directly related to the plug-in unit and channel from which they originated. Usually, the readout information for plug-in units and/or channels, which are selected by the mode switches, appear in the readout display. (Some special purpose plug-in units may over-ride the mode switches to display readout even though the compartment is not selected for display.)

READOUT IDENTIFY. An "Identify" feature is provided by the Readout System to correlate the readout word with the originating plug-in unit and channel (amplifier units only). When the "identify" button of an amplifier unit is pressed, the word IDENTIFY appears in the readout location allocated to that plug-in and channel. Other readout words

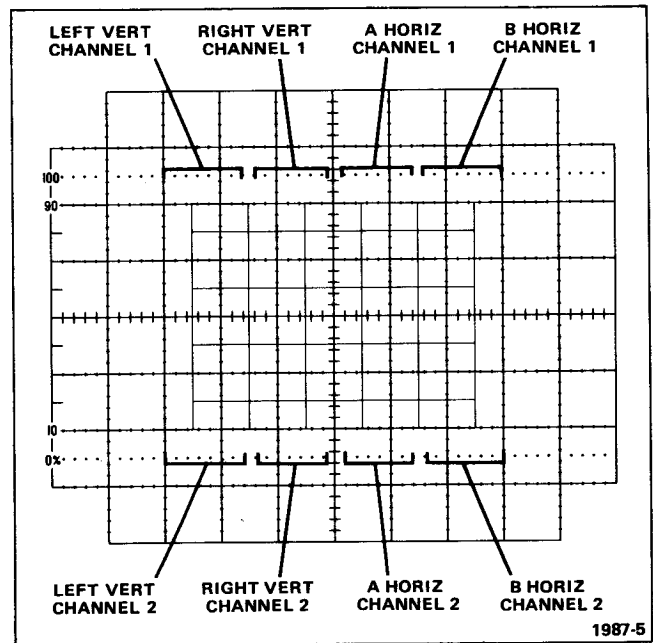


Figure 2-5. Location of readout on the crt when REDUCED SCAN is selected.

in the display remain unchanged. When the "identify" button is released, the readout display from this plug-in channel is again displayed. Circuitry may also be provided in the amplifier unit to produce a noticeable change in the analog waveform display to identify the associated trace when the "identify" button is pressed (see the plug-in unit instruction manual for details).

READOUT INTENSITY. The READOUT control determines the intensity of only the readout portion of the display, independently of the other traces. The Readout System is inoperative when the READOUT control is in the fully counterclockwise OFF position. This may be desirable when the top and bottom divisions of the graticule are to be used for waveform display, or when the trace interruptions necessary to display characters interfere with the waveform display.

READOUT MODES. The READOUT GATED or FREE RUN switch determines the operating mode of the Readout System. With the READOUT GATED or FREE RUN switch set to FREE RUN, the Readout System operates continuously, interrupting the usual crt display at random (for about 20 microseconds) in order to write each character on the crt. With the READOUT GATED or FREE RUN switch set to the GATED position, the Readout System operates in a triggered mode; one complete frame (up to eight words) of readout is displayed after the displayed time-base unit completes each sweep of the crt.

Readout Operation With Storage. Each of the storage modes modify the operation of the Readout System, to some extent. With the READOUT GATED or FREE RUN switch set to FREE RUN the Readout System operates as follows:

BISTABLE AND VAR PERSIST. In the BISTABLE and VAR PERSIST positions, of the Storage Mode switch, the readout display is turned off during the storage erase cycle; otherwise, the Readout System operates as previously described under READOUT MODES.

FAST BISTABLE AND FAST VAR PERSIST. In the FAST BISTABLE and FAST VAR PERSIST positions, of the storage mode switch, the Readout System turns off at the beginning of an erase cycle or when the single-sweep time-base mode is reset and remains off until the end of the storage transfer cycle. In addition, the Readout System is held off whenever the MULTI TRACE DLY control is in operation (out of its detent position) and the displayed time-base unit is in a repetitive sweep mode.

With the READOUT GATED or FREE RUN switch set to GATED the Readout System operates as follows:

BISTABLE. In the BISTABLE storage mode, the readout display runs continuously (as in the free run mode); however, the readout system turns off when the storage erase cycle begins and remains off until the end of the first displayed sweep.

VAR PERSIST. In the VAR PERSIST storage mode one complete frame of readout is displayed after the displayed time-base unit completes each sweep; however, there is no readout display during a storage erase cycle.

FAST BISTABLE. In the FAST BISTABLE storage mode the readout display runs continuously (as in the Free Run mode); however, the readout system turns off at the beginning of each erase cycle or when the single sweep time-base mode is reset and remains off until the end of the storage transfer cycle. In addition, the readout system is held off whenever the MULTI TRACE DLY control is in operation (out of its detent position) and the displayed time-base unit is in a repetitive sweep mode.

FAST VAR PERSIST. In the FAST VAR PERSIST storage mode, one complete frame of readout is displayed after the completion of the storage transfer cycle. However, there is no readout during a storage erase cycle and there is no readout when the MULTI TRACE DLY control is out of detent position and the displayed time-base unit is in a repetitive sweep mode.

STORAGE SAVE READOUT MODES. When the storage system enters the SAVE mode, the operation of the readout system changes from that previously described under FREE RUN and GATED READOUT modes for the BISTABLE, VAR PERSIST, FAST BISTABLE, and FAST VAR PERSIST positions of the Storage mode switch. (Refer to the SAVE mode discussion, in this manual, for information on the SAVE mode operation.)

Save With Free Run Readout. With the READOUT GATED or FREE RUN switch set to FREE RUN and the Storage mode switch set to any one of the storage modes, the readout system turns off approximately 1 second after the storage system enters the SAVE mode.

Save With Gated Readout. With the READOUT GATED or FREE RUN switch set to GATED and the Storage mode switch set to BISTABLE or FAST BISTABLE, the readout is displayed for approximately 1 second after the storage system enters the SAVE mode, then it turns off; with the READOUT mode switch set to GATED and the Storage mode switch set to VAR PERSIST, 1 complete frame of readout is displayed at the end of the displayed sweep; with the READOUT mode switch set to GATED and the Storage mode switch set to FAST VAR PERSIST, 1 frame of readout is displayed at the end of the storage transfer cycle, or whenever the storage system enters the save mode and the MULTI TRACE DLY control is out of its detent position.

Reduced Scan Mode

The Reduced Scan mode increases the stored writing speed (in centimeters/microsecond). The calibrated graticule division size changes from 0.9 centimeters in the Full Scan mode to 0.45 centimeters in the Reduced Scan mode. Calibrated measurements are confined to the inner half-size 8 x 10 graticule area. The operation of the instrument controls do not change from their operation in the Full Scan mode.

Storage Display

The 7834 Storage Oscilloscope has four selectable storage modes. Listed in order of increasing writing speed, they are: BISTABLE, VARIABLE PERSISTENCE, FAST BISTABLE, and FAST VARIABLE PERSISTENCE. In each mode the viewed image is stored on the storage target located in the front of the crt.

In the BISTABLE mode the luminance of any point on the storage target will take on one of two discrete levels, either written or unwritten. In this mode, only the A or B INTENSITY controls affect the stored writing speed; writing speed is quite low but the stored view time is indefinitely long.

In the VAR PERSIST mode, points on the storage target can vary in luminance between totally dark and very bright. In this mode, writing speed is greater than in the BISTABLE mode, but the stored display is essentially unstable, or continuously fading away. The rate of fading is adjusted by the PERSISTENCE control. The VAR PERSIST storage mode is particularly useful for viewing high-speed repetitive signals with low repetition rates. The PERSISTENCE control can be adjusted in conjunction with the STORAGE LEVEL and INTENSITY controls, to produce a steady, bright trace. Writing speed is varied in this mode by the STORAGE LEVEL control as well as the crt INTENSITY controls. Maximum stored writing speed is achieved by setting the INTENSITY controls and the STORAGE LEVEL control fully clockwise.

The 7834 crt has a special high-speed target, known as the fast target, located just behind the storage target. The fast target has an extremely high writing speed but retains images for only a fraction of a second. For this reason images stored on the fast target are quickly and automatically transferred to the storage target; this operation is called transfer storage. Transfer storage can be used with the storage target operating in either bistable or variable persistence mode, resulting in the FAST BISTABLE and FAST VAR PERSIST modes.

In either of the FAST modes the writing speed is adjusted by the STORAGE LEVEL control, as well as the crt INTENSITY controls. Maximum stored writing speed in both FAST storage modes is attained by setting the STORAGE LEVEL and INTENSITY controls fully clockwise.

In all storage modes, an erase cycle removes any previous display from the storage target. This prepares the storage and fast targets (in the FAST storage modes) to receive the next waveform. Erase cycles are initiated by pressing the ERASE push button, grounding the rear panel REMOTE ERASE INPUT, or by rotating the AUTO ERASE control out of the OFF (detent) position. The AUTO ERASE control can be set to erase the storage display in 1- to 10-second intervals.

WARNING

Electric-shock hazard. Only qualified service personnel should internally modify the operation of the instrument.

Two modes of operation for the AUTO ERASE function are available, either Erase After Sweep or Periodic Erase (refer selection of either mode to qualified service personnel

only). The two modes differ in the following ways: The Erase After Sweep mode requires that the displayed time-base unit complete a sweep in order to initiate the delay interval prior to the erasure; the Periodic Erase mode repetitively erases independent of the displayed time-base operation.

Both time-base units and the readout system are inhibited during the erase cycle. Also during each erase cycle, the displayed time-base unit is reset if it is in single-sweep mode. (The other time base will also be reset at this time if it is also in single-sweep mode.) In the BISTABLE and VAR PERSIST storage modes, the erase cycle takes approximately 0.9 second; in the FAST BISTABLE and FAST VAR PERSIST modes, the erase cycle takes approximately 1.4 seconds. The additional time is required for preparing the fast target.

In all storage modes the time-base unit(s) is free to run immediately following an erase cycle. However, in FAST BISTABLE or FAST VARIABLE PERSISTENCE storage modes, the time-base unit(s) is locked out immediately after the first sweep occurs, so that transfer can occur. (In the ALT or CHOP horizontal modes, both time-base units are allowed to run once before transfer occurs.) If the time-base unit(s) is set for single-sweep operation, it remains locked out indefinitely after transfer occurs. The operator can initiate a cycle, however, called the multi-trace cycle, which causes another trace to be stored without erasing the initial display. This is accomplished by pressing the single-sweep-reset button on the time-base unit(s), or by grounding the REMOTE RESET INPUT on the 7834 rear panel. When this is done the storage system initiates a cycle, lasting approximately 600 milliseconds, which prepares the fast target to store another display and sends an additional single-sweep-reset command to the time-base unit(s). After the multi-trace cycle, the time-base unit(s) can again sweep once, after which it is again locked out and the transfer function occurs.

When the time-base unit(s) is operated in other than a single-sweep mode, the multi-trace cycle is controlled by the MULTI TRACE DLY control. If the MULTI TRACE DLY control is set to its detent position, operation is as previously described for the single-sweep mode. If the MULTI TRACE DLY control is out of the detent position, the multi-trace cycle is triggered automatically following the transfer cycle. The length of the cycle can be varied by the MULTI TRACE DLY control over a range from approximately 600 milliseconds to more than 4 seconds.

SAVE MODE. The SAVE mode can be entered from any storage mode by pressing the SAVE button or by grounding the rear-panel REMOTE SAVE INPUT. The indicator next to the SAVE push button switch illuminates when the

SAVE mode is activated. When in the SAVE mode, the time-base unit(s) and readout system are inhibited and the display cannot be erased. The SAVE INTENSITY control adjusts the intensity of the saved display. Minimum intensity provides the greatest viewing time in the VAR PERSIST and FAST VAR PERSIST modes; and although the view time of the BISTABLE and FAST BISTABLE storage modes is very long without the use of the SAVE mode, the SAVE mode simplifies photography by allowing the operator to control the stored display's intensity.

The SAVE mode can be selected with or without a stored display present. If it is selected after an erase cycle and before a sweep has occurred (no stored display), then the display waits in the STORE mode until a sweep occurs, at which time the display automatically enters the SAVE mode. (This is referred to as the Auto Save mode.)

Care of Storage Screen

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

1. Use minimum beam intensity to produce a clear, well-defined display.
2. Use minimum SAVE INTENSITY when storing images for extended periods of time.
3. Avoid repeated use of the same area of the screen. If a particular display is to be stored repeatedly, change the vertical position occasionally to use other portions of the display area.

Vertical and Horizontal Mode Combinations

There are 20 possible combinations of VERTICAL MODE and HORIZONTAL MODE switch settings. The total possible number of display combinations is further multiplied by the variety of plug-in units available for use with this instrument, the interchangeability of plug-ins (i.e., either an amplifier or a time-base unit can be installed in any compartment), and by the capabilities of the plug-in units which are used in the instrument (e.g., a dual-trace amplifier unit can be used in either of the two single-channel modes, in the dual-trace mode or added-algebraically mode; a delaying time base may be used either for a sweep or for delayed sweep). Therefore, it is difficult to list all of the display combinations which can occur during use of the 7834 and available plug-in units. Table 2-1 lists the combination of VERTICAL MODE and HORIZONTAL MODE switch positions available and the type of display obtained with each combination.

TABLE 2-1
Display Combinations¹

Vertical Mode	Horizontal Mode	Comments
LEFT	A or B	One trace. Vertical deflection from single unit; horizontal deflection from single unit.
	ALT or CHOP	Two traces. Vertical deflection from single unit; horizontal deflection from both units.
ALT	A or B	Two traces. Vertical deflection from both units; horizontal deflection from single unit.
	ALT or CHOP	Two traces. Vertical deflection from both units; horizontal deflection from both units. Independent-pairs (sweep slaving) operation, see Alternate Mode discussion in this section.
ADD	A or B	One trace. Vertical deflection shows algebraic summation of signals from both units; horizontal deflection from single unit.
	ALT or CHOP	Two traces. Vertical deflection shows algebraic summation of signals from both units; horizontal deflection from both horizontal compartments.
CHOP	A or B	Two traces. Vertical deflection shows signals from both units; horizontal deflection from single unit.
	ALT or CHOP	Four traces. Vertical deflection shows signals from both units; horizontal deflection from both units.
RIGHT	A or B	One trace. Vertical deflection shows signal from single unit; horizontal deflection from single unit.
	ALT or CHOP	Two traces. Vertical deflection shows signal from single unit; horizontal deflection from both units.

¹ Combinations given for single-channel vertical and horizontal units only.

VERTICAL MODES. When the LEFT or RIGHT button of the VERTICAL MODE switch is pressed, only the signal from the plug-in unit in the selected compartment is displayed.

Alternate Mode. The ALT position of the VERTICAL MODE switch produces a display which alternates between the LEFT VERT and RIGHT VERT compartments with each sweep of the crt. Although the ALT mode can be used at all sweep rates, the CHOP mode provides a more satisfactory display at sweep rates below about 20 milliseconds/division. At these slower sweep rates, alternate-mode switching becomes perceptible.

Alternate Mode displays have three types of triggering available. When the A and B TRIGGER SOURCE switches are set to the VERT MODE positions, each sweep is triggered by the signal being displayed on the crt. This provides a stable display of two unrelated signals, but does not indicate the time relationship between the signals. In either the LEFT VERT or the RIGHT VERT positions of the TRIGGER SOURCE switches, the two signals are displayed showing true time relationship. However, if the signals are not time related, the display from the plug-in that is not providing a trigger signal will be unstable on the crt.

When the ALT vertical mode is selected and either the ALT or CHOP button of the HORIZONTAL MODE switch is selected, the instrument operates in the independent-pairs mode. Under this condition, the signal from the LEFT VERT unit is always displayed at the sweep rate of the B HORIZ time-base unit, and the signal from the RIGHT VERT unit is displayed at the sweep rate of the A HORIZ time-base unit (non-delayed sweep only). This results in two displays that are completely independent as to vertical deflection and sweep rate. This display is equivalent to the display obtainable with a dual-beam oscilloscope for most repetitive-display combinations.

If delayed-sweep operation is used with this Mode, a different sequence is displayed. First, the LEFT VERT unit signal is displayed at the sweep rate of the A HORIZ time-base unit (delaying sweep) and then at the sweep rate of the B HORIZ time-base unit (delayed sweep). The vertical display then shifts to the RIGHT VERT unit and its signal is displayed consecutively at the delaying and delayed sweep rates.

Chopped Mode. The CHOP position of the VERTICAL MODE switch produces a display which is electronically switched between channels at about a one-megahertz rate. In general, the CHOP mode provides the best display at sweep rates slower than about 20 milliseconds/division or

whenever dual-trace, single-shot phenomena are to be displayed. At faster sweep rates the chopped switching becomes apparent and may interfere with the display.

When the A or B TRIGGER SOURCE switches are set to VERT MODE, internal trigger signals from the vertical plug-ins are algebraically added and the time-base units are triggered from the resultant signal. The LEFT VERT or RIGHT VERT trigger-source positions provide trigger signals to the time-base units on the internal trigger signal from the selected vertical unit only. This allows two time-related signals to be displayed showing true time relationship. (If the signals are not time-related, the display from the channel that is not providing the trigger signal will appear unstable.)

The CHOP mode can be used to compare two single-shot, transient, or random signals that occur within the time interval determined by the time-base unit (ten times selected sweep rate). To provide correct triggering, the displayed signal which provides the trigger signal must precede the second display in time. Since the signals show true time relationship, time-difference measurements can be made from the display.

Algebraic Addition. The ADD position of the VERTICAL MODE switch can be used (1) to display the sum or difference of two signals, (2) for common-mode rejection to remove an undesired signal, or (3) for dc offset (applying a dc voltage to one channel to offset the dc component of a signal on the other channel). The common-mode rejection ratio between the vertical plug-in compartments is at least 100:1 from dc to 150 megahertz. The rejection ratio decreases to 30:1 from 150 to 400 megahertz.

The overall deflection on the crt in the ADD mode is the algebraic sum of the signals from the two vertical plug-in units. It is difficult to determine the voltage amplitude of the resultant display unless the amplitude of the signal applied to one of the plug-ins is known. This is particularly true when the vertical units are set to different deflection factors, since it is not obvious which portion of the display results from the signal applied to a given plug-in unit. The polarity and repetition rate of the applied signals will also affect the ADD display.

The following precautions should be observed when using the ADD mode:

1. Do not exceed the input-voltage ratings of the plug-in units.

2. Do not apply large signals to the plug-in inputs. A good rule is to not apply a signal of more than about eight times the vertical deflection factor. For example, with a vertical deflection factor of 0.5 volt/division, the voltage applied to that plug-in should not exceed four volts. Larger voltages may result in a distorted display.

3. To ensure the greatest dynamic range in the ADD mode, set the position controls of the plug-in units to a setting which would result in a mid-screen display if viewed in the LEFT or RIGHT positions of the VERTICAL MODE switch.

4. For similar response from each channel, use identical plug-ins and set the plug-in units for the same type of input or coupling mode.

HORIZONTAL MODES. When either the A or B button of the HORIZONTAL MODE switch is pressed, the signal is displayed at the sweep rate of the selected time-base unit. Set the applicable intensity control and trigger-source switch for the desired display.

Alternate Mode. The ALT position of the HORIZONTAL MODE switch provides crt sweeps derived alternately from the two time-base units. Although the ALT horizontal mode can be used at all sweep rates, the CHOP mode provides a more satisfactory display at sweep rates below about 20 milliseconds/division. At slower sweep rates, the switching between the alternate-mode traces becomes apparent and may interfere with correct analysis of the display.

NOTE

This instrument will not operate in the ALT position of the HORIZONTAL MODE switch if either horizontal plug-in compartment is left vacant.

The A and B INTENSITY controls allow individual adjustment of the traces produced by the time-base units in the A HORIZ and B HORIZ compartments. Correct triggering of both time-base units is essential in obtaining the correct display in the ALT horizontal mode. If either of the time-base units does not receive a correct trigger, and therefore does not produce a sweep, the other unit cannot produce a sweep either. This means that one time-base unit cannot begin its sweep until the previous unit has completed its entire display. This can be avoided if the time-base units are set for auto-mode triggering (sweep free runs if not correctly triggered). See Trigger Source for operation of the A and B TRIGGER SOURCE switches. Also, see

Vertical Trace Separation for information on positioning the B HORIZ display when in the ALT dual-sweep mode.

Chopped Mode. When the CHOP button of the HORIZONTAL MODE switch is pressed, the display is electronically switched between the two time-base units at about a 200 kilohertz rate. In general, the CHOP horizontal mode provides the best display when either of the time-base units is set to a sweep rate slower than about 20 milliseconds/division. It also provides the best display when the two time-base units are set to widely differing sweep rates. In the CHOP horizontal mode, equal time segments are displayed from each of the time-base units. This provides a display which does not change greatly, in intensity, as the sweep rate of either time-base unit is reduced (in contrast to ALT horizontal mode operation where the slowest trace tends to be the brightest).

The A and B INTENSITY controls allow individual adjustment of the intensity of the traces produced by the time-base units in the A HORIZ and B HORIZ compartments. Triggering is not as critical in the CHOP horizontal mode as in ALT; if one of the units is not triggered properly, only the trace from the untriggered time-base unit is missing from the display. The other trace is presented in the normal manner. See Trigger Source and Vertical Trace Separation for information on positioning the trace produced by the B HORIZ unit in relation to the trace from the A HORIZ unit.

Horizontal Selection. The Horizontal Selector switch provides the means to override the HORIZONTAL MODE switch in selecting the horizontal compartment for deflection. The Horizontal Selector switch has three positions (Normal, A, and B). In Normal the operation of the HORIZONTAL MODE switch is unchanged. In A or B the plug-in compartment selected by the Horizontal Selector switch provides the signal for horizontal deflection. The plug-in compartment selected by the HORIZONTAL MODE switch provides the other control signals, such as unblanking, storage control, etc.

The Horizontal Selector switch provides a convenient method of storing X-Y displays using the FAST BISTABLE or FAST VAR PERSIST storage modes. These storage modes require control signals, provided by a time-base unit or an external input signal (see REMOTE STORAGE GATE INPUT), to develop a stored display. For X-Y storage, the Horizontal Selector switch can be set to display the signal from an amplifier unit installed in one of the horizontal compartments. The HORIZONTAL MODE switch can select the other plug-in compartment, with a time-base unit installed, allowing the storage circuitry and crt unblanking to be controlled by the time-base unit while the horizontal deflection is provided by the amplifier unit.

Vertical Trace Separation

When one of the dual-sweep horizontal modes is selected, the VERT TRACE SEPARATION (B) control allows the trace produced by the B HORIZ sweep to be positioned above or below the trace produced by the A HORIZ sweep. To use the control, first position the trace produced by the A HORIZ plug-in unit. Then adjust the VERT TRACE SEPARATION (B) control to move the trace produced by the B HORIZ plug-in unit away from the A HORIZ display. If both waveforms are larger than four divisions in amplitude, the displays can only be positioned so they do not directly overlap since each waveform cannot be positioned to a unique area of the crt.

Trigger Source

The A and B TRIGGER SOURCE switches select the internal trigger signals for the A HORIZ and B HORIZ time-base units. For most applications, these switches can be left in the VERT MODE position. This position is the most convenient since the internal trigger signal is automatically switched as the VERTICAL MODE switch is changed or as the display is electronically switched between the LEFT VERT and RIGHT VERT plug-ins, in the ALT position of the VERTICAL MODE switch. It also provides a usable trigger signal in the ADD or CHOP positions of the VERTICAL MODE switch, since the internal trigger signal in these modes is the algebraic sum of the signals applied to the vertical plug-in units. Therefore, the VERT MODE position ensures that the time-base units receive a trigger signal regardless of the VERTICAL MODE switch setting without the need to change the trigger source selection.

If correct triggering for the desired display is not obtained in the VERT MODE position, the trigger source for either the A HORIZ or B HORIZ time-base unit can be changed to obtain the trigger signal from either the LEFT VERT or RIGHT VERT plug-in. The internal trigger signal is obtained from the selected vertical compartment whether the plug-in in that compartment is selected for display on the crt or not. If the internal trigger signal is obtained from one of the vertical units but the other vertical unit is selected for display, the internal trigger signal must be time-related to the displayed signal in order to obtain a triggered (stable) display.

Calibrator Output

The CALIBRATOR provides a convenient signal for checking basic vertical gain and sweep timing. The calibrator signal is also very useful for adjusting probe compensation as described in probe instruction manuals. In addition, the calibrator can be used as a convenient signal source for application to external equipment.

VOLTAGE. The CALIBRATOR provides accurate output voltages of 40 millivolts, 0.4 volt, and 4 volts into high

impedance loads. In addition, it provides 4 millivolts, 40 millivolts, and 0.4 volt into 50-ohm loads.

CURRENT. The optional current loop accessory provides a 40-milliampere output current (the CALIBRATOR must be set for 4 volt output), which can be used to check and calibrate current-measuring probe systems. The current signal is obtained by clipping the probe around the current loop.

REPETITION RATE. The repetition rate of the CALIBRATOR is 1 kilohertz. The calibrator circuit uses frequency-stable components to maintain accurate frequency and a constant duty factor. Thus, the CALIBRATOR can be used for checking the basic sweep timing of time-base units (1-kilohertz rate only).

WAVE SHAPE. The square-wave output signal of the CALIBRATOR can be used as a reference wave shape when checking or adjusting the compensation of passive, high-resistance probes. The square-wave output from the CALIBRATOR has a flat top; any distortion in the displayed waveform is due to the probe compensation.

Signal Outputs

+ **SAWTOOTH OUT.** The + SAWTOOTH OUT connector provides a positive-going sawtooth signal derived from the time-base unit installed in the A HORIZ compartment or from the time-base unit installed in the B HORIZ compartment.

WARNING

Electric-shock hazard present. Only qualified service personnel should internally modify the operation of the instrument.

It is possible to select either the A HORIZ or the B HORIZ compartment as the source of the + SAWTOOTH output signal. Refer such selection to qualified service personnel only. The unit of time for the sawtooth output is determined by the setting of the time-base-unit Time/Division switch. Refer to Table 1-4, in the General Information section, for signal parameters.

+ **GATE OUT.**

WARNING

Electric shock hazard present. Only qualified service personnel should internally modify the operation of the instrument.

The + GATE OUT connector provides a positive-going rectangular pulse which is derived from a time-base unit installed in either horizontal plug-in compartment. The + GATE OUT signal can be selected from the time-base unit installed in the A HORIZ compartment or B HORIZ compartment. Refer such selection to qualified service personnel only. The duration of the + GATE OUT signal is the same as the duration of the respective sweep or, in the case of the delayed gate, it starts at the end of the delay period and lasts until the end of the sweep from the delaying time-base unit. Amplitude of the output signal at the + GATE OUT connector is about 0.5 volt into 50 ohms or about 10 volts into 1 megohm.

VERTICAL SIGNAL. The VERT SIG OUT connector provides a sample of the vertical deflection signal. The source of the output signal at this connector is determined by the A TRIGGER SOURCE switch. In the VERT MODE position of the A TRIGGER SOURCE switch, the output signal is determined by the setting of the VERTICAL MODE switch. The output signal in the LEFT and RIGHT positions of the VERTICAL MODE switch is obtained only from the selected vertical unit. In the ALT position of the VERTICAL MODE switch, the output signal at the VERT SIG OUT connector switches between signals from the two vertical units, along with the crt display. However, the vertical output signal in the CHOP position is a composite signal and is the same as that obtained in the ADD position due to the requirements of the triggering system. The LEFT VERT and RIGHT VERT positions of the A TRIGGER SOURCE switch are independent of the selection of the VERTICAL MODE switch and provide the vertical output signal only from the selected vertical unit even when it is not selected for display.

The output voltage into a 50 ohm load is about 25 millivolts/division of crt display and about 0.5 volt/division of display into a 1 megohm load. The output signal frequencies are determined by the vertical plug-in unit used (see Systems Specification in the General Information section).

PROBE POWER. The two PROBE POWER connectors on the rear panel of this instrument provide operating power for active probe systems. It is not recommended that these connectors be used as a power source for applications other than the compatible probes or other accessories which are specifically designed for use with this system. (Option 1 deletes these PROBE POWER connectors from the instrument).

Display Photography

A permanent record of the crt display can be obtained with an oscilloscope camera system. The instruction manual for the Tektronix Oscilloscope Cameras includes complete instructions for obtaining waveform photographs.

The crt bezel provides integral mounting for Tektronix Oscilloscope Cameras. The three pins located on the left side of the crt bezel connect power to compatible camera systems. Control signals are also received from Tektronix automatic cameras to allow camera-controlled single-shot photography (see camera manual for further information).

If the readout portion of the display is to be included on waveform photographs, the following suggestions will aid in obtaining good photographs.

1. Focus the oscilloscope display and the camera on the readout portion of the crt display. The auto-focus feature in this instrument will maintain the traces at optimum focus.
2. Set the READOUT intensity control for the minimum setting that allows the characters to be written. This normally occurs at a slightly lower intensity level than is necessary for complete writing of the waveform display. Some experimentation may be necessary to establish the correct level. Too high a setting of the READOUT intensity control will result in a broad, poorly defined photograph of the readout display.
3. If single-shot photography is used, set the READOUT FREE RUN or GATED switch to the GATED position (see Readout Display for complete operating information). Then, the readout is displayed in a single-shot manner after the trace is complete (be sure the camera shutter remains open at least 0.5 second after the sweep is completed to photograph the entire readout). Also, set the GRAT ILLUM control counterclockwise while the trace is being photographed. Then, the graticule can be photographed later to produce a double-exposed picture showing the complete information.

Intensity Modulation

Intensity (Z-axis) modulation can be used to relate a third item of electrical phenomena to the vertical (Y-axis) and the horizontal (X-axis) coordinates without affecting the waveshape of the displayed signal. This is accomplished by changing the intensity of the displayed waveform to provide a "gray scale" display.

The voltage amplitude required for visible trace modulation depends on the setting of the A and B INTENSITY controls. A two-volt peak-to-peak signal will completely blank the display even at maximum intensity levels; lower amplitude signals can be used to change only the relative trace brightness. Negative-going signals increase the display intensity and positive-going signals decrease the display intensity.

Refer to Table 1-4 in the General Information section for specifications on Z-axis signal requirements.

Time markers applied to the Z-AXIS INPUT provide a direct time reference on the display. With uncalibrated horizontal sweep or X-Y mode operation, the time markers provide a means of reading time directly from the display. If the markers are not time-related to the displayed waveform, use a single-sweep display.

Remote Input Signals

The signal source requirements to operate the remote input functions on the rear panel can be either active (pulse generator, logic circuit, etc.) or passive (switch or relay). Refer to Table 1-4, in the General Information section for specific parameters on each input.

REMOTE RESET INPUT. An external single-sweep-reset signal can be applied to time-base units installed in the horizontal plug-in compartments through the rear-panel REMOTE RESET INPUT connector. This remote reset function is a duplication of the manually-operated single sweep reset function (push button) located on the front panel of the 7B-Series time-base units.

REMOTE ERASE INPUT. The storage screen can be erased by applying a signal to the REMOTE ERASE INPUT. However, if the SAVE mode is being used the stored display cannot be erased by either front-panel erase controls or the rear-panel REMOTE ERASE INPUT signal.

REMOTE SAVE INPUT. The SAVE storage mode can be entered into by applying a signal to the REMOTE SAVE INPUT connector. The SAVE mode prevents accidental erasure and/or additional storage of the stored display.

REMOTE STORAGE GATE INPUT. The FAST BI-STABLE and FAST VAR PERSIST storage modes can be externally controlled by applying a gate signal to the REMOTE STORAGE GATE INPUT. The positive-going transition of the gate enables the transfer storage mesh to retain the display. The negative-going transition transfers the display stored on the transfer storage mesh to the storage screen (the display is not visible until transferred to the storage screen). However, if the displayed sweep starts before the positive transition of the remote storage gate the transfer storage mesh is enabled at the start of the displayed sweep. Then, the display stored on the transfer storage mesh will not be transferred until the displayed sweep has ended and the negative transition of the remote storage gate occurs.

APPLICATIONS

The 7834 Oscilloscope and its associated plug-in units provide a flexible measurement system. The capabilities of the overall system depend mainly upon the plug-in units selected for use with this instrument. Specific applications for the individual plug-in units are described in the plug-in unit instruction manuals. The overall system can also be used for many applications which are not described in detail, either in this manual or in the manuals for the individual plug-in units. Contact your Tektronix Field Office or representative for assistance in making specific measurements with this instrument.

The following books describe oscilloscope measurement techniques which can be adapted for use with this instrument:

John D. Lenk, "Handbook of Oscilloscopes, Theory, and Application", Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1968.

J. Czech, "Oscilloscope Measuring Techniques", Springer-Verlag, New York, 1965.

J. F. Golding, "Measuring Oscilloscopes", Transatlantic Arts, Inc., 1971.

Charles H. Roth, Jr., "Use of the Oscilloscope", programmed text, Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1970.

Vertical Amplifier Plug-In Units

All 7A-Series plug-in units (except the 7A21N unit) can be used with the 7834. Bandwidth and sensitivity ranges should be taken into consideration when selecting amplifier plug-in units.

SINGLE-TRACE. Any single-channel amplifier will display a signal, with the sweep provided by any 7B-Series time-base plug-in. This combination leaves two unused compartments available for other special purpose units. Blank plug-in panels are available to cover any unfilled plug-in compartments.

DUAL-TRACE. A dual-channel amplifier in either vertical compartment can display two separate signals with the other vertical compartment free for other uses.

THREE-TRACE. A dual-channel amplifier can be used with any single-channel amplifier to display three separate signals. If two time-base plug-in units are used in the horizontal compartments, two signals can be displayed at one sweep rate while the other signal is displayed at the other sweep rate.

FOUR-TRACE. Two dual-channel amplifiers can display four separate signals. If one time-base unit is used, all four signals will be displayed at the same sweep rate.

Time-Base Plug-In Units

The 7834 is compatible with time-base units of the 7B70, 7B80 and 7B90 Series. Sweep rates and triggering ranges should be taken into consideration when selecting time-base plug-in units.

To obtain a delayed-sweep display, a delaying time-base unit must be installed in the A HORIZ compartment and a delayed time-base unit installed in the B HORIZ compartment. A delayed-sweep display can also be obtained with one horizontal plug-in unit in either horizontal compartment if a dual time-base unit is used. This leaves the other horizontal compartment available for other plug-in units as suggested later in this section.

The 7B50-Series time-base units are not recommended for use with this instrument because they require a longer delay line than is used in the 7834. Therefore, the triggering event may not appear on the display.

Sampling Displays

Sampling-system plug-in units for the 7000-Series oscilloscopes provide displays of fast-changing signals that cannot be examined using any other method. For example, sampling systems available for the 7834 can resolve repetitive signals having less than 10 millivolts of peak amplitude and occurring in less than 1 nanosecond.

The technique used for sampling is very similar in principle to the use of stroboscopic light to study fast motion. Samples of successive waveforms are taken, amplified by a relatively low-bandwidth amplifier, and then displayed on the crt as a replica of the sampled waveforms.

Three sampling systems are available at this time for the 7834: (1) the 7S12, which provides time-domain-reflectometry displays for general-purpose measurements, (2) the 7S11/7T11 system and (3) the 7S14, a dual-channel vertical sampling system, including main and delayed sweep functions. See the Tektronix Products catalog to determine the characteristics of the individual units mentioned and of additional units made available after this manual is published.

SINGLE-TRACE SAMPLING. A single-trace sampling display requires either a double-width 7S12 (which includes a time-base), or the 7S11 sampling unit and the 7T11 sampling sweep unit. Direct interconnections between the

7S11 and the 7T11 require these units to be adjacent, with the 7S11 in the RIGHT VERT compartment and the 7T11 in the A HORIZ compartment. If either the 7S12 or the 7S14 is used, it must be located in the middle two compartments to make the proper connections with the 7834.

DUAL-TRACE SAMPLING. Two 7S11's can be used with a single sampling time-base unit for time-related displays of two signals. Direct interconnections from the LEFT VERT 7S11 pass through the RIGHT VERT 7S11 to reach the A HORIZ time-base unit.

The 7S14 is a dual-channel sampling unit with delaying sweep capability. It must be used in the middle two plug-in compartments.

Dual-trace sampling displays can also be made by a 7S12 in the middle two compartments and a 7S11 in the LEFT VERT compartment. In this application, the 7S12 supplies the time-base for both traces.

X-Y SAMPLING. One 7S11 inserted in the RIGHT VERT compartment and one in the adjacent A HORIZ compartment automatically share a 50 kilohertz free-running strobe condition specified for X-Y displays. The 7S14 has an X-Y operation incorporated as one of its normal mode functions.

Special Purpose Plug-In Units

The variety of special-purpose plug-in units available allows the 7834 Oscilloscope to be used for many specialized applications. The following is a brief discussion of some of the available special-purpose plug-in units.

DIGITAL COUNTERS AND MULTIMETER PLUG-IN UNITS. The digital-multimeter plug-in units measure current, voltage, temperature, and resistance; digital-frequency-counter plug-in units measure frequency, from dc to above 500 MHz. These units make use of the readout system to display the measured information on the crt and can function in any compartment, in combination with each other or with any other plug-in units available for use with the 7834 oscilloscope system.

The ability of digital readout plug-in units to operate with other plug-in units makes it possible to process and monitor signals at the same time the digital measurement is being made. For example, by locating a frequency counter in one of the vertical compartments and an amplifier unit in the other vertical compartment, the crt can display the trigger waveform, superimposed on the displayed signal, to indicate the actual triggering point. Or, if the counter is placed in a horizontal compartment, a low-amplitude signal

can be applied to a vertical amplifier and amplified before it is internally routed by the trigger source switches to the counter trigger circuit. This allows the unit to be used on signals too small to trigger other counters.

READOUT ACCESS PLUG-IN UNIT. The 7M13 READ-OUT plug-in unit provides front-panel keyboard operation for convenient access to the crt readout characters. This allows information, such as dates and identifying nomenclature, to be displayed on the crt with the normal crt display. This capability is particularly useful when making photographs.

TRANSISTOR CURVE-TRACER PLUG-IN UNITS. The 7000-Series transistor curve-tracer plug-in checks small-signal transistors and diodes by producing a display showing the basic characteristic curves for the device being tested. Stepped sweep signals from an internal power supply are applied to the device under test. The resulting output signals are, in turn, applied to the horizontal and vertical deflection systems of the oscilloscope to plot a family of characteristic curves. This plot can be used to check for damaged transistors and diodes, or to select for special or matched characteristics and to calculate gain, leakage, breakdown voltage, etc.

SPECTRUM ANALYZER PLUG-IN UNITS. The 7000-Series spectrum analyzer plug-in units display applied-signal amplitudes dispersed over portions of the rf spectrum. Absolute signal energy is plotted on the vertical axis against frequency on the horizontal axis. Applications include waveform and distortion analysis, EMC and random noise measurements, filter design, spectrum surveillance, etc.

X-Y Operation

In some applications, it is desirable to display one signal versus another (X-Y) rather than against time (internal sweep). The flexibility of the amplifier plug-in units available for use with the 7834 provide the means of applying external signals to the horizontal-deflection system.

Installation of a 7A-Series amplifier plug-in unit in one of the horizontal and one of the vertical compartments provides X-Y operation. For further information, refer to the horizontal specifications in this manual and to the individual instruction manuals for the amplifier units.

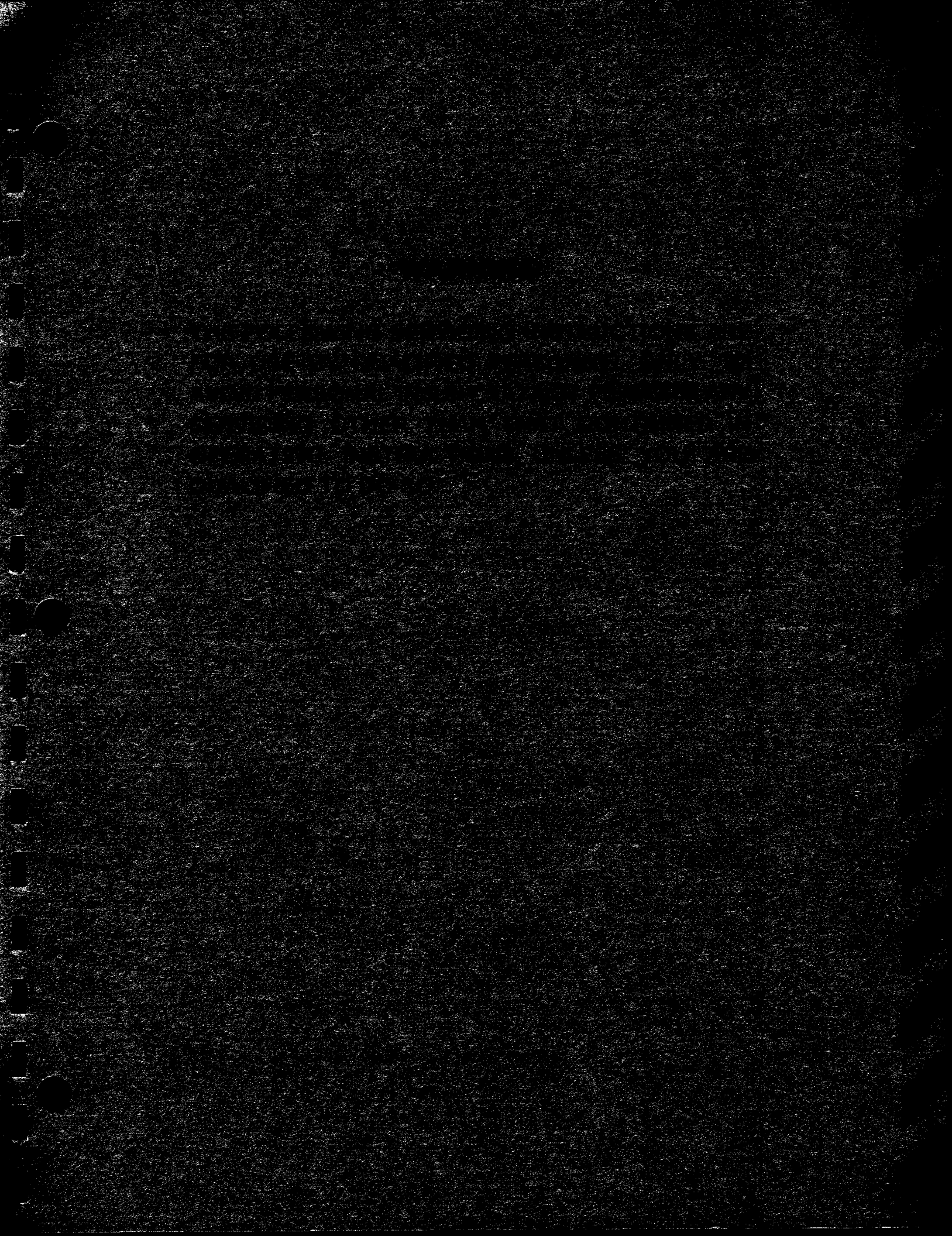
Some of the 7B-Series time-base units can be operated as amplifiers in addition to their normal uses as time-base generators. This feature allows an external signal to provide the horizontal deflection to the crt. For most of the time-base units with the amplifier function, the X (horizontal) deflection signal can be connected either to an external input connector on the time-base unit, or it can be routed to the time-base unit through the internal triggering system (see time-base instruction manual for details). If the latter method is used, the A and B TRIG SOURCE switches must be set so that the X (horizontal) deflection signal is obtained from one of the vertical amplifier units and Y (vertical) deflection signal is obtained from the other vertical unit. The attenuator switch on the amplifier unit can provide the horizontal with a preconditioned signal, compatible with the horizontal deflection factor. Also, plug-in units need not be moved from one compartment to another to change from X-Y operation to other modes of operation.

Raster Displays

A raster-type display can be used effectively to increase the apparent sweep length. For this type of display, the trace is deflected both vertically and horizontally by sawtooth signals. This is accomplished in the 7834 by installing a 7B-Series time-base unit in one of the vertical plug-in compartments. Normally, the time-base unit in the vertical compartment should be set at a slower sweep rate than the time-base unit in the horizontal compartment; the number of horizontal traces in the raster depends upon the ratio between the two sweep rates.

Information can be displayed on the raster using several different methods. In the ADD position of the VERTICAL MODE switch, the signal from an amplifier unit can be algebraically added to the vertical waveform. With this method, the vertical signal amplitude on the crt should not exceed the distance between the horizontal lines of the raster. Another method of displaying information on the raster is to use the Z-AXIS INPUT to provide intensity modulation for the display. This type of raster display could be used to provide a television-type display. Complete information on operation using the Z-axis feature is given under Intensity Modulation.

To provide a stable raster display, both time-base units must be correctly triggered. Internal triggering is not provided for the time-base units when they are in the vertical compartments; external triggering must be used. Also, blanking is not provided from the time-base units when they are installed in a vertical compartment.



THEORY OF OPERATION

This section describes the circuitry used in the 7834 Storage Oscilloscope. The description begins with a discussion of the instrument, using the block diagram shown in Figure 3-1. Next, each circuit is described in detail with supporting illustrations, when appropriate, to show the relationship between the stages in each major circuit. Detailed schematics of each circuit are located in the Diagrams section at the rear of this manual. Refer to these schematics throughout the following circuit description for specific electrical values and relationships.

BLOCK DIAGRAM

The following discussion is provided to aid in understanding the overall concept of the 7834 before the individual circuits are discussed in detail. A basic block diagram of the 7834 is shown in Figure 3-1. Only the basic interconnections between the individual blocks are shown on this diagram. Each major circuit within the instrument is given a block. The number of each block refers to the complete circuit diagram located at the rear of this manual.

DESCRIPTION

Vertical signals to be displayed on the crt are applied to the Vertical Interface circuit from both vertical plug-in compartments. The VERTICAL MODE switch determines whether the signals from the LEFT VERT or RIGHT VERT compartments are displayed on the crt. The selected vertical signal(s) are amplified by the Vertical Amplifier circuits to bring them to the level necessary to drive the vertical deflection plates of the crt (cathode-ray tube). The Vertical Amplifier circuit also includes an input from the Readout System to produce the vertical portion of the alphanumeric readout display.

Horizontal signals for display on the crt are connected to the Horizontal Interface circuit from both horizontal plug-in compartments. The HORIZONTAL MODE switch determines whether the signals from the A HORIZ or B HORIZ units are displayed by the crt. The selected horizontal signal(s) are amplified by the Horizontal Amplifier circuit to provide horizontal deflection of the crt. The Horizontal Amplifier circuit also accepts an input signal from the Readout System to produce the horizontal portion of the alphanumeric readout display.

The Readout System provides an alphanumeric display of information encoded by the plug-in units. The readout display is written on the crt on a time-shared basis with the analog waveform display. The Mode Switch circuits determine which plug-in units display readout information.

The internal trigger signals from the vertical plug-in units are connected to the Trigger Selector circuits. The Mode Switch and Trigger Selector circuits direct trigger signals from the LEFT VERT or RIGHT VERT units to the A HORIZ or B HORIZ units.

The Logic circuit develops control signals for use in other circuits within this instrument and the plug-in units. These control signals automatically determine the correct instrument operation in relation to the plug-in units, plug-in unit control settings, and the 7834 control settings.

The CRT Circuit contains the control circuits necessary for operation of the crt. The Z-Axis Amplifier provides the drive signal to control the intensity level of the crt display.

The Calibrator circuit produces a 1 kilohertz square-wave signal which can be used to check the calibration of this instrument and the compensation of probes. The calibrator signal is available as a voltage at the CALIBRATOR connector or as a current through a 40 milliamperere optional current loop accessory.

The Output Signals circuit process signals from the plug-in units for rear-panel output.

The Storage Display and Storage Control circuits produce the timing signals and control voltages required to operate the storage functions of the crt.

The Converter/Rectifiers and Low-Voltage Regulator circuits provide the power necessary to operate this instrument. These voltages are connected to all circuits within the instrument. The CRT Circuit contains a high-voltage power supply that provides accelerating potential for the crt.

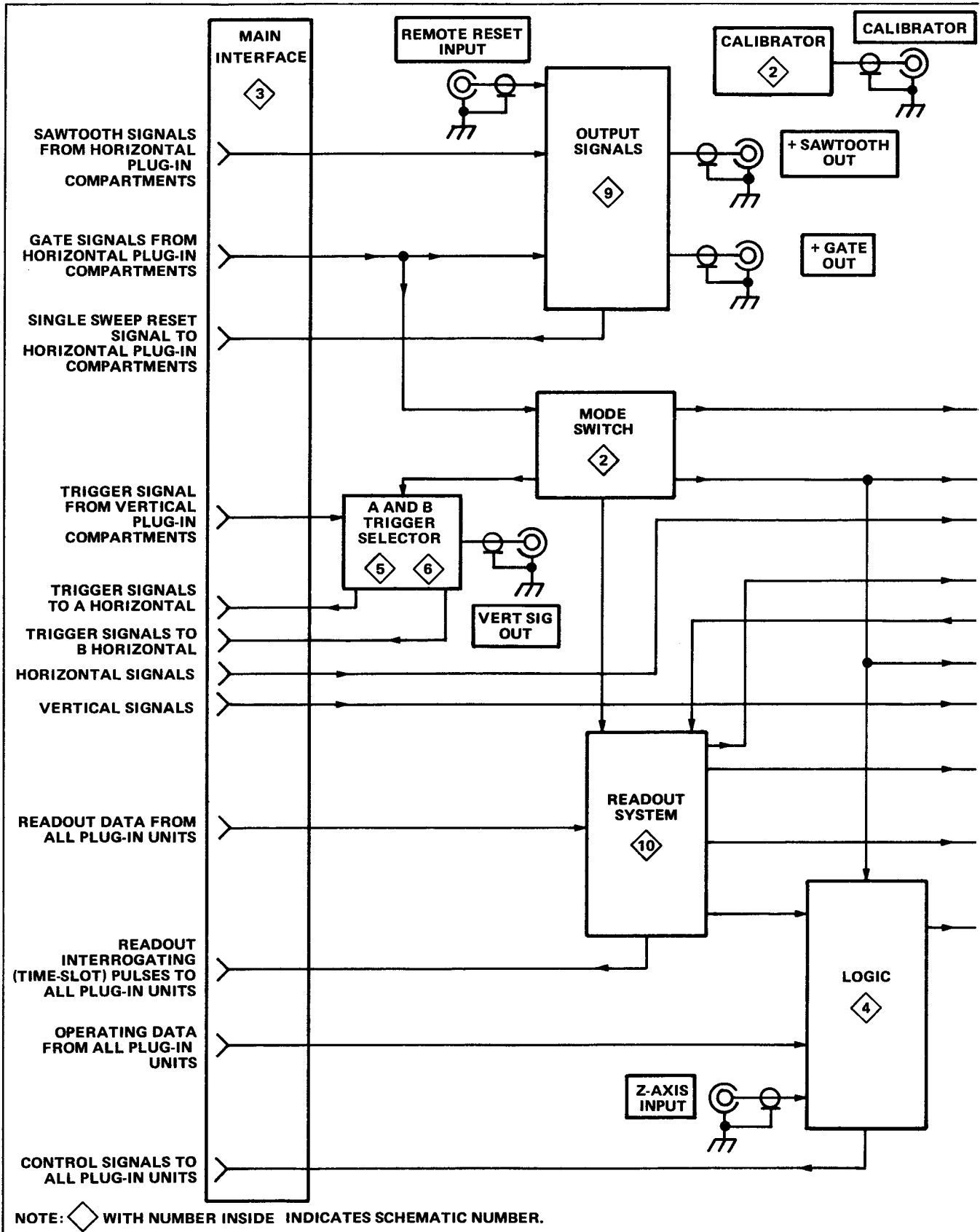
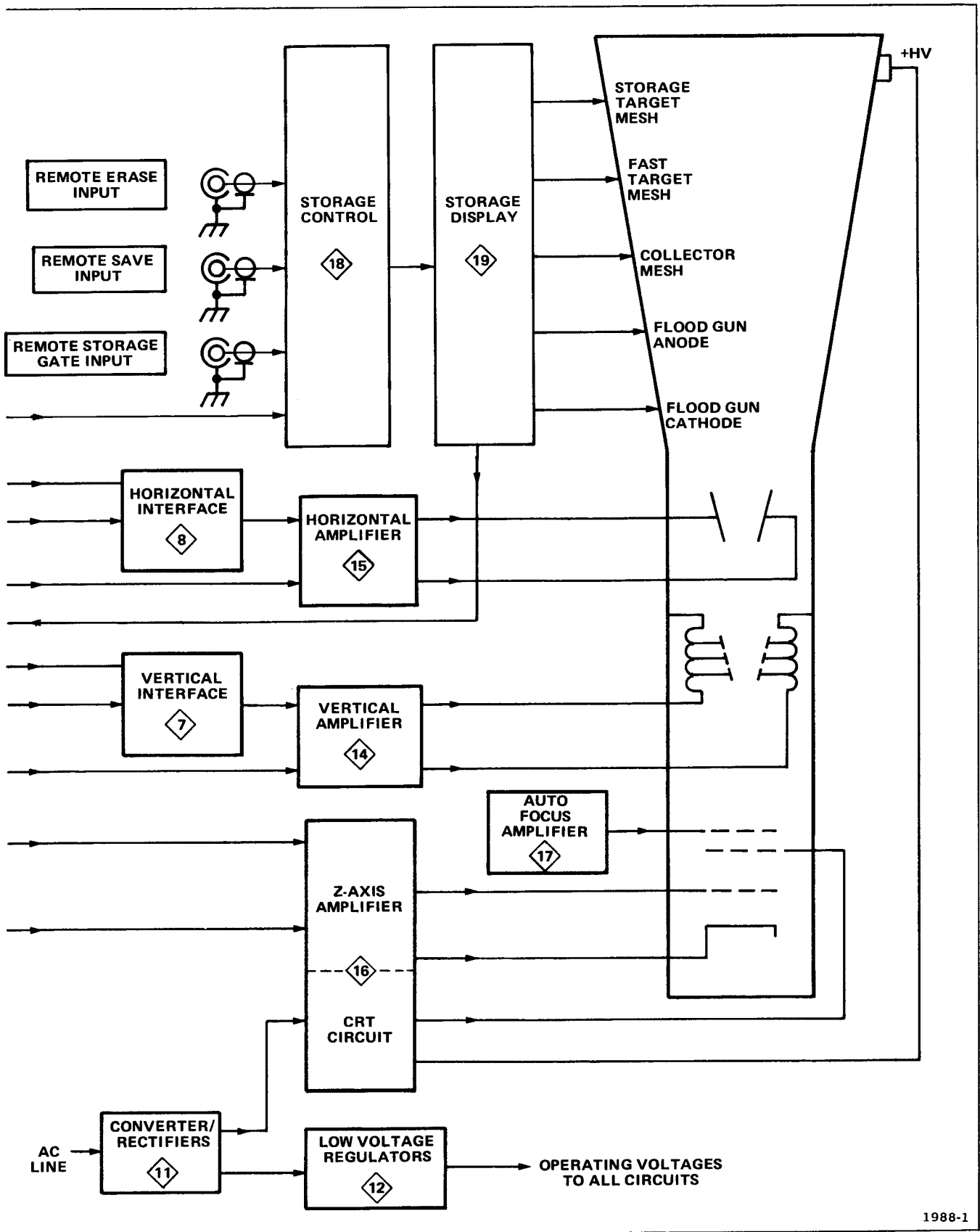


Figure 3-1. Basic block diagram of the 7834 Storage Oscilloscope.



1988-1

Figure 3-1. Basic block diagram of the 7834 Storage Oscilloscope (continued).

DETAILED CIRCUIT OPERATION

This portion of the Theory of Operation section provides a detailed description of the electrical operation and relationship of the circuits in the 7834. The theory of operation for circuits unique to this instrument is described in detail in this discussion. Circuits commonly used in the electronics industry are not described in detail. If more information is desired on these commonly used circuits, refer to the following textbooks:

Gordon V. Deboo, "Integrated Circuits and Semiconductor Devices", McGraw-Hill, New York, 1971.

Jacob Milman and Herbert Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, New York, 1965.

Albert Paul Malvino, "Transistor Circuit Approximations", McGraw-Hill, New York, 1973.

The following circuit analysis is accompanied by supporting illustrations that give the names of the individual stages within the major circuits, and show how they are connected together to form the major circuit. These illustrations also show the inputs and outputs for each circuit and the relationship of the front-panel controls to the individual stages. The detailed circuit diagrams from which the illustrations are derived are shown in the Diagrams section.

LOGIC FUNDAMENTALS

Digital logic techniques are used to perform many functions within the instrument. The function and operation of the logic circuits are described using logic symbology and terminology. This portion of the manual is provided to aid in the understanding of these symbols and logic concepts, not a comprehensive discussion of the subject. For further information on binary number systems and the associated Boolean algebra concepts, the derivation of logic functions, or a more detailed analysis of digital logic, refer to the following textbooks:

Robert C. Baron and Albert T. Piccirilli, "Digital Logic and Computer Operation", McGraw-Hill, New York, 1967.

Thomas C. Bartee, "Digital Computer Fundamentals", McGraw-Hill, New York, 1966.

Yaohan Chu, "Digital Computer Design Fundamentals", McGraw-Hill, New York, 1962.

Joseph Millman and Herbert Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, New York, Chapters 9-11, 1965.

Symbols

The operation of circuits in this instrument which use digital techniques is described using the graphic symbols set forth in military standard MIL-STD-806B. Table 3-1 provides a basic logic reference for the logic devices used within this

instrument. Any deviations from the standard symbology, or devices not defined by the standard are described in the circuit description for the applicable device.

NOTE

Logic Symbols used on the diagrams depict the logic function as used in this instrument and may differ from the manufacturer's data.

Logic Polarity

All logic functions are described using the positive logic convention. Positive logic is a system of notation where the more positive of two levels (HI) is called the true or 1-state; the more negative level (LO) is called the false or 0-state. The HI-LO method of notation is used in this logic description. The specific voltages that constitute a HI or LO state vary between individual devices. Whenever possible, the input and output lines are named to indicate the function that they perform when at the HI (true) state.

Input/Output Tables

Input/Output (truth) tables are used to show the input combinations important to a particular function, along with the resultant output conditions. This table may be given either for an individual device or for a complete logic stage. For examples of input/output tables for individual devices, see Table 3-1.

TABLE 3-1
Basic Logic Reference

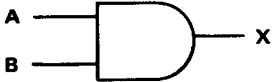



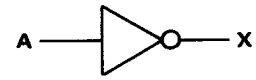
Device	Symbol	Description	Input/Output Table																		
AND gate		A device with two or more inputs and one output. The output of the AND gate is HI if and only if all of the inputs are at the HI state.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>HI</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	LO	LO	HI	LO	HI	LO	LO	HI	HI	HI
Input		Output																			
A	B	X																			
LO	LO	LO																			
LO	HI	LO																			
HI	LO	LO																			
HI	HI	HI																			
NAND gate		A device with two or more inputs and one output. The output of the NAND gate is LO if and only if all of the inputs are at the HI state.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>LO</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	HI	LO	HI	HI	HI	LO	HI	HI	HI	LO
Input		Output																			
A	B	X																			
LO	LO	HI																			
LO	HI	HI																			
HI	LO	HI																			
HI	HI	LO																			
OR gate		A device with two or more inputs and one output. The output of the OR gate is HI if one or more of the inputs are at the HI state.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>HI</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	LO	LO	HI	HI	HI	LO	HI	HI	HI	HI
Input		Output																			
A	B	X																			
LO	LO	LO																			
LO	HI	HI																			
HI	LO	HI																			
HI	HI	HI																			
NOR gate		A device with two or more inputs and one output. The output of the NOR gate is LO if one or more of the inputs are at the HI state.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>LO</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	HI	LO	HI	LO	HI	LO	LO	HI	HI	LO
Input		Output																			
A	B	X																			
LO	LO	HI																			
LO	HI	LO																			
HI	LO	LO																			
HI	HI	LO																			
Inverter		A device with one input and one output. The output state is always opposite to the input state.	<table border="1"> <thead> <tr> <th>Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> </tr> </tbody> </table>	Input	Output	A	X	LO	HI	HI	LO										
Input	Output																				
A	X																				
LO	HI																				
HI	LO																				

TABLE 3-1 (cont)

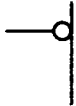
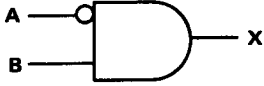
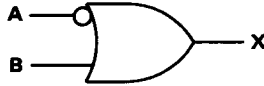

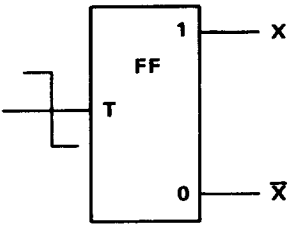
Device	Symbol	Description	Input/Output Table																				
<p>LO-state indicator</p>	 	<p>A small circle at the input or output of a symbol indicates that the LO state is the significant state. Absence of the circle indicates that the HI state is the significant state. Two examples follow:</p> <p>AND gate with LO-state indicator at the A input.</p> <p>The output of this gate is HI if and only if the A input is LO and the B input is HI.</p>	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>LO</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	LO	LO	HI	HI	HI	LO	LO	HI	HI	LO		
Input		Output																					
A	B	X																					
LO	LO	LO																					
LO	HI	HI																					
HI	LO	LO																					
HI	HI	LO																					
		<p>OR gate with LO-state indicator at the A input:</p> <p>The output of this gate is HI if either the A input is LO or the B input is HI.</p>	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th>Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>HI</td> </tr> </tbody> </table>	Input		Output	A	B	X	LO	LO	HI	LO	HI	HI	HI	LO	LO	HI	HI	HI		
Input		Output																					
A	B	X																					
LO	LO	HI																					
LO	HI	HI																					
HI	LO	LO																					
HI	HI	HI																					
<p>Edge symbol</p>		<p>Normally superimposed on an input line to a logic symbol. Indicates that this input (usually the trigger input of a flip-flop) responds to the indicated transition of the applied signal.</p>																					
<p>Triggered (toggle) Flip-Flop</p>		<p>A bistable device with one input and two outputs (either or both outputs may be used). When triggered, the outputs change from one stable state to the other stable state with each trigger. The outputs are complementary (i.e., when one output is HI the other is LO). The edge symbol on the trigger (T) input may be of either polarity depending on the device.</p>	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th colspan="2">Output</th> </tr> <tr> <th>Condition before trigger pulse</th> <th>Condition after trigger pulse</th> <th>X</th> <th>\bar{X}</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>\bar{X}</td> <td>X</td> <td>\bar{X}</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>LO</td> <td>HI</td> </tr> </tbody> </table>	Input		Output		Condition before trigger pulse	Condition after trigger pulse	X	\bar{X}	X	\bar{X}	X	\bar{X}	LO	HI	HI	LO	HI	LO	LO	HI
Input		Output																					
Condition before trigger pulse	Condition after trigger pulse	X	\bar{X}																				
X	\bar{X}	X	\bar{X}																				
LO	HI	HI	LO																				
HI	LO	LO	HI																				

TABLE 3-1 (cont)

Device	Symbol	Description	Input/Output Table																																		
Set-Clear (J-K) Flip-Flop		A bistable device with two inputs and two outputs (either or both outputs may be used). The outputs change state in response to the states at the inputs. The outputs are complementary (i.e., when one output is HI the other is LO).	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th colspan="2">Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> <th>\bar{X}</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td colspan="2">No change</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td colspan="2">Changes state</td> </tr> </tbody> </table>	Input		Output		A	B	X	\bar{X}	LO	LO	No change		LO	HI	LO	HI	HI	LO	HI	LO	HI	HI	Changes state											
Input		Output																																			
A	B	X	\bar{X}																																		
LO	LO	No change																																			
LO	HI	LO	HI																																		
HI	LO	HI	LO																																		
HI	HI	Changes state																																			
D (data) Type Flip-Flop		A bistable device with two inputs and two outputs (either or both outputs may be used). When triggered the state of the "1" output changes to the state at the data (D) input prior to the trigger. The outputs are complementary (i.e., when one output is HI the other is LO). The edge symbol on the trigger (T) input may be of either polarity, depending on the device.	<table border="1"> <thead> <tr> <th>Input</th> <th colspan="2">Output</th> </tr> <tr> <th>A</th> <th>X</th> <th>\bar{X}</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>HI</td> <td>LO</td> </tr> </tbody> </table> <p>Output conditions shown after trigger pulse</p>	Input	Output		A	X	\bar{X}	LO	LO	HI	HI	HI	LO																						
Input	Output																																				
A	X	\bar{X}																																			
LO	LO	HI																																			
HI	HI	LO																																			
Triggered Set-Clear (J-K) Flip-Flop		A bistable device with three or more inputs and two outputs (either or both outputs may be used). When triggered, the outputs change state in response to the states at the inputs prior to the trigger. The outputs are complementary (i.e., when one output is HI the other is LO). The edge symbol on the trigger (T) input may be of either polarity depending on the device.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th colspan="2">Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>X</th> <th>\bar{X}</th> </tr> </thead> <tbody> <tr> <td>LO</td> <td>LO</td> <td colspan="2">No change</td> </tr> <tr> <td>LO</td> <td>HI</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>HI</td> <td>LO</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>HI</td> <td>HI</td> <td colspan="2">Changes state</td> </tr> </tbody> </table> <p>Output conditions shown after trigger pulse</p>	Input		Output		A	B	X	\bar{X}	LO	LO	No change		LO	HI	LO	HI	HI	LO	HI	LO	HI	HI	Changes state											
Input		Output																																			
A	B	X	\bar{X}																																		
LO	LO	No change																																			
LO	HI	LO	HI																																		
HI	LO	HI	LO																																		
HI	HI	Changes state																																			
Flip-Flop with Direct Inputs (may be applied to all triggered flip-flops)		For devices with direct-set (S_D) or direct-clear (C_D) inputs, the indicated state at either of these inputs over-rides all other inputs (including trigger) to set the outputs to the states shown in the input/output table.	<table border="1"> <thead> <tr> <th colspan="2">Input</th> <th colspan="2">Output</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>X</th> <th>\bar{X}</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>LO</td> <td>LO</td> <td colspan="2">No change¹</td> </tr> <tr> <td>Φ</td> <td>Φ</td> <td>LO</td> <td>HI</td> <td>LO</td> <td>HI</td> </tr> <tr> <td>Φ</td> <td>Φ</td> <td>HI</td> <td>LO</td> <td>HI</td> <td>LO</td> </tr> <tr> <td>Φ</td> <td>Φ</td> <td>HI</td> <td>HI</td> <td colspan="2">Undefined</td> </tr> </tbody> </table> <p>Φ = Has no effect in this case ¹Output state determined by conditions at triggered inputs</p>	Input		Output		A	B	C	D	X	\bar{X}	1	1	LO	LO	No change ¹		Φ	Φ	LO	HI	LO	HI	Φ	Φ	HI	LO	HI	LO	Φ	Φ	HI	HI	Undefined	
Input		Output																																			
A	B	C	D	X	\bar{X}																																
1	1	LO	LO	No change ¹																																	
Φ	Φ	LO	HI	LO	HI																																
Φ	Φ	HI	LO	HI	LO																																
Φ	Φ	HI	HI	Undefined																																	

NON-DIGITAL DEVICES

Not all of the integrated circuit devices in this instrument are digital logic devices. The function of non-digital devices is described individually, using operating waveforms or other techniques to illustrate their function.

CABLING

Diagram 1, in the Diagrams and Circuit Board Illustrations section, shows the inter-connections between major circuits within the 7834.

CALIBRATOR AND MODE SWITCH

The Calibrator circuit provides voltage outputs of 40 millivolts, 0.4 volt and 4 volts at the CALIBRATOR output connector. A current output of 40 milliamperes is available from the Calibrator with an optional current loop adapter. When the current loop adapter is used, the Calibrator must be set to the 4 V switch position.

The Mode Switch circuit includes front-panel switching and provides the logic for selection of the vertical and horizontal compartments that provide deflection for the crt. The Mode Switch circuit operates in conjunction with the Logic circuit (diagram 4) to develop control signals for use in other circuits within this instrument, and within plug-in units installed in the plug-in compartments.

Figure 3-2 shows a detailed block diagram of the Calibrator and Mode Switch circuits. A schematic of these circuits is shown on diagram 2 at the rear of this manual.

Calibrator

Transistors Q376 and Q382 comprise a 1 kilohertz, square-wave oscillator. Oscillation occurs as follows: Initially assume that Q376 is conducting and Q382 is not conducting. The voltage at the emitter of Q382 becomes more negative as C376 discharges through R381. Capacitor C376 discharges until the emitter-base junction of Q382 becomes forward biased. As Q382 begins conducting the oscillator changes states. Regeneration starts when Q382 conducts and C376 stops discharging; this reduces the collector current of Q376. Thus, the collector voltage of Q376 rises positive which causes the base and emitter of Q382 to rise positive. The positive going voltage is coupled by C376 to the emitter of Q376, turning it off.

Now, Q382 is conducting and Q376 is not conducting. The voltage at the emitter of Q376 goes negative as C376 charges through R376. When the emitter-base junction of Q376 becomes forward biased the oscillator will again change states to complete the cycle.

The square wave signal produced at the collector of Q382 switches Q384 on and off. When Q384 is on, the current from R383 and R384 flows to ground. When Q384 is off, this current flows through CR386 and R386 into the voltage divider network of R387, R392, R393, R394, R395, R396 and R397 to produce the 4 volt, 0.4 volt and 40 millivolt Calibrator output voltages. The accuracy of the Calibrator is set by the 0.4 Volts DC adjustment, R385. Both the 4V and .4V calibrator push-button switches must be engaged when adjusting R385. The Calibrator frequency is set by the 1 kHz adjustment, R375.

Plug-In Single Sweep Logic

The Plug-In Single Sweep Logic stage (consisting of U322C, U326C, U326D, Q304 and Q308) develops the A or B Single Sweep Logic level for use by the Storage circuitry on diagram 18. A HI logic level is produced at pin 11 of U326D whenever the time-base unit selected by the HORIZONTAL MODE switch is set for single-sweep operation. When the HORIZONTAL MODE switch is set to ALT or CHOP, pin 11 of U326D will be HI if either the A or B time-base unit is set for single-sweep operation.

Storage Sweep Gate Logic

The Storage Sweep Gate Logic stage develops the Storage Sweep Gate; this gate is used by the Storage circuitry on diagram 18, at the rear of this manual. Gate signals from the time-base unit(s) selected by the HORIZONTAL MODE switch determine when the Storage Sweep Gate will occur.

STORAGE SWEEP GATE LATCH. The Storage Sweep Gate Latch, (consisting of U322D and U332D), produces the positive-going Storage Sweep Gate at pin 11 of U322D. Once pin 12 of U322D goes LO, the output pin 11 of U322D goes HI and remains HI until pin 13 of U332D goes LO, at which time the output will return to its LO state.

STORAGE SWEEP GATE LATCH SET. The Storage Sweep Gate Latch Set stage, consisting of U322B, Q321, Q325 and U326 (A and B) provides the signal to set the output of the Storage Sweep Gate Latch stage to the HI state. The HORIZONTAL MODE switch determines whether the A Sweep Gate/A Auxiliary Gate or the B Sweep Gate/B Auxiliary Gate is used to set the Storage Sweep Gate Latch. The HORIZONTAL MODE switch applies logic levels to pin 5 of U322B and U326B for the gate selection. When the HORIZONTAL MODE switch is set to ALT or CHOP, pin 5 of U322B and U326B are HI so that the gate which occurs first (from either the A or B time-base unit) will set the output of the Storage Sweep Gate Latch HI.

STORAGE SWEEP GATE LATCH RESET. The Storage Sweep Gate Latch Reset stage, consisting of U330 (A and B), U332 (A, B, and C), U334 (A, B, C, and D), Q332, Q336 and Q328, provides the signal to reset the output of

TELEPHONE OR VERBAL CONVERSATION RECORD

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

DATE

7 MAR 80

SUBJECT OF CONVERSATION CALibration procedure for 7834 Section on protection circuit.

~~PERSON CALLING~~ CALLED TEKTRONIX

PERSON CALLING R.B. HACHEY	ADDRESS	PHONE NUMBER AND EXTENSION
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PERSON CALLED LARRY SYNDER	OFFICE TEKTRONIX INC DAYTON	PHONE NUMBER AND EXTENSION
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OUTGOING CALL

PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
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PERSON CALLED	ADDRESS	PHONE NUMBER AND EXTENSION
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SUMMARY OF CONVERSATION

MR Synder said that the portion of the calibration procedure that pertains to protection circuit (A4² in cal procedure in manual) should be deleted from procedure. TP 1786 is NOT on vertical AMP BOARD.

1401-01

Sgt Hall

Handwritten initials

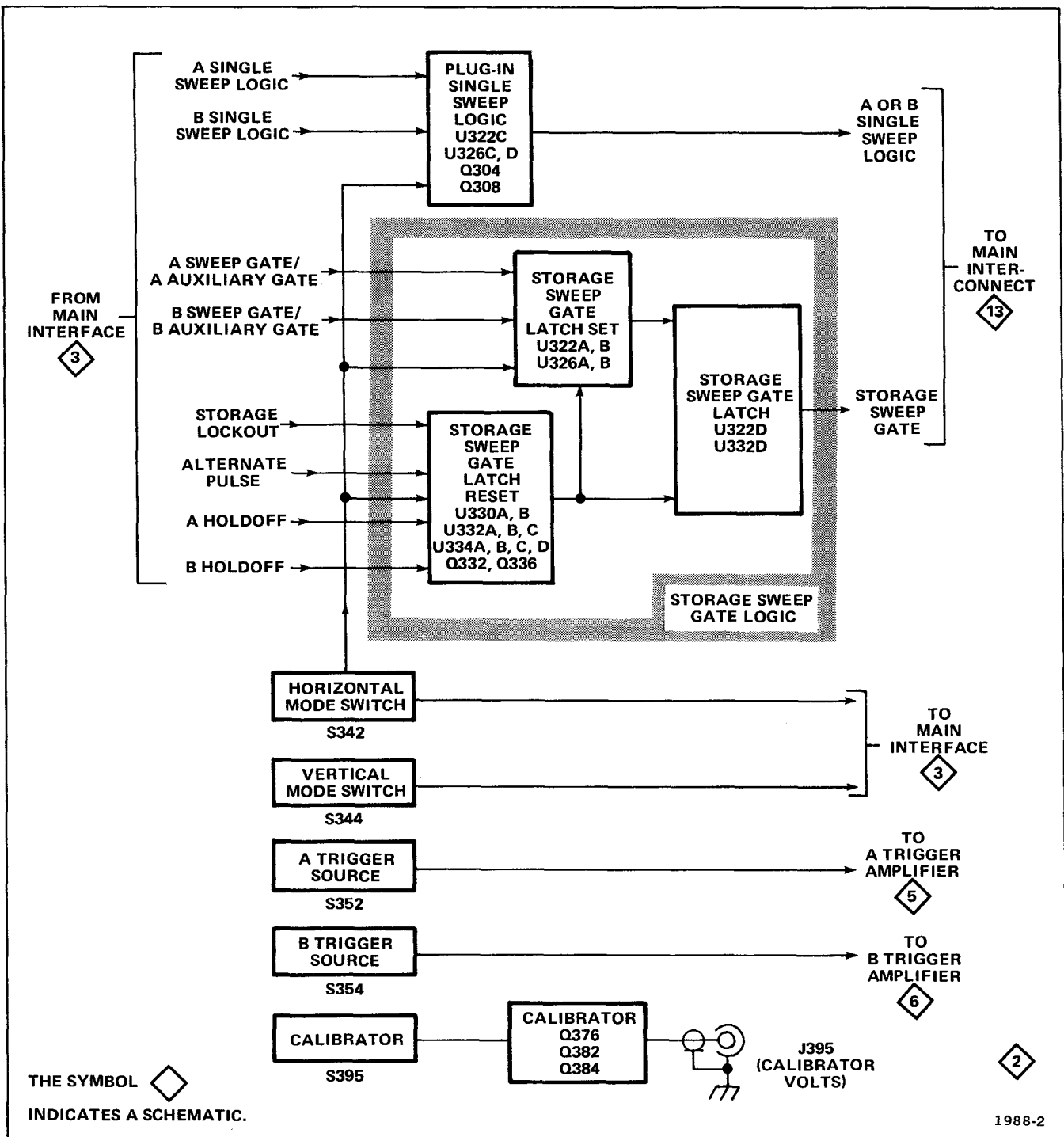


Figure 3-2. Detailed block diagram of the Calibrator and Mode Switch.

the Storage Sweep Gate Latch stage to its LO state. The reset signal is produced when any one of the following conditions occur:

(1) The Storage Lockout signal (pin 4 of P324) goes HI.

(2) The Alternate Pulse signal (pin 8 of P324) goes HI with the HORIZONTAL MODE switch set to A or B.

(3) The A Holdoff and B Holdoff signals (pin 5 and 6 of P324 respectively) both go HI with the HORIZONTAL MODE switch set to ALT or CHOP.

Theory of Operation—7834

In condition 1 above, the positive-going Storage Lockout signal is inverted by Q382 to reset the Storage Sweep Gate Latch. This reset can occur at any time with any setting of the HORIZONTAL MODE switch.

In condition 2 the positive-going Horizontal Logic Holdoff signal occurs at the beginning of each A and B Holdoff signal. The Alternate Pulse signal passes through U332C when pin 9 is HI (pin 9 is HI when the HORIZONTAL MODE switch is set to A or B). The signal is then inverted by U332B and applied to the base of Q328; this, in turn, resets the output of the Storage Gate Latch to its LO state.

In condition 3 the positive-going A Holdoff signal is coupled through Q322 and U334D to the clock input (pin 3) of U330A setting pin 5 of U330A HI at the beginning of the A Holdoff signal. Likewise, the positive-going B Holdoff signal sets pin 9 of U330B HI. When pins 9 and 5 of U330 (A and B) are HI, a LO is applied to pin 4 of U332B. This LO is inverted by U332B and applied to the base of Q328.

The LO on pin 4 is inverted by U332B and applied to the base of Q328 to reset the Storage Sweep Gate Latch output to its LO state.

MAIN INTERFACE

Diagram 3 shows the plug-in interface and the inter-connections between the plug-in compartments, circuit boards, etc., of this instrument. Also, the signal and voltage connections of each interface connector are identified.

LOGIC

The Logic circuit develops control signals for use in other circuits within this instrument and the plug-in units installed in the vertical and horizontal compartments. These control signals automatically determine the correct instrument operation in relation to the plug-in units installed or selected, plug-in control settings, and 7834 control settings. A block diagram of the Logic circuit is shown in Figure 3-3. A schematic of the Logic circuit is given on diagram 4 at the rear of this manual.

The circuit description for the Logic circuit is written with the approach that each of the integrated circuits and its associated discrete components compose an individual stage as shown by the block diagram (Fig. 3-3). The operation of each stage is discussed, relating the input signals or levels to the output, with consideration given to the various modes of operation that may affect the stage. A logic diagram is also provided for each stage. These diagrams are not discussed in detail, but are provided to aid in relating the function performed by a given stage to standard logic techniques. It

should be noted that these logic diagrams are not an exact representation of the internal structure of the integrated circuit, but are only a logic diagram of the function performed by the stage. An input/output table is given, where applicable, for use with the circuit description and logic diagram. These input/output tables document the combination of input conditions that are of importance to perform the described function of an individual stage.

Horizontal Logic

The Horizontal Logic stage performs three separate logic functions: A Sweep Lockout, B Sweep Lockout, and Alternate Pulse generation. Most of the logic for these functions is contained within the Horizontal Logic IC, U4428. Figure 3-4 identifies the three individual stages of U4428 and the input and output terminals associated with each. Note that some of the input levels are connected internally to more than one of the individual stages.

A SWEEP LOCKOUT STAGE. The A Sweep Lockout Stage produces an output level at the collector of Q4462 that determines if the A HORIZ time-base unit can produce a sweep. If this output is HI, the A HORIZ unit is locked out (disabled) so it cannot produce a sweep. If the level is LO, the A HORIZ unit is enabled and can produce a sweep when triggered.

As shown by the logic diagram and input/output table of Figure 3-5, only two combinations of input conditions to U4428 produce an A Sweep Lockout level (HI).

The first combination disables the A sweep while the B sweep is being displayed with the HORIZONTAL MODE switch in ALT position (both time-base units must be in sweep mode), if non-delayed operation is being used. The second combination disables the A sweep during delayed-sweep operation so that the B sweep can complete its hold-off before the next A sweep begins. If neither of these conditions occurs, the A Sweep Lockout level is determined by the Storage Lockout signal. (This signal originates in the circuitry on diagram 18.) Figure 3-5a shows the Storage Lockout signal connected to the output of the A Sweep Lockout stage through a phantom-OR gate. (A phantom-OR gate performs the OR-logic function merely by inter-connection of two or more signal lines.)

B SWEEP LOCKOUT STAGE. The B Sweep Lockout stage produces an output level at the collector of Q4468 that determines if the B HORIZ time-base unit can produce a sweep. A HI output level locks out (inhibits) the B HORIZ unit and a LO level enables the B HORIZ unit to produce a sweep.

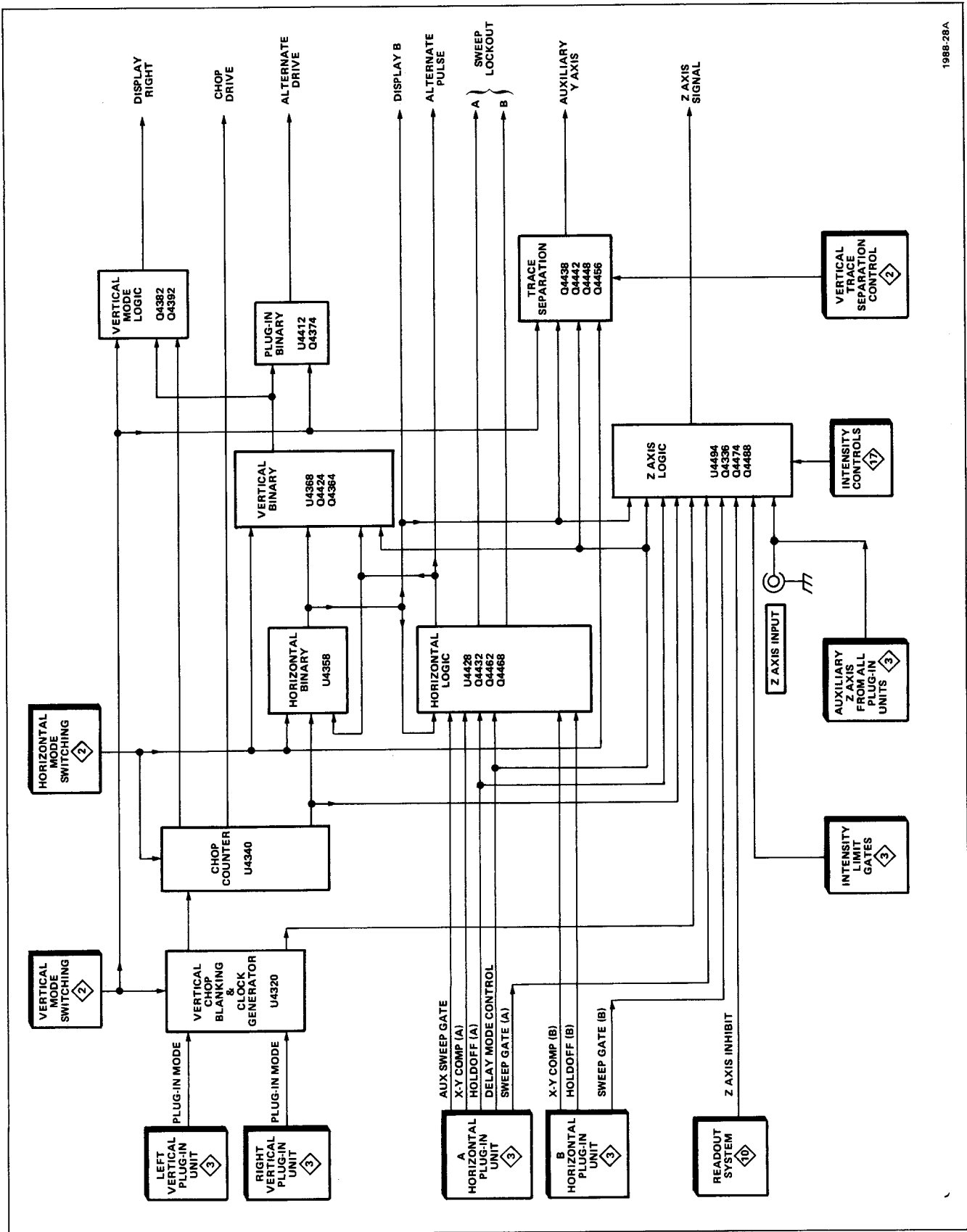


Figure 3-3. Detailed block diagram of the Logic circuit.

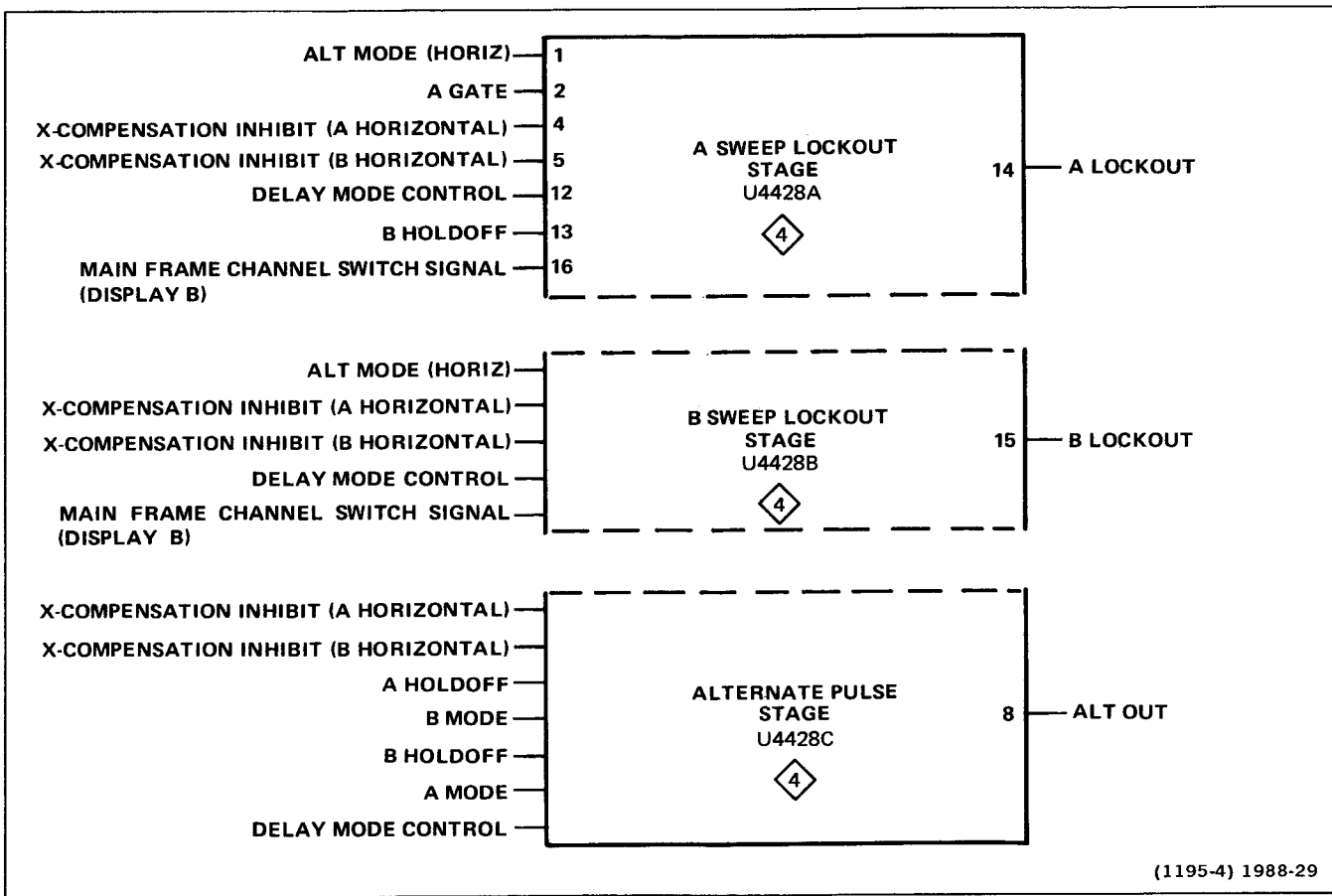


Figure 3-4. Breakdown of separate stages within Horizontal Logic IC (U4428); showing inputs and outputs for each stage.

As shown by Figure 3-6B, the output of this stage is HI only under one set of input conditions to V4428. This set of conditions disables the B sweep while the A sweep is being displayed in the ALT, HORIZONTAL MODE switch position, if both time-base units are in a sweep mode and non-delayed sweep is used. For any other combination of input conditions, the B Sweep Lockout level is determined by the Delay Gate (from A time-base unit) and the Storage Lockout signal (from Storage Control, diagram 18).

Figure 3-6A shows Delay Gate and Storage Lockout connections to the output of the B Sweep Lockout stage through a phantom-OR gate. (A phantom-OR gate performs the OR logic function merely by interconnection of two or more signal lines.)

ALTERNATE PULSE STAGE. The third function performed by the Horizontal Logic stage is to produce an Alternate Pulse signal for use by the Horizontal and Vertical Binary stages, and the Storage Sweep Gate circuit on the mode switch circuit board.

The Alternate Pulse is produced at the end of either sweep, depending upon the operating conditions as shown in Figure 3-7B. The holdoff gate produced at the end of the sweep by the respective time-base unit is differentiated by either C4420 or C4423 to provide a positive-going pulse to pin 6 or 9 of U4428.

In Figure 3-7A, note the resistors shown connected to pins 6 and 9. These resistors, which are internal to the IC, hold the levels at pin 6 and 9 LO unless a HI level is applied to the corresponding input. Since the holdoff gate is capacitively-coupled to pins 6 and 9, these inputs are at the LO level except when a differentiated A or B Holdoff gate is received.

The following discussions describe the operation of the Alternate Pulse stage in relation to the various combinations of input conditions shown in Figure 3-7B.

(1) A (Only) Mode

An Alternate Pulse is produced at the end of each A sweep when the HORIZONTAL MODE switch is set to the A position.

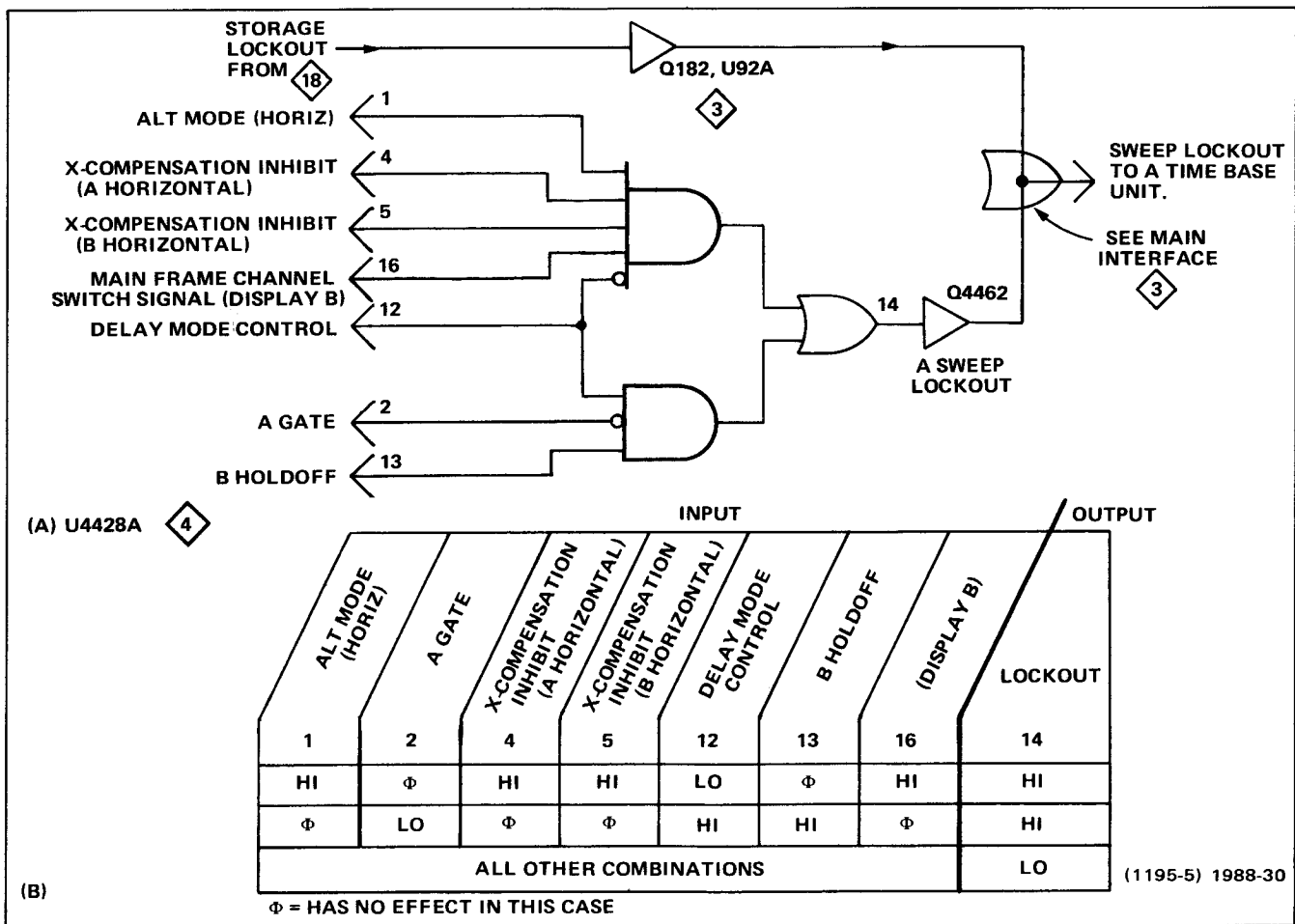


Figure 3-5. (A) Logic diagram for A Sweep Lockout Stage; (B) Table of input/output combinations.

(2) B (Only) Mode

In the B position of the HORIZONTAL MODE switch, an Alternate Pulse is produced at the end of each B sweep. (A time-base must be in independent, non-delayed mode.)

(3) Alt or Chop Mode

When the HORIZONTAL MODE switch is set to ALT or CHOP (A time-base unit must be independent, non-delayed mode), an Alternate Pulse is produced at the end of each sweep. For example, an Alternate Pulse is produced at the end of the A sweep, then at the end of the B sweep, again at the end of the A sweep, etc. Although Alternate Pulses are produced in the CHOP horizontal mode, they are not used in this instrument.

(4) Delayed Sweep (A Delays B)

When the A time-base unit is set for delayed operation, the operation of the Alternate Pulse Stage is changed so an Alternate Pulse is produced only at the end of the A sweep, even when the HORIZONTAL MODE switch is set to B. This is necessary since the A time-base estab-

lishes the amount of delay time for the B time-base unit whenever it is displayed.

(5) Amplifier Unit in Horizontal Compartment

When an amplifier unit is installed in either of the horizontal plug-in compartments, the Alternate Pulse can be produced only from the remaining time-base unit. If amplifier units are installed in both horizontal compartments, an Alternate Pulse is not produced since there are no time-base units to produce a holdoff pulse.

Z-Axis Logic

The Z-Axis Logic stage produces an output current signal at pin 8 of U4494 which sets the intensity of the crt display except for the readout display which is controlled by the Readout System. The output current at pin 8 is determined by the setting of the A or B INTENSITY controls, the conditions of various logic gates, and by an external Z-Axis signal. The input current from the A and B INTENSITY controls is switched so the output current matches the horizontal display. The Vertical Chopped Blanking, Horizontal

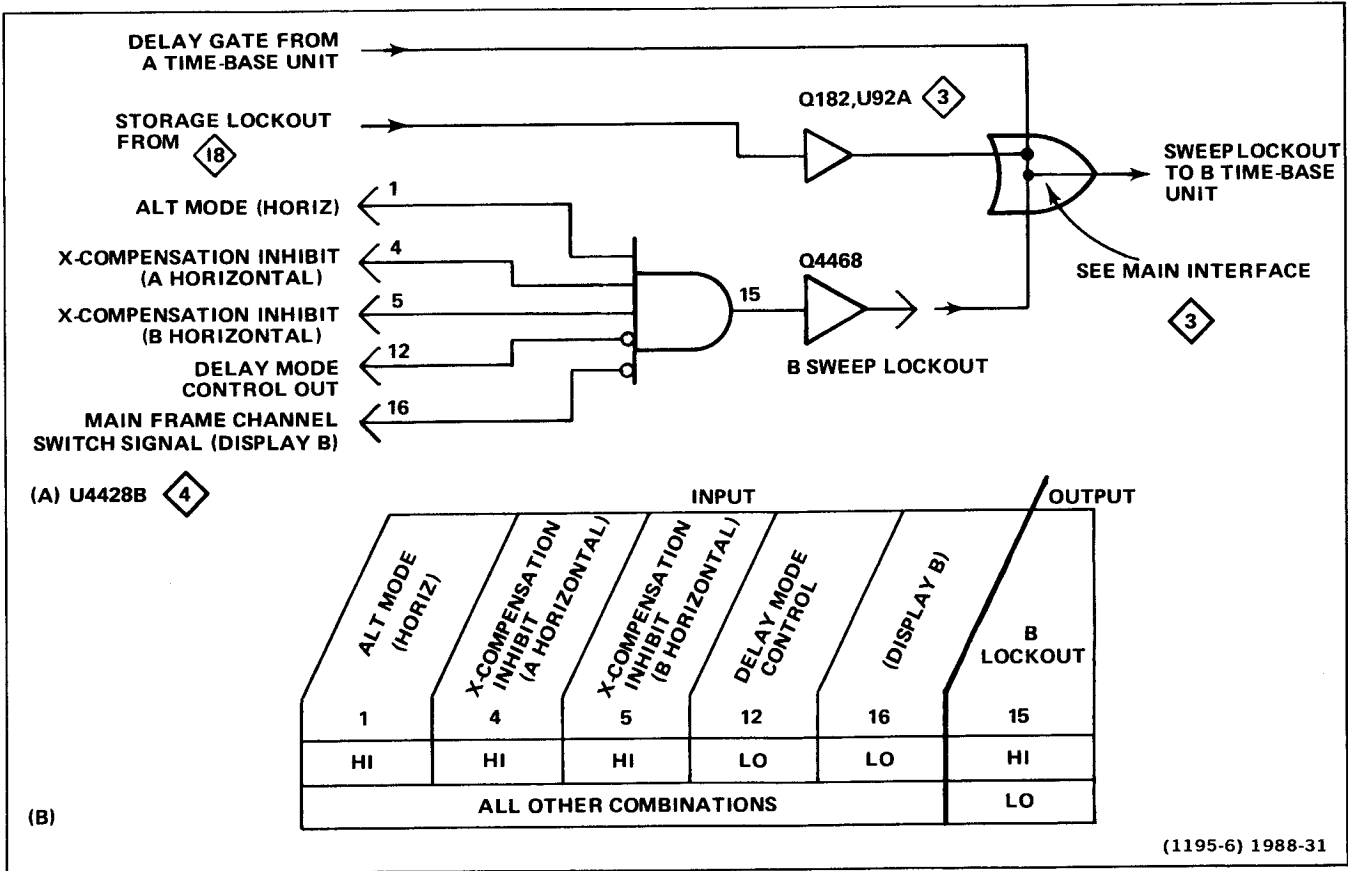


Figure 3-6. (A) Logic diagram for B Sweep Lockout stage; (B) Table of input/output combinations.

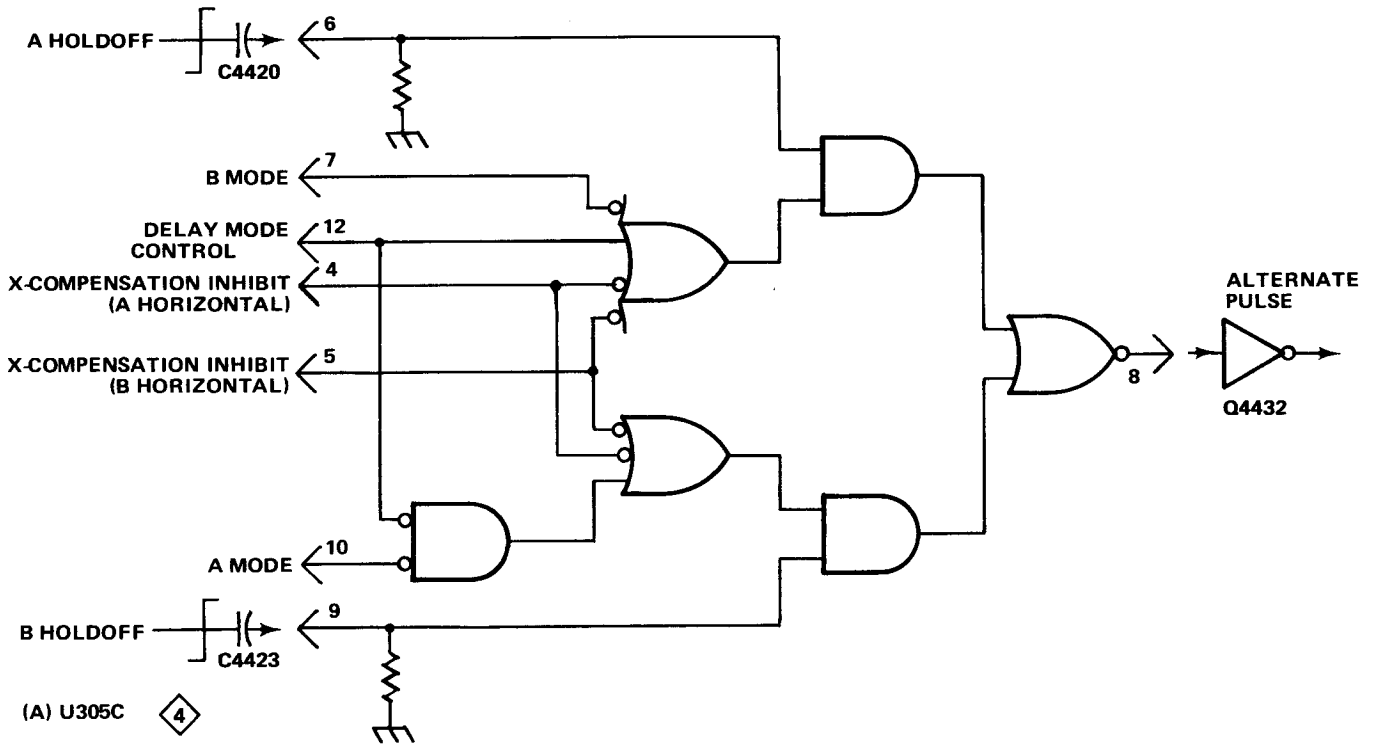
Chopped Blanking, and readout blanking signals are applied to this stage to block the output current and blank the crt display for vertical chopping, horizontal chopping, or during a readout display.

Figure 3-8 identifies the inputs to the Z-Axis Logic stage. This circuit is current-driven at all inputs except pins 5 and 15. The current at pins 1, 2, 9, and 16 is variable from zero to four milliamperes and is determined by the applicable current source to control the output current at pin 8.

The Vertical Chopped Blanking signal connected to pin 7, and the Horizontal Chopped Blanking connected to both pins 6 and 7 through Q4336, CR4487, CR4488, enable or disable this stage to control all output current. Quiescently, the level at pins 6 and 7 is HI so that the intensity current from pins 1, 2, 9, and 16 can pass to the output. However, pin 7 goes LO during Vertical Chopped Blanking and both pins 6 and 7 go LO for Horizontal Chopped Blanking or during a readout display. This blocks the output current and the crt is blanked. The Vertical Chopped Blanking signal is connected to pin 7 of U4494 directly from pin 4 of U4320. The Horizontal Chopped Blanking signal is connected to U4494 from pin 4 of U4340 through LR4338, Q4336 and CR4487, CR4488. Notice that this signal is connected

to the collector of Q4336. This transistor is normally operating in the saturated condition, and the HI Horizontal Chopped Blanking level from U4340 is the collector source voltage. When the Horizontal Chopped Blanking level goes LO, the current through Q4336 drops to produce a corresponding LO level at its emitter. This level is connected to pins 6 and 7 of U4494 through CR4488 and CR4487 respectively.

Transistor Q4336 also controls the levels at pins 6 and 7 for readout displays. The Z-Axis Logic Off Command from the Readout System is connected to the base of Q4336 through VR4334 and R4335. This level is normally HI, so Q4336 operates as controlled by the Horizontal Chopped Blanking level at its collector. When a readout display is to be presented, the Z-Axis Logic Off Command drops LO and this level is coupled to the base of Q4336 through VR4334. Transistor Q4336 is reverse biased to produce a LO level at its emitter. This level is coupled to pins 6 and 7 of U4494 through CR4487 and CR4488 to block the Z-Axis Logic output current during the readout display. (The intensity of the readout display is determined by a separate READOUT intensity level connected directly to the Z-Axis Amplifier; see CRT Circuit description.) Diode CR4486 clamps the emitter of Q4336 at about -0.6 volt when the transistor is off.



INPUT							OUTPUT	
X-COMPENSATION INHIBIT (A HORIZONTAL)	X-COMPENSATION INHIBIT (B HORIZONTAL)	A HOLDOFF	B MODE	B HOLDOFF	A MODE	DELAY MODE CONTROL	TIME-BASE WHICH IS SOURCE OF ALTERNATE PULSE	
4	5	6	7	9	10	12	8 ²	HORIZONTAL CONDITIONS
HI	Φ	HI ¹	LO	Φ	HI	Φ	A	A ONLY
Φ	HI	Φ	HI	HI ¹	LO	LO	B	B ONLY
HI	HI	HI ¹	LO	HI ¹	LO	LO	A AND B	ALT OR CHOP
HI	HI	HI ¹	Φ	Φ	Φ	HI	A	A DELAYS B
HI	LO	HI ¹	LO	LO	Φ	Φ	A	A WITH VERTICAL UNIT IN B COMPARTMENT.
LO	HI	LO	Φ	HI ¹	LO	LO	B	B WITH VERTICAL UNIT IN A COMPARTMENT.
ALL OTHER COMBINATIONS							NO OUTPUT PULSE (LO AT OUTPUT)	

Φ = HAS NO EFFECT IN THIS CASE

¹ POSITIVE-GOING PULSE. WHERE BOTH A AND B HOLDOFF ARE REQUIRED TO BE HI, A HI AT EITHER INPUT PRODUCES AN ALTERNATE PULSE.

² NEGATIVE-GOING PULSE.

(B)

(1195-7) 1988-32

Figure 3-7. (A) Logic diagram for Alternate Pulse Generator stage; (B) Table of input/output combinations.

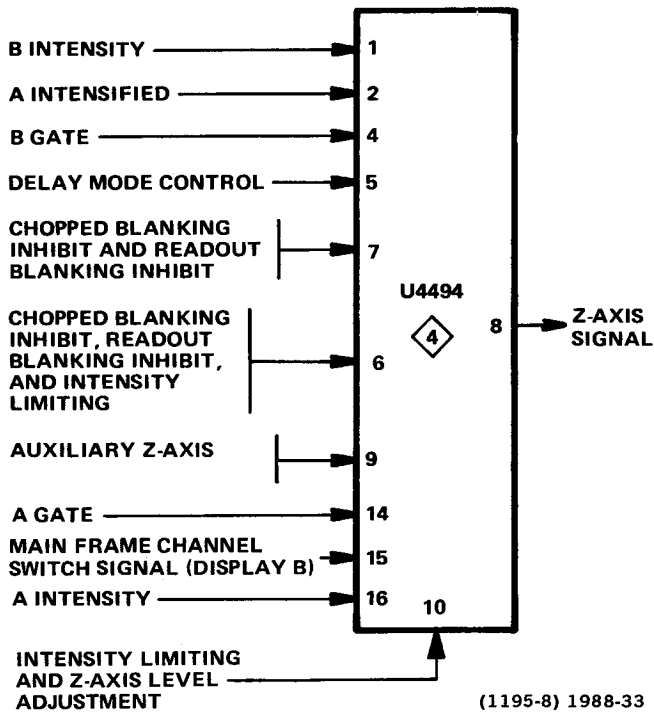


Figure 3-8. Input and output pins for Z-Axis Logic IC (U4494).

Intensity limiting is provided for high crt beam currents at slow sweep rates and X-Y operation by the Intensity Limit input. Quiescently, Q4474 is reverse biased; resistors R4485, R4481, and R4474 establish the current at pins 6 and 10 of U4494. When the Intensity Limit input is connected to ground, in the plug-in units for slow sweep rates and amplifier operation, the emitter of Q4474 is grounded through CR4472. Transistor Q4474 takes current from pins 6 and 10 of U4494 to limit the output current from this stage.

The A INTENSITY control sets the output current level when the A Gate at pin 14 is HI and the main frame channel switch signal (Display B) at pin 15 is LO. Whenever the A Gate level goes LO indicating that the A sweep is complete or the Display B goes HI indicating that the B sweep is being displayed, the A INTENSITY current is blocked. The current from the A INTENSITY control is connected to pin 16 through R4496.

In the delayed mode, current is added to the A INTENSITY current during the A-sweep time to intensify a portion of the trace. This intensified portion is coincident with the B-sweep time to provide an indication of which portion of the A sweep is displayed in the delayed mode. The A intensified current is supplied to pin 2 of U4494 from the A INTENSITY control through R4496. With this configuration, the intensified current increases as the A INTENSITY control setting is advanced to provide a proportional intensity increase in the intensified zone as the overall A-sweep intensity increases. Therefore, the intensified zone is more

readily visible at high intensity levels. The intensified current is added to the A INTENSITY current to produce an intensified zone on the A sweep under the following conditions: HI A Gate level at pin 14, LO Display B at pin 15, HI B Gate level at pin 4, and HI Delay Mode Control Out level at pin 5.

The B INTENSITY control determines the output current when the B Gate level at pin 4 and the Display B at pin 15 are both HI. The current from the B INTENSITY control is connected to the Z-Axis Logic stage through R4498.

The current level established by the intensity controls can be altered by the Auxiliary Z-Axis current level at pin 9. The current at this pin can come from the Z-AXIS INPUT connector on the rear panel (see diagram 3) or from any of the plug-in compartments. This current either increases or decreases (depending on polarity) the output current to modulate the intensity of the display. Input from the Z-AXIS INPUT connector allows the trace to be modulated by external signals. The Auxiliary Z-Axis inputs from the plug-in compartments allow special-purpose plug-in units to modulate the display intensity. Diodes CR4473 and CR4474 limit the maximum voltage change at pin 9 to about + and -0.6 volt to protect the Z-Axis Logic stage if an excessive voltage is applied to the Z AXIS INPUT connector.

Figure 3-9A shows a logic diagram of the Z-Axis Logic stage. Notice the current-driven inputs as indicated by the current generator symbols at the associated inputs. An input/output table for the Z-Axis Logic stage is given in Figure 3-9B.

Horizontal Binary

The Horizontal Binary stage produces the Main Frame Channel Switch Signal (Display B) to determine which horizontal unit provides the sweep display on the crt. When this level is HI, the B HORIZ unit is displayed; when it is LO, the A HORIZ unit is displayed.

The Display B signal is used in the following stages within the Logic circuit: Horizontal Logic (A and B Sweep Inhibit), Z-Axis Logic, Vertical Binary, and Trace Separation. In addition, it is connected to the following circuits elsewhere in the instrument to indicate which horizontal unit is to be displayed: Main Interface (A and B HORIZ plug-in compartments), Horizontal Interface (for horizontal channel selection), and the Auto Focus Amplifier.

Figure 3-10 identifies the function of the input pins for this stage. Notice (on Logic diagram 4) that the levels at pins 3, 4, 7, and 10 of U4358 are determined by the HORIZONTAL MODE switch. This switch indicates which horizontal mode has been selected by providing a HI output level on only one of four output lines; the remaining lines are LO.

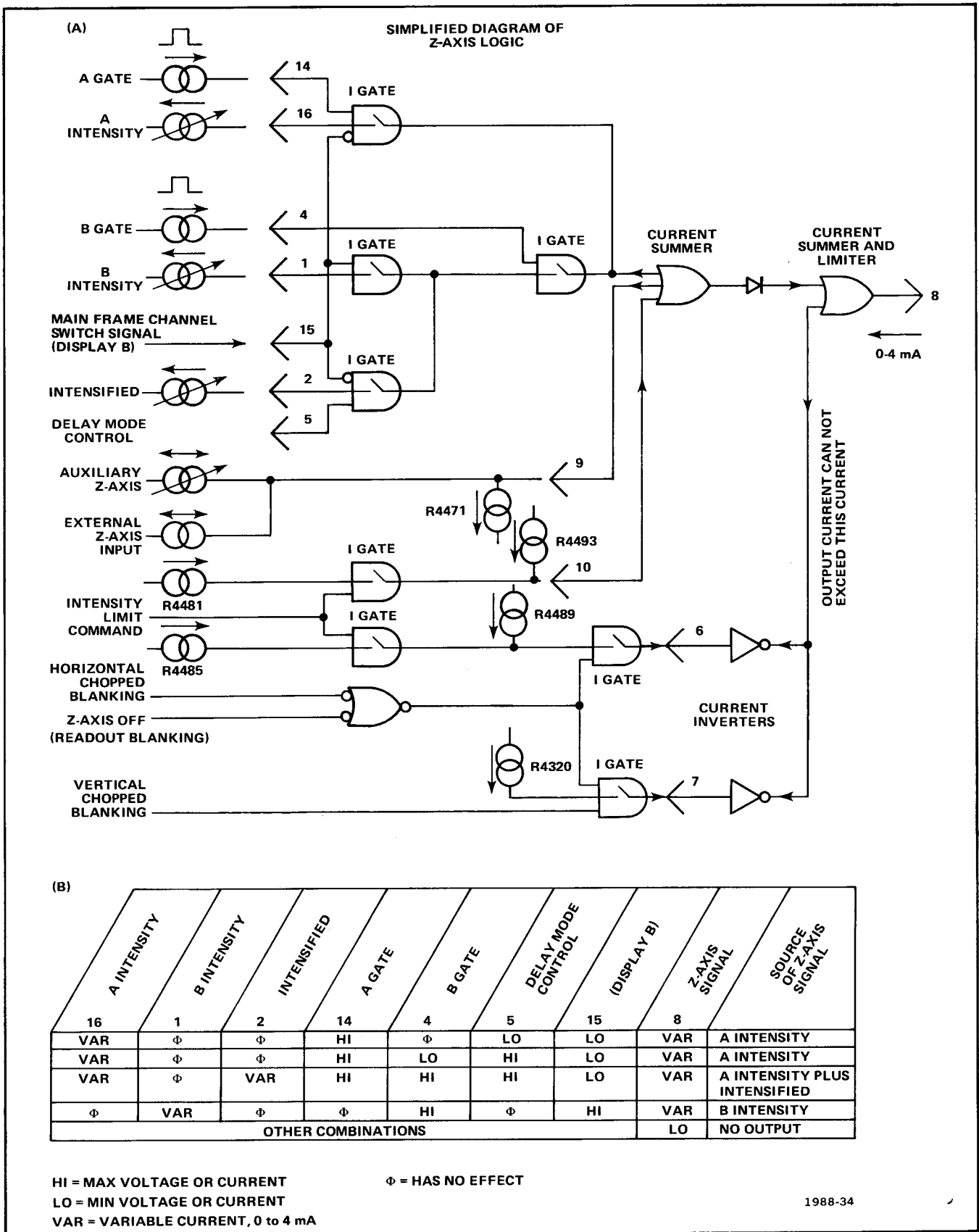
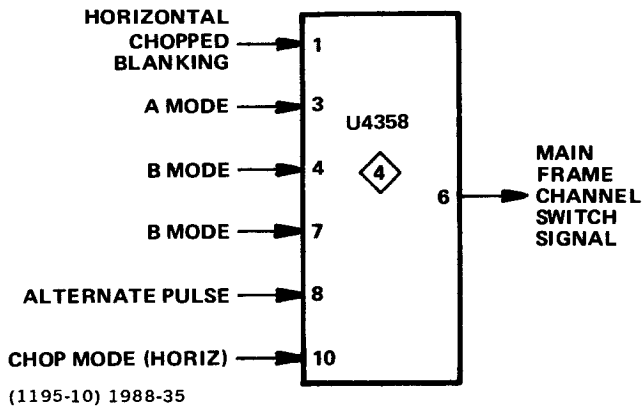


Figure 3-9. (A) Logic diagram for Z-Axis Logic stage; (B) Table of input/output combinations.



(1195-10) 1988-35

Figure 3-10. Input and output pins for horizontal binary IC (U4358).

The Horizontal Binary stage operates as follows for each position of the HORIZONTAL MODE switch (refer to Figure 3-11B for input/output conditions):

1. **A MODE.** When the HORIZONTAL MODE switch is set to A, Display B is LO to indicate to all circuits that the A HORIZ unit is to be displayed.
2. **B MODE.** Selecting the B HORIZONTAL MODE provides a HI Display B signal to all circuits.
3. **CHOP MODE.** In the CHOP position of the HORIZONTAL MODE switch, the Display B signal switches between the HI and LO levels to produce a display that switches between the A and B HORIZ units at a 0.2 megahertz rate. The repetition rate of Display B in this mode is determined by the Horizontal Chopped Blanking pulse (see Chop Counter description). Each time the Horizontal Chopped Blanking pulse at pin 1 drops LO, the output at pin 6 switches to the opposite state.
4. **ALT MODE.** For ALT HORIZONTAL MODE operation, the Display B signal switches to the opposite state each time the negative portion of the Alternate Pulse is received from the Horizontal Logic stage. Repetition rate of Display B in this mode is one-half the repetition rate of the Alternate Pulse applied to pin 8.

Figure 3-11A shows a logic diagram for the Horizontal Binary stage. An input/output table showing the conditions for each position of the HORIZONTAL MODE switch is shown in Figure 3-11B.

Vertical Binary

The Vertical Binary stage produces the Vertical Alternate Command to determine which vertical unit is to be displayed

when the VERTICAL MODE switch is set for ALT. When this output level is HI, the RIGHT VERT unit is displayed; when it is LO, the LEFT VERT unit is displayed. In the ALT or CHOP positions of the HORIZONTAL MODE switch (non-delayed operation only), the output of this stage is slaved to the output of the Horizontal Binary stage so that the Vertical Alternate Command is always HI when Display B is LO, and vice versa. This action allows independent-pairs operation (sweep-slaving) in the ALT position of the VERTICAL MODE switch and the ALT or CHOP positions of the HORIZONTAL MODE switch, whereby the LEFT VERT unit is always displayed at the sweep rate of the B time-base and the RIGHT VERT unit is displayed at the sweep rate of the A time-base. Thus, independent-pairs operation can simulate dual-beam operation for repetitive sweeps.

When the A time-base unit is set to the delaying mode, the repetition rate of the Vertical Alternate Command is one-half the repetition rate of Display B. This results in each vertical unit being displayed first against the A time-base unit (delaying), then the B time-base unit (delayed), before the display is switched to the other vertical unit.

The Vertical Alternate Command is used in the Plug-In Binary and Vertical Mode Logic stages.

Figure 3-12 identifies the function of the input pins for the Vertical Binary IC (U4368). This stage uses the same type of IC as the Horizontal Binary stage. Notice the Display A level at pin 7. This input is the inverse of the Display B level at pin 8. Therefore, the Display A level is always HI when the Display B level is LO, and vice versa (Q4364 generates the Display A level). Also, notice the line connected to pin 4 of the Vertical Binary IC U4368. The level at pin 4 is generated by Q4424 and is HI only when the HORIZONTAL MODE switch is set for ALT or CHOP and the A time-base unit is set for nondelayed operation. The Vertical Binary IC uses the information at pin 4 for correct slaving of the Vertical Alternate Command to the Display B signal (necessary for independent-pairs operation).

The following discussions describe the operation of the Vertical Binary stage in relation to the modes of operation that can occur.

1. **A OR B MODE.** When the HORIZONTAL MODE switch is set to either A or B, the Vertical Alternate command will switch to the opposite state each time an Alternate Pulse is received from the Horizontal Logic stage. Repetition rate of the Vertical Alternate Command in this mode is one-half the repetition rate of the Alternate Pulse. The input conditions for these modes are:

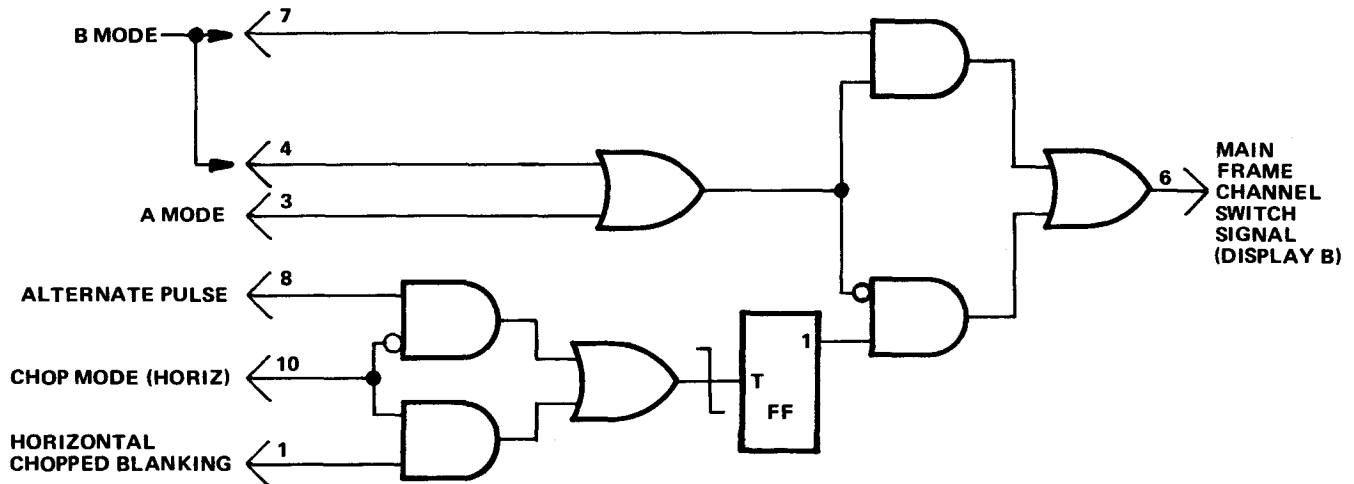
Pin 1 LO-Alternate Pulse generated by the Horizontal Logic stage goes negative.

Pin 4 LO-HORIZONTAL MODE switch in any position except ALT, CHOP, or when the A time-base unit is set for delayed sweep.

Pin 10 HI-HORIZONTAL MODE switch set to A or B.

2. ALT OR CHOP MODE (HORIZ)-NONDELAYED. In the ALT or CHOP positions of the HORIZONTAL MODE switch, the output level at pin 6 is the same as the Display A level at pin 7. The Display A level is produced by inverting the Display B level from the Horizontal Binary stage.

Therefore, the repetition rate of the output signal is the same as the Display B signal. The result (with the VERTICAL MODE switch set to ALT or CHOP and the A time-base unit set for nondelayed operation) is that the RIGHT VERT unit is always displayed at the sweep rate of the A time-base unit, and the LEFT VERT unit at the sweep rate of the B time-base unit (independent-pairs operation or sweep slaving). The input conditions to provide a HI output level so that the RIGHT VERT unit can be displayed at the A sweep rate are:



(A) U4358



INPUT						OUTPUT	
HORIZONTAL CHOPPED BLANKING	A MODE	B MODE	B MODE	ALTERNATE PULSE	CHOP MODE (HORIZ)	(DISPLAY B)	
1	3	4	7	8	10	6	HORIZONTAL DISPLAY
Φ	HI	LO	LO	Φ	LO	LO	A HORIZONTAL UNIT
Φ	LO	HI	HI	Φ	LO	HI	B HORIZONTAL UNIT
LO ¹	LO	LO	LO	Φ	HI	n+1 ²	CHOP BETWEEN A AND B
Φ	LO	LO	LO	LO ¹	LO	n+1 ³	ALTERNATE BETWEEN A AND B

Φ = HAS NO EFFECT IN THIS CASE

n+1 = IF OUTPUT IS LO PRIOR TO LO¹, IT GOES HI, AND VICE VERSA

¹ ACTUATED BY NEGATIVE-GOING EDGE.

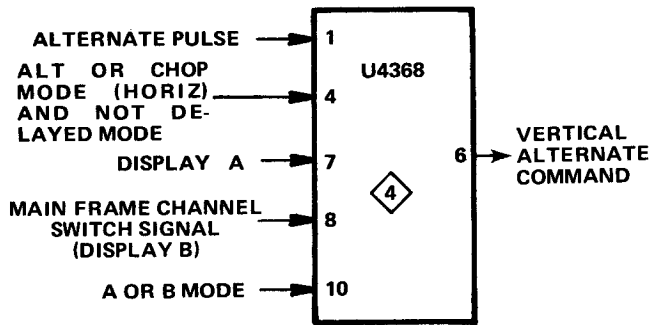
² REPETITION RATE ONE-HALF HORIZONTAL CHOPPED BLANKING RATE.

³ REPETITION RATE ONE-HALF ALTERNATE PULSE RATE.

(B)

(1195-11) 1988-36

Figure 3-11. (A) Logic diagram for Horizontal Binary stage; (B) Table of input/output combinations.



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Figure 3-12. Input and output pins for Vertical Binary IC (U4368).

Pin 4 HI-HORIZONTAL MODE switch set to ALT or CHOP with nondelayed sweep.

Pin 7 HI-A sweep is to be displayed (Display B LO).

Pin 10 LO-HORIZONTAL MODE switch set to any position except A or B.

The input conditions required to provide a LO output level to display the LEFT VERT unit at the B-sweep rate are:

Pin 4 HI-HORIZONTAL MODE switch set to ALT or CHOP with nondelayed sweep.

Pin 7 LO-B sweep is to be displayed (Display B HI).

Pin 10 LO-HORIZONTAL MODE switch set to any position except A or B.

3. ALT OR CHOP MODE (HORIZ)-DELAYED. If the A time-base unit is set to the delayed mode when the HORIZONTAL MODE switch is set to either ALT or CHOP, the operation of the stage is changed from that discussed above. Now, the Vertical Alternate Command switches between the HI and LO states at a rate that is one-half the repetition rate of the Display B signal. The resultant crt display in the ALT position of the VERTICAL MODE switch allows the RIGHT VERT unit to be displayed first against the A sweep (delaying) and then against the B sweep (delayed). Then the display switches to the LEFT VERT unit and is displayed consecutively against the A and B sweeps in the same manner. The input conditions for this mode of operation are:

Pin 4 LO-A time-base unit set for delayed operation.

Pin 8 HI or LO-Vertical Alternate command changes state at HI to LO transition of Display B.

Pin 10 LO-HORIZONTAL MODE switch set to any position except A or B.

A logic diagram of the Vertical Binary stage is shown in Figure 3-13A. Several logic functions in this stage are performed by logic devices made up of discrete components. The components that make up these logic devices are identified on the logic diagram. An input/output table for the Vertical Binary stage is given in Figure 3-13B.

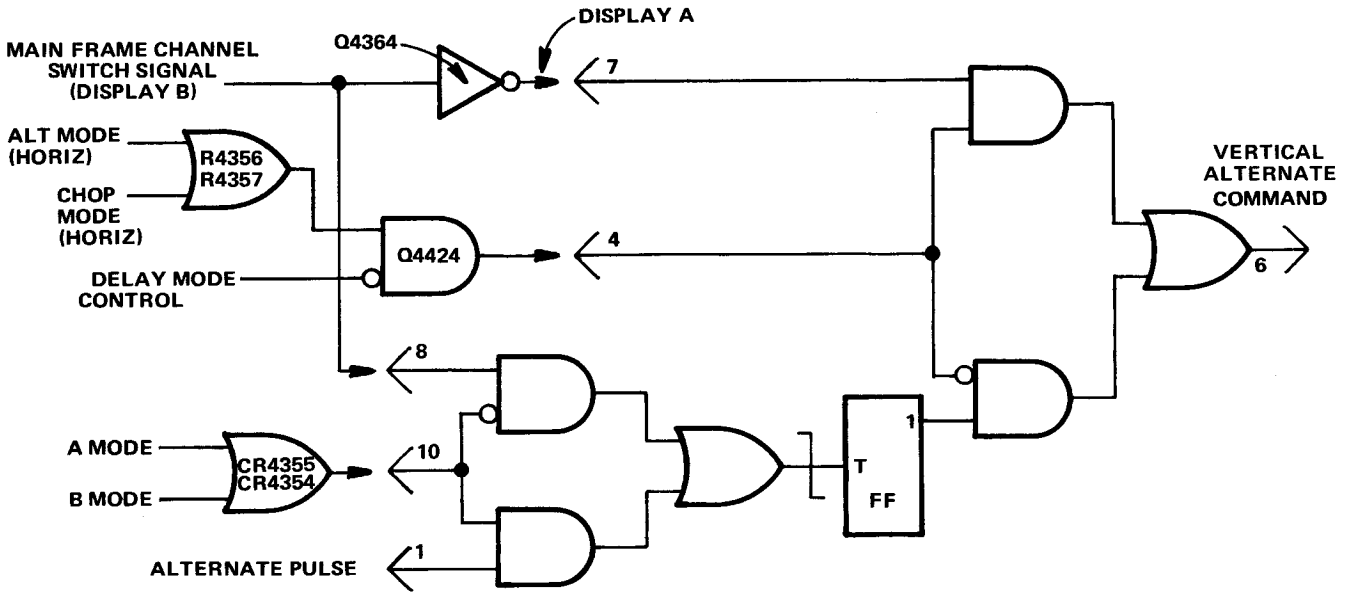
Plug-In Binary

The Plug-In Binary stage produces the Alternate Drive signal to alternate dual-trace units. Figure 3-14 identifies the function of the input pins for the Plug-In Binary IC, U4412. This stage uses the same type of integrated circuit as the Horizontal Binary and Vertical Binary stages.

When the Alternate Drive level is HI and the plug-in unit is set for alternate operation, Channel 2 of the dual-trace unit is displayed. When it is LO, Channel 1 is displayed. The repetition rate of the Alternate Drive signal is determined by the setting of the VERTICAL MODE switch. For all positions of the VERTICAL MODE switch except ALT, the Alternate Drive level is the same as the Vertical Alternate Command from the Vertical Binary stage. Since the Vertical Alternate Command is derived directly from the Display B signal, the two channels of a dual-trace vertical unit are allowed to be slaved to the time-base units (nondelayed, dual-sweep horizontal modes only) in the same manner as previously described for independent-pairs operation between the vertical and time-base units. The resultant crt presentation (when the dual-trace unit is set for alternate operation) displays the Channel 1 trace at the sweep rate of the B time-base unit and the Channel 2 trace at the sweep rate of the A time-base unit.

The Alternate Drive switches from HI to LO as the Display B signal (from the Horizontal Binary stage) switches from LO to HI, and vice versa.

When the VERTICAL MODE switch is set to ALT, the Vertical Alternate Command from the Vertical Binary stage switches the vertical display between the two vertical units. However, if either of the vertical plug-in units are dual-trace units, they can be operated in the alternate mode also. To provide a switching command to these units, the Plug-In Binary stage produces an output signal with a repetition rate that is one-half the repetition rate of the Vertical Alternate Command. The sequence of operation, when two dual-trace vertical units are installed in the vertical plug-in compartments and they are both set for alternate operation, is as follows (VERTICAL MODE and HORIZONTAL MODE switches set to ALT): 1. Channel 1 of LEFT VERT unit at sweep rate of B time-base unit, 2. Channel 1 of RIGHT VERT unit at sweep rate of A time-base unit, 3. Channel 2 of LEFT VERT unit at sweep rate of B time-base unit, 4. Channel 2 of RIGHT VERT unit at sweep rate of A time-base unit. Notice that under these conditions, both channels of the LEFT VERT unit are displayed at the



(A) U4368 4

INPUT					OUTPUT	
1	4	7	8	10	6	HORIZONTAL MODE
ALTERNATE PULSE	ALT OR CHOP MODE (HORIZ) AND NOT DELAYED MODE	DISPLAY A	(DISPLAY B)	A OR B MODE	VERTICAL ALTERNATE COMMAND	A OR B
LO ¹	LO	Φ	Φ	HI	n+1 ²	DISPLAY RIGHT
Φ	HI	HI	LO	LO	HI	DISPLAY LEFT
Φ	HI	LO	HI	LO	LO	} ALT OR CHOP, NON-DELAYED MODE (SWEEP-SLAVING)
Φ	LO	Φ	LO ¹	LO	n+1 ³		ALT OR CHOP, DELAYED MODE

Φ = HAS NO EFFECT IN THIS CASE.

n+1 = IF OUTPUT IS LO PRIOR TO LO¹ IT GOES HI, AND VICE VERSA.

¹ ACTUATED BY NEGATIVE-GOING EDGE.

² REPETITION RATE ONE-HALF ALTERNATE PULSE RATE.

³ REPETITION RATE ONE-HALF DISPLAY B RATE.

(B)

(1195-13) 1988-38

Figure 3-13. (A) Logic diagram for Vertical Binary stage; (B) Table of input/output combinations.

B-sweep rate and that both channels of the RIGHT VERT unit are displayed at the A-sweep rate. Input conditions when the VERTICAL MODE switch is set to ALT are:

Pin 8 HI or LO-Plug-In Alternate Drive signal changes state at HI to LO transition of Vertical Alternate Command pulse.

Pin 4 LO-VERTICAL MODE switch set to ALT.

Figure 3-15A shows a logic diagram of the Plug-In Binary stage. An input/output table for this stage is given in Figure 3-15B.

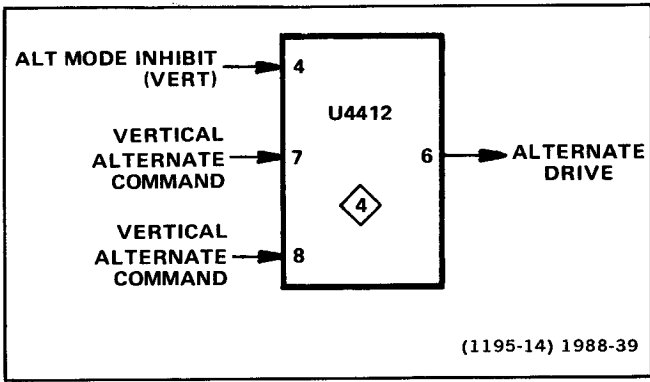
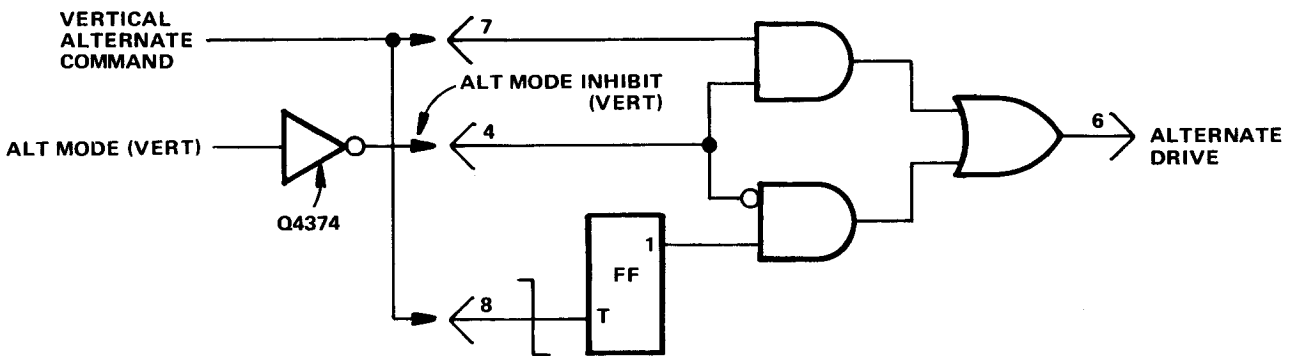


Figure 3-14. Input and output pins for Plug-In Binary IC (U4412).

Clock Generator

Part of integrated circuit U4320 along with the external components shown in Figure 3-16A make up the Clock Generator stage. R1, Q1, Q2, and Q3 represent an equivalent circuit within U4320. This circuit along with discrete components C4314-R4312-R4313-R4314 compose a two-megahertz free-running oscillator that provides a timing (Clock) signal used to synchronize the vertical, horizontal, and plug-in chopping modes.

This stage operates as follows: Assume that Q2 is conducting and Q1 is off. The collector current of Q2 produces a voltage drop across R1 to turn off Q1. This negative level at the collector of Q2 is also connected to pin 14 through Q3



(A) U4412 4

INPUT			OUTPUT	COMMENTS
ALT MODE INHIBIT (VERT)	VERTICAL ALTERNATE COMMAND	VERTICAL ALTERNATE COMMAND	ALTERNATE DRIVE	
4	7	8	6	
LO	ϕ	LO ¹	n+1 ²	ALT VERTICAL MODE
HI	LO	ϕ	LO	} ALL VERTICAL MODES EXCEPT ALT PROVIDE SWEEP-SLAVING FOR NON-DELAYED DUAL-SWEEP OPERATION.
HI	HI	ϕ	HI		CHANNEL 2 DISPLAYED

ϕ = HAS NO EFFECT IN THIS CASE.

n+1 = IF OUTPUT IS LO PRIOR TO LO¹ IT GOES HI, AND VICE VERSA.

¹ ACTUATED BY NEGATIVE-GOING EDGE.

(B) ² REPETITION RATE ONE-HALF VERTICAL ALTERNATE COMMAND RATE.

(1195-15) 1988-40

Figure 3-15. (A) Logic diagram for Plug-In Binary stage; (B) Table of input/output combinations.

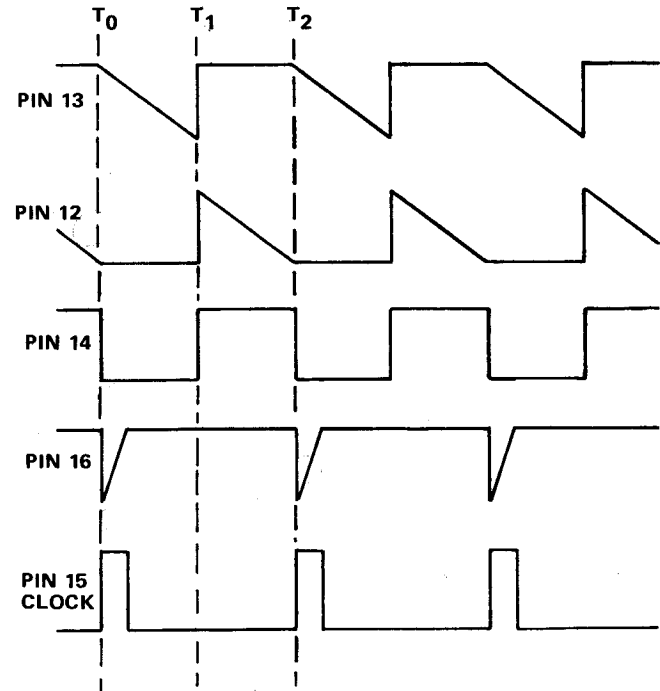
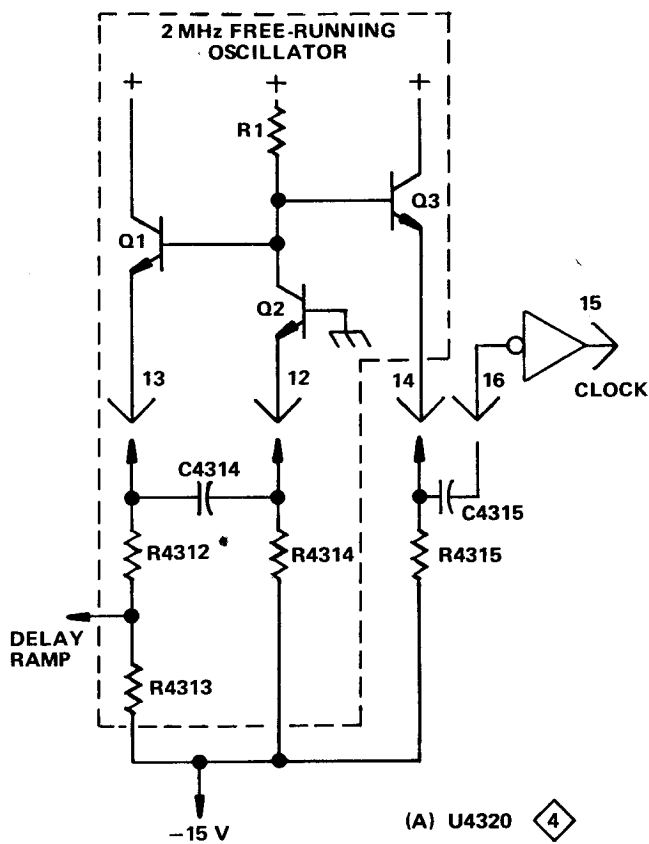


Figure 3-16. (A) Diagram of clock generator stage; (B) Idealized waveforms for clock generator stage.

(see waveforms in Figure 3-16B at time T_0). Since there is no current through Q1, C4314 begins to charge towards -15 volts through R4312-R4313. The emitter of Q1 goes negative as C4314 charges, until it reaches a level about 0.6 volts more negative than the level at its base. Then Q1 is forward biased and its emitter rapidly rises positive (see Time T_1 on waveforms). Since C4314 cannot change its charge instantaneously, the sudden change in voltage at the emitter of Q1 also pulls the emitter of Q2 positive to reverse-bias it. With Q2 reverse biased, its collector rises positive to produce a positive output level at pin 14.

Now, conditions are reversed. Since Q2 is reverse biased, there is no current through it. Therefore, C4314 can begin to discharge through R4314. The emitter level of Q2 follows the discharge of C4314, until it reaches a level of about 0.6 volt more negative than its base. Then Q2 is forward biased and its collector drops negative to reverse-bias Q1. The level at pin 14 also drops negative to complete the cycle. Once again, C4314 begins to charge through R4312-R4313 to start the second cycle.

Two outputs are provided from this oscillator. The Delay Ramp signal from the junction of R4312-R4313 is connected to the Vertical Chopped Blanking stage. This signal

has the same waveshape as shown by the waveform at pin 13; its slope is determined by the divider ratio between R4312-R4313. A wide pulse train output is provided at pin 14. The frequency of this pulse train is determined by the overall RC relationship between C4314-R4312-R4313-R4314 and its duty cycle is determined by the ratio of R4312 and R4313 to R4314.

The pulse train at pin 14 is connected to pin 16 through C4315. Capacitor C4315, along with the internal resistance of U4320, differentiates the pulse train at pin 14 to produce a narrow negative-going pulse coincident with the falling edge of the pulse train (positive-going pulse coincident with rising edge has no effect on circuit operation). This negative-going pulse is connected to pin 15 through an inverter-shaper that is also part of U4320A. The output at pin 15 is a positive-going clock pulse with a repetition rate of about two megahertz.

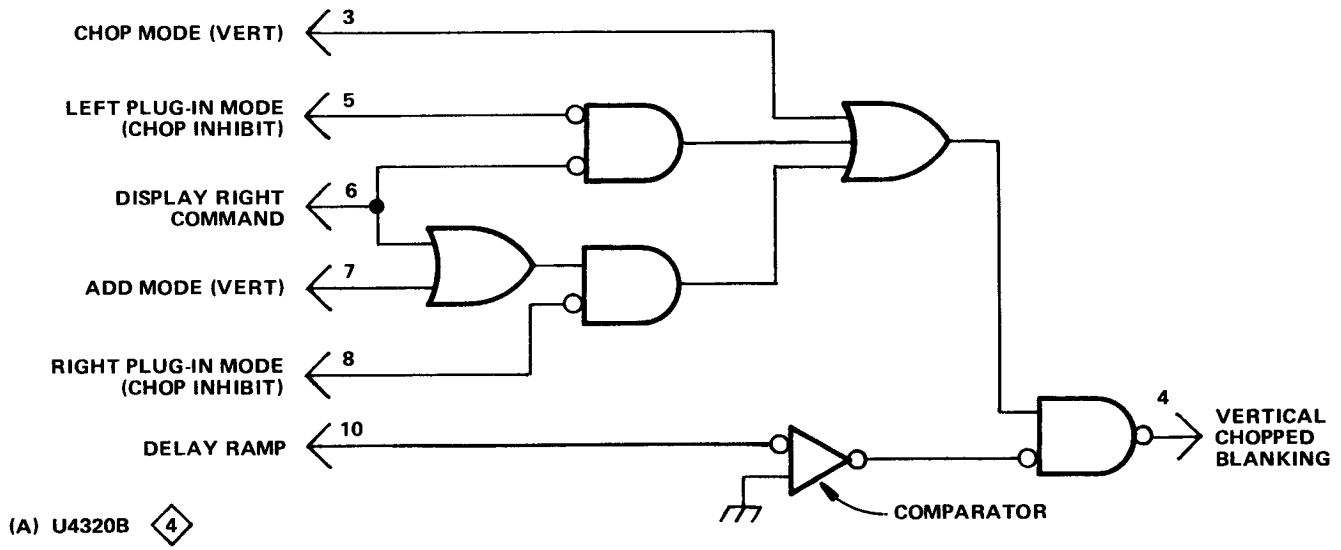
Vertical Chopped Blanking

The Vertical Chopped Blanking stage is made up of the remainder of U4320. This stage determines if Vertical Chopped Blanking pulses are required, based upon the operating mode of the vertical system or the plug-in units (dual-trace units only). Vertical Chopped Blanking pulses are

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produced if: 1. VERTICAL MODE switch is set to CHOP; 2. Dual-trace vertical unit is operating in the chopped mode and is being displayed; 3. Dual-trace vertical unit operating in the chopped mode with the VERTICAL MODE switch set to ADD. The repetition rate of the negative-going Vertical Chopped Blanking pulse output at pin 4 is two megahertz for all of the above conditions as determined by the Clock Generator stage.

Figure 3-17 shows a logic diagram and an input/output table for the Vertical Chopped Blanking stage. Notice the comparator block on the diagram. The output of this comparator is determined by the relationship between the levels of its inputs. If pin 10 is more positive (HI) than the grounded input, the output is HI also: if it is more negative, the output is LO.



INPUT						OUTPUT	
CHOP MODE (VERT)	LEFT PLUG-IN MODE (CHOP INHIBIT)	DISPLAY RIGHT COMMAND	ADD MODE (VERT)	RIGHT PLUG-IN MODE (CHOP INHIBIT)	DELAY RAMP	VERTICAL CHOPPED BLANKING	CONDITIONS
3	5	6	7	8	10 ¹	4 ²	
HI	Φ	Φ	LO	Φ	LO	LO	CHOP MODE (VERT)
LO	LO	LO	LO	Φ	LO	LO	LEFT PLUG-IN CHOPPED
LO	Φ	HI	LO	LO	LO	LO	RIGHT PLUG-IN CHOPPED
LO	LO ³	LO	HI	LO ³	LO	LO	ADD MODE, LEFT OR RIGHT PLUG-IN CHOPPED
ALL OTHER COMBINATIONS						HI	NO VERTICAL CHOPPED BLANKING PULSES AT OUTPUT

Φ = HAS NO EFFECT IN THIS CASE

¹ RAMP SIGNAL; CONSIDERED LO WHEN MORE NEGATIVE THAN ABOUT ZERO VOLTS.

² NEGATIVE-GOING PULSE AT TWO MEGAHERTZ RATE.

(B) ³ PIN 5 CAN BE HI AND NOT AFFECT OPERATION IF PIN 8 IS LO, AND VICE VERSA.

(1195-17) 1988-42

Figure 3-17. (A) Logic diagram for Vertical Chopped Blanking stage; (B) Table of input/output combinations.

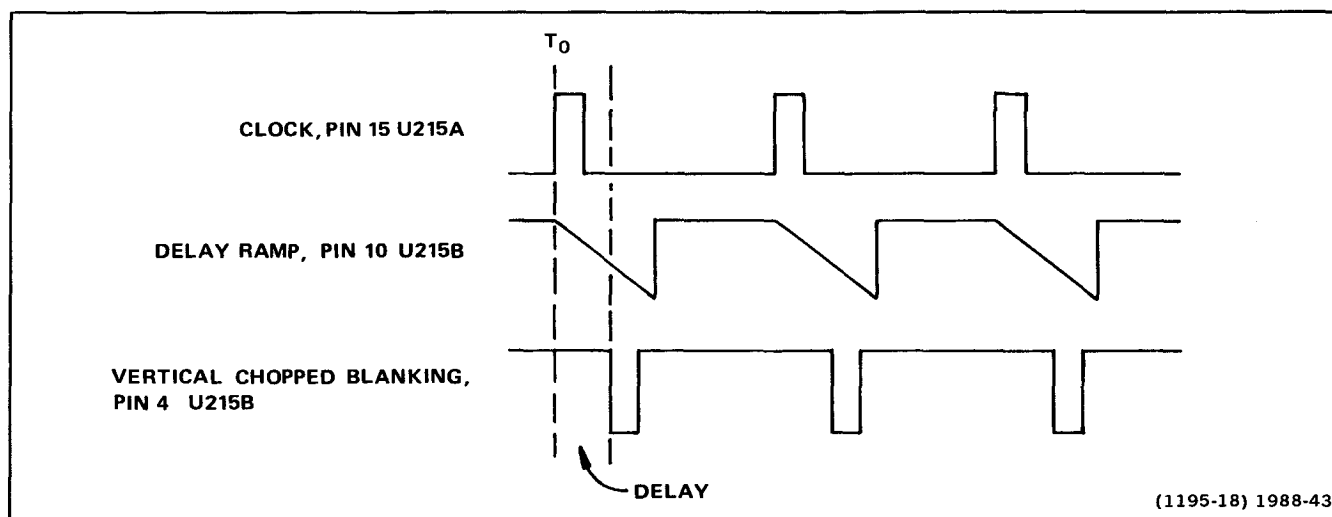


Figure 3-18. Idealized waveforms for Vertical Chopped Blanking stage.

The Delay Ramp signal from the Clock Generator stage determines the repetition rate and pulse width of the Vertical Chopped Blanking pulses. The Delay Ramp applied to pin 10 starts to go negative from a level of about +1.1 volts coincident with the leading edge of the Clock pulse (see waveforms in Fig. 3-18). This results in a HI quiescent condition for the Vertical Chopped Blanking pulse. The slope of the negative-going Delay Ramp is determined by the Clock Generator stage. As it reaches a level slightly negative from ground, the Vertical Chopped Blanking pulse output level changes to the LO state and remains LO until the Delay Ramp goes HI again.

Notice the delay between the leading edge of the Clock pulse generated by U4320A, and the leading edge of the Vertical Chopped Blanking pulses. The amount of delay between the leading edges of these pulses is determined by the Delay Ramp applied to pin 10. This delay is necessary due to the delay line in the vertical deflection system. Otherwise, the trace blanking resulting from the Vertical Chopped Blanking pulse would not coincide with the switching between the displayed traces. The duty cycle of the wide pulse train produced in the Clock Generator stage determines the pulse width of the Vertical Chopped Blanking pulses (see Clock Generator Description for more information).

Chop Counter

The Chop Counter stage U4340 produces the Vertical Chopping Signal, the Plug-In Chop Drive, and the Horizontal Chopped Blanking signal. The Clock pulse produced by the Clock Generator stage provides the timing signal for this stage. The functions of the input and output pins for the Chop Counter IC, U4340, are identified in Figure 3-19A. Idealized waveforms showing the timing relationship between the input and output signals for this stage are shown in Figure 3-19B.

The repetition rate of the output signals from this stage is determined by the setting of the HORIZONTAL MODE switch. When the HORIZONTAL MODE switch is set to any position except CHOP, the repetition rate of the Vertical Chopping Signal output at pin 1 is one megahertz (one-half Clock rate). This determines the switching between the LEFT and RIGHT VERT units when the VERTICAL MODE switch is set to CHOP. At the same time, the repetition rate of the Plug-In Chop Drive at pin 8 is 0.5 megahertz (one-fourth Clock rate). This provides a chopping signal for switching between the two channels of dual-trace vertical units. The relationship between these output signals and the Clock input is shown by the waveforms in Figure 3-19B during the time between T_0 and T_1 . During this time, the level at pin 4 remains HI.

When the HORIZONTAL MODE switch is set to CHOP, the basic repetition rate of the Vertical Chopping Signal and the Plug-In Chop Drive is altered. For example, if the HORIZONTAL MODE switch is changed to the CHOP position at time T_1 (see Fig. 3-19B), a HI level is applied to pin 6. This stage continues to produce outputs at pins 1 and 8 in the normal manner until both outputs are at their HI level. (See time T_2 ; this condition only occurs once every fifth Clock pulse and only when the HORIZONTAL MODE switch is set to CHOP.) When both of these outputs are at their HI level, the next Clock pulse switches both outputs LO, and at the same time switches the Horizontal Chopped Blanking to the LO level.

This change at time T_2 does not appear at pin 4 immediately, due to a delay network in the circuit. The delay is necessary to make the Horizontal Chopped Blanking coincide with the Vertical Chopped Blanking produced by U4320 and the switching between the displayed signals. (Compare bottom two waveforms of Fig. 3-19B; also see Vertical Chopped Blanking for further information.) After the delay

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time, the output level at pin 4 goes LO where it remains for about 0.5 microsecond which is equal to the period of the Clock pulse (two-megahertz repetition rate).

The Horizontal Chopped Blanking time must be longer than the Vertical Chopped Blanking time, since it takes more time for the display to switch between horizontal units than between vertical units. During the time that the level at pin 4 is LO, the crt is blanked and the Vertical Chopping Signal and the Plug-In Chop Drive cannot change levels. The Clock pulse at T_3 changes only the Horizontal Chopped Blanking output at pin 4. The level on this pin goes HI after the delay time to unblank the crt.

For the next three Clock pulses, the Vertical Chopping Signal output and Plug-In Chop Drive operate in the normal manner. However, just prior to the fourth Clock pulse (time T_4), both outputs are again at their HI level. The fourth clock pulse at T_4 switches the output at pin 1, pin 8, and pin 4 (after delay) to the LO level to start the next cycle. Notice that a Horizontal Chopped Blanking pulse is

produced at pin 4 with every fifth Clock pulse. Also notice that with the HORIZONTAL MODE switch set to CHOP, two complete cycles of the Vertical Chopping Signal are produced with each five Clock pulses (repetition rate two-fifths clock rate) and one complete cycle of the Plug-In Chop Drive for every five clock pulses (one-fifth clock rate). Notice that the large shaded area produced by the Horizontal Chopped Blanking pulse (see Fig. 3-19B) is not part of the display time (crt display blanked). However, about the same time segment is displayed from the vertical signal source with or without Horizontal Chopped Blanking, due to the change in repetition rate with the HORIZONTAL MODE switch set to CHOP.

The Vertical Chopping Signal at pin 1 of U4340 is connected to the Vertical Mode Logic stage (see following description) through LR4342. This signal is HI when the RIGHT VERT unit is to be displayed and it is LO when the LEFT VERT unit is to be displayed. The Plug-In Chop Drive at pin 8 is connected to the plug-in units in the vertical compartments through LR4344, via the Main Interface board. When this signal is HI, Channel 2 of the plug-in units can be displayed;

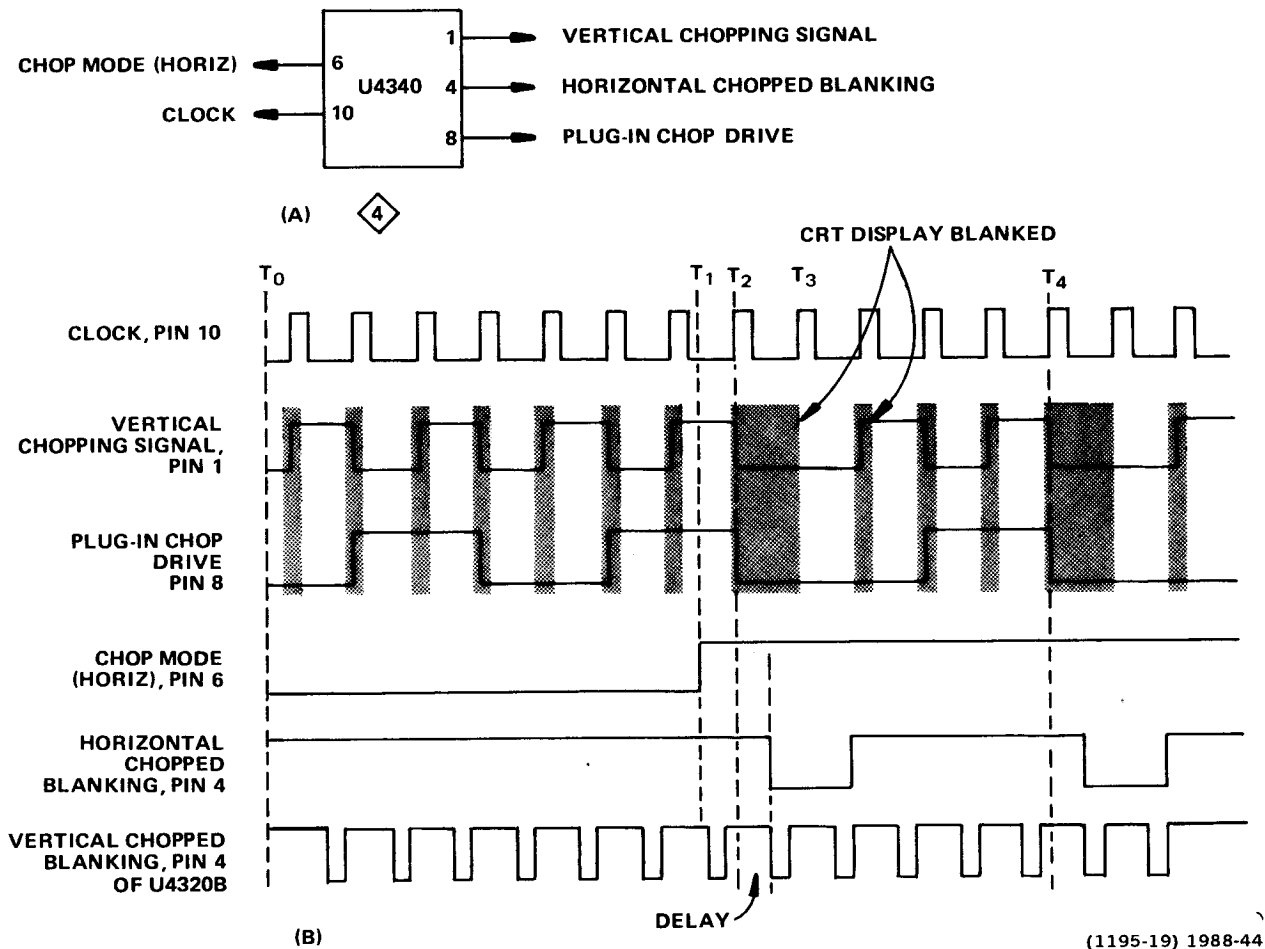


Figure 3-19. (A) Input and output pins for Chop Counter IC, U4340; (B) Idealized waveforms for Chop Counter stage.

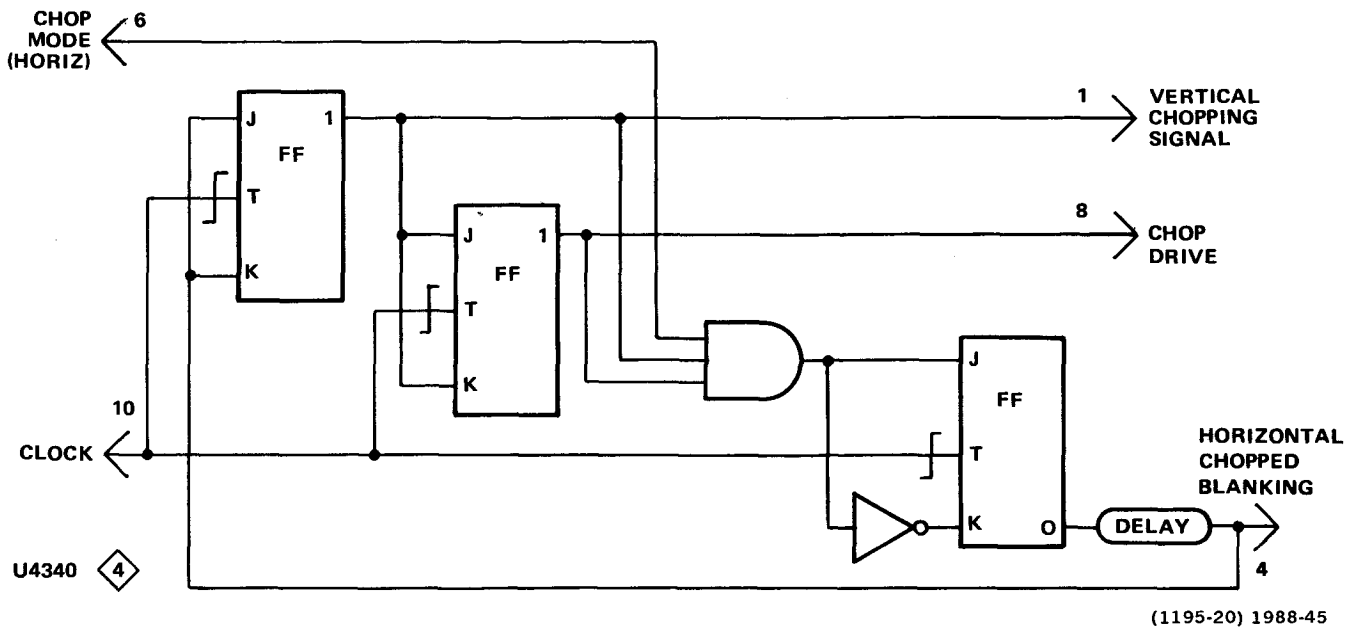


Figure 3-20. Logic diagram of Chop Counter stage.

when this level is LO, Channel 1 can be displayed. The Horizontal Chopped Blanking signal at pin 4 is connected through LR4338 to the Horizontal Binary stage U4358, and to the Z-Axis Logic stage U4494 by way of Q4336. When this signal is HI, the crt is unblanked to display the selected signal. When it is LO, the crt is blanked to allow switching between the horizontal units.

A logic diagram of the Chop Counter stage is shown in Figure 3-20. Details of operation for the flip-flops (FF) are shown in Table 3-1 at the front of this section. Use the waveforms given in Figure 3-19B along with this diagram.

Vertical Mode Logic

The Vertical Mode Logic stage is made up of discrete components CR4323-CR4322, CR4369-CR4368 and buffer Q4382-Q4392. These components develop the Main Frame Channel Switch signal (Display Right), which is connected to the Main Interface, Vertical Interface, and Trigger Select-or circuits to indicate which vertical unit is to be displayed. When this output level is HI, the RIGHT VERT unit is displayed; when it is LO, the LEFT VERT unit is displayed.

The VERTICAL MODE switch shown on diagram 2 provides control levels to this stage. This switch provides a HI level on only one of five output lines to indicate the selected vertical mode; the remaining lines are LO. Notice that only four of the lines from the VERTICAL MODE switch are connected to the Logic circuit. Operation of this stage is as follows:

When the VERTICAL MODE switch is set to RIGHT, a HI level is connected to the base of Q4382 through R4321. This forward biases Q4382, and the positive-going level at its emitter is connected to the emitter of Q4392. The collector of Q4392 goes HI to indicate that the RIGHT VERT unit is to be displayed. For the CHOP position of the VERTICAL MODE switch, a HI level is applied to the anodes of CR4323-CR4322 through R4322. Both diodes are forward biased so that the Vertical Chopping Signal from pin 1 of U4340 can pass to the base of Q4382. This signal switches between the HI and LO levels at a one-megahertz rate and produces a corresponding Display Right output at the collector of Q4392. When the output is HI, the RIGHT VERT unit is displayed and when it switches to LO, the LEFT VERT unit is displayed.

In the ALT position of the VERTICAL MODE switch, a HI level is applied to the anodes of CR4369-CR4368 through R4369. These diodes are forward biased so the Vertical Alternate Command from pin 6 of the Vertical Binary stage can pass to the base of Q4382 to determine the Display Right level. The Vertical Alternate Command switches between its HI and LO levels at a rate determined by the Vertical Binary stage.

The control levels in the LEFT and ADD positions of the VERTICAL MODE switch are not connected to this stage. However, since only the line corresponding to the selected vertical mode can be HI, the RIGHT, CHOP, and ALT lines must remain at their LO level when either LEFT or ADD are selected. Therefore, the base of Q4382 remains LO to produce a LO Display Right output level at the collector of Q4392.

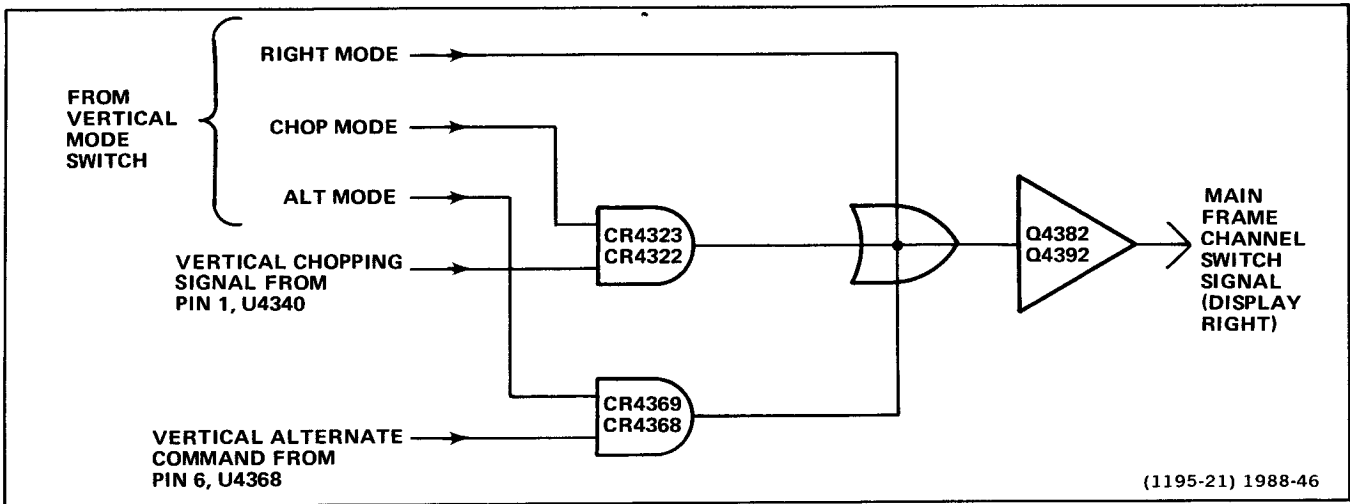


Figure 3-21. Logic diagram of Vertical Mode Logic stage.

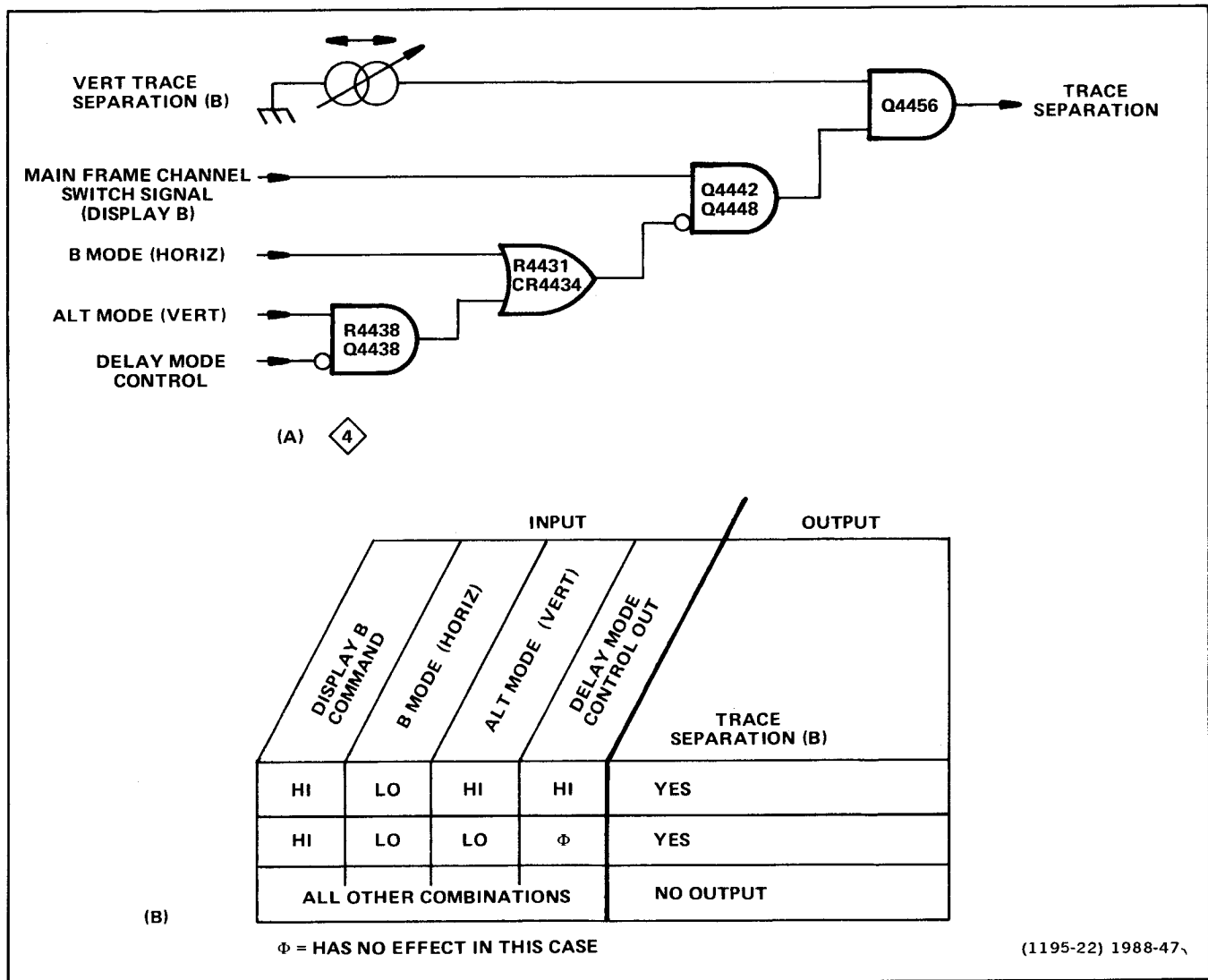


Figure 3-22. (A) Logic diagram of Trace Separation stage; (B) Table of input/output combinations.

A logic diagram of the Vertical Mode Logic stage is shown in Figure 3-21. The discrete components that make up each logic function are identified.

Trace Separation

The Trace Separation stage is made up of discrete components Q4438, Q4442, Q4448 and Q4456. This stage produces the Trace Separation output to the Vertical Amplifier circuit to offset the B-sweep display when operated in a dual-sweep mode (horizontal). The level of this output current is determined by the setting of the VERT TRACE SEPARATION (B) control. The current from the VERT TRACE SEPARATION (B) control is switched so that the Trace Separation output is provided only when the B sweep is being displayed in the ALT or CHOP horizontal modes and not when the B sweep only is being displayed, nor for independent-pairs operation (sweep slaving). Operation of this stage is as follows:

The VERT TRACE SEPARATION (B) control provides current to the Trace Separation output through R4456 and Q4456 when Q4456 is forward biased. When the B sweep is being displayed (for ALT or CHOP horizontal operation), the Display B signal at the base of Q4442 is HI. This forward biases Q4442 causing its collector to go negative to forward-bias Q4448. This causes Q4448 to saturate and its collector goes positive to forward bias Q4456. During the time the A sweep is being displayed, the Display B signal is LO. This reverse biases Q4442 and Q4448; Q4456 is reverse biased, the VERT TRACE SEPARATION (B) control is disconnected while the A sweep is being displayed.

When the HORIZONTAL MODE switch is set to B (only), a HI level is connected to the emitter of Q4442 through R4431. This reverse biases Q4442 even though Display B at its base is HI for this mode. Therefore, the VERT TRACE SEPARATION (B) control has no effect. When the VERTICAL MODE switch is set to ALT and the Delay Mode Control Out level from the A time-base unit is LO (indicating non-delayed sweep operation), a HI level is applied to the emitter of Q4442 through R4438 and CR4434. This HI level reverse biases Q4442 even though the Display B level is HI. This action disconnects the VERT TRACE SEPARATION (B) control for independent-pairs operation so that the vertical position of the B sweep display is determined by the slaved LEFT VERT plug-in unit only. If delayed-sweep operation is selected, the Delay Mode Control level is

HI to forward bias Q4438 and Q4443. This allows the VERT TRACE SEPARATION (B) control to position the B sweep display, since independent-pairs operation is not possible when operating in a delayed-sweep mode.

A logic diagram of the Trace Separation stage is shown in Figure 3-22A. The discrete components which make up each logic function are identified. An input/output table for this stage is given in Figure 3-22B.

A TRIGGER SELECTOR 5

The A Trigger Selector circuit determines the source of the internal triggering signals connected to the A HORIZ plug-in compartment. Figure 3-23 shows a detailed block diagram of the A Trigger Selector circuit. A schematic of the A Trigger Selector circuit is shown on diagram 5, at the rear of this manual.

A Trigger Channel Switch

The A Trigger Channel Switch provides control signals for the Left and Right Trigger Preamplifier stages. The front-panel A TRIGGER SOURCE switch (S352) provides the control signals to operate the A Trigger Channel Switch. When the A TRIGGER SOURCE is set to LEFT, the A Trigger Channel Switch allows the Left Trigger Preamplifier to pass trigger signals from the LEFT VERT plug-in compartment to the A Trigger Output Amplifier. When the A TRIGGER SOURCE switch is set to RIGHT, the A Trigger Channel Switch allows the Right Trigger Preamplifier to pass trigger signals from the RIGHT VERT plug-in compartment to the A Trigger Output Amplifier. When the A TRIGGER SOURCE switch is set to VERT MODE, the A Trigger Channel Switch allows the Left and Right Trigger Preamplifier stages to pass trigger signals from the LEFT and RIGHT VERT plug-in compartments to the A Trigger output Amplifier.

Table 3-2 shows the input and output conditions of the A Trigger Channel Switch, for each combination of the A TRIGGER SOURCE switch and VERTICAL MODE switch. Notice that only the A TRIGGER SOURCE switch controls the output to U520 and U580 when in the LEFT or RIGHT VERT positions. Also, Notice that the VERTICAL MODE switch determines the output when the A TRIGGER SOURCE switch is in the VERT MODE position.

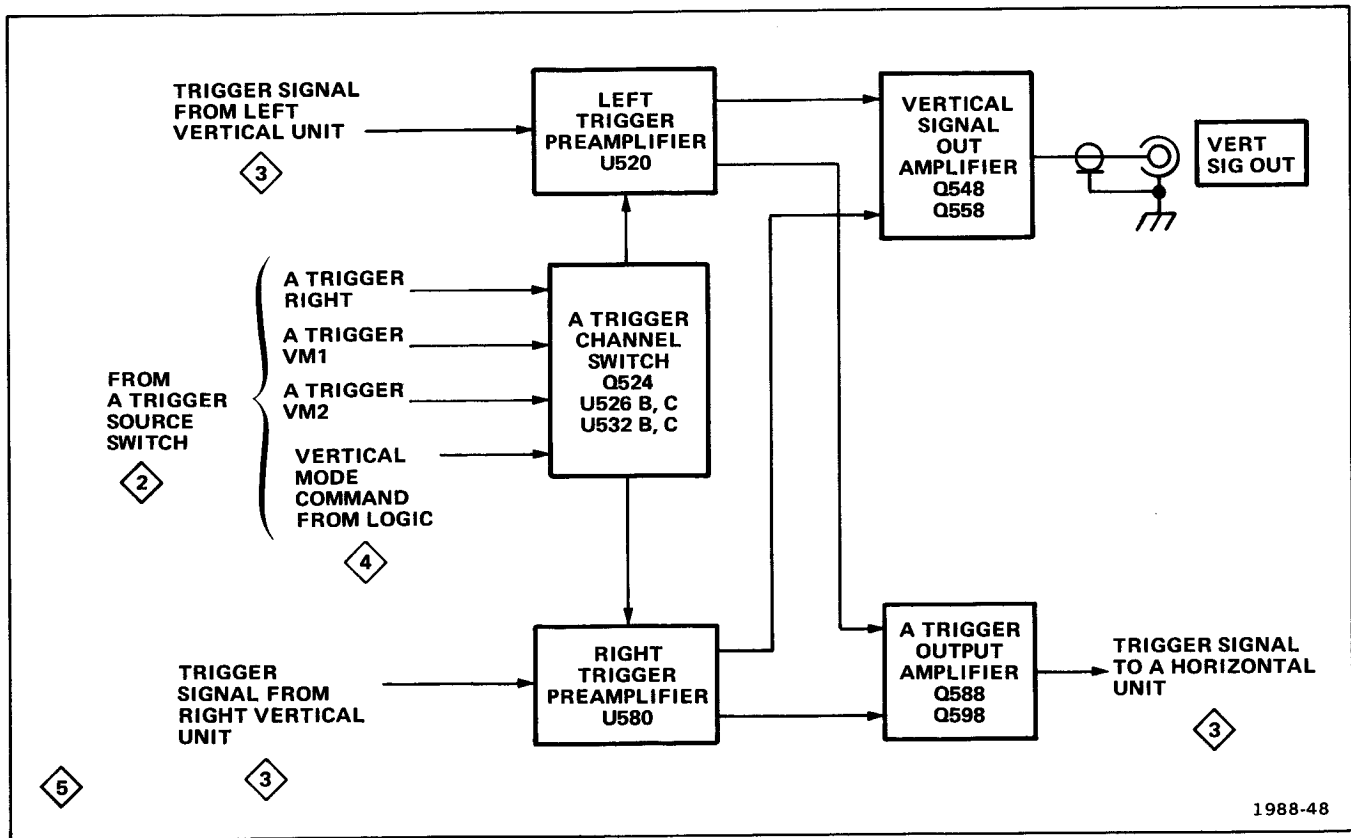


Figure 3-23. Detailed block diagram of the A Trigger Selector circuit.

TABLE 3-2
Input/Output Combinations for A Trigger Channel Switch

A TRIGGER SOURCE Switch Positions	VERTICAL MODE Switch Positions	Vertical Mode Command (HI = 1 V, LO = -0.5 V)	A Trigger			A Trigger Channel Switch Output to U520 and U580			
			Right (HI = 5 V, LO = GND)	VM1 (HI = 4.4 V, LO = -0.6 V)	VM2 (HI = 4.4 V, LO = -0.5 V)	U520		U580	
						Pin 11	Pin 12	Pin 11	Pin 12
LEFT VERT	Φ^1	Φ^1	LO	Open	Open	LO	HI	HI	LO
RIGHT VERT	Φ^1	Φ^1	HI	Open	Open	HI	LO	LO	HI
VERT MODE	LEFT	LO	LO	LO	LO	LO	HI	HI	LO
	ALT	ALT ²	LO	HI	LO	ALT ²	ALT ²	ALT ²	ALT ²
	ADD	Φ^1	LO	LO	HI	LO	HI	LO	HI
	CHOP	Φ^1	LO	LO	HI	LO	HI	LO	HI
	RIGHT	HI	LO	HI	LO	HI	LO	LO	HI

¹ Φ —Has no effect in this case.

² Switches between HI and LO at a rate determined by the sweep speed of time-base unit(s) installed in the horizontal compartment(s).

Left and Right Trigger Preamplifiers

The operation of the Left and Right Trigger Preamplifiers is similar. Therefore only a discussion of the Left Trigger Preamplifier is given.

The Left Trigger Preamplifier U520 operates as a switching amplifier. Trigger signals from the LEFT VERT compartment are connected to the input pins 1 and 13 (U520). The logic levels applied to pins 11 and 12, determine if the trigger signal is coupled from the input to the output (pins 9 and 5) or is terminated within the stage. Table 3-2 shows the logic level combinations applied to pins 11 and 12 of both U520 and U580, with all combinations of the A TRIGGER SOURCE switch and the VERTICAL MODE switch. When pin 11 is HI and pin 12 is LO, trigger signals are coupled through the stage. When pin 11 is LO and pin 12 is HI, signals are terminated within the stage.

A Trigger Output Amplifier

The A Trigger Output Amplifier provides the internal trigger signal to the A HORIZ compartment. Transistors Q585 and Q598 are connected as a paraphase amplifier. The DC Center adjustment R586 balances the emitter current of Q588 and Q598 for equal dc output levels. Gain adjustment R589 sets the emitter degeneration of Q588 and Q598 to adjust the gain of the A Trigger Output Amplifier. Components R596 and C596 are selected for optimum amplifier bandwidth. The output impedance of this stage is 100 ohms differentially, determined primarily by R584 and R594.

Vertical Signal Out Amplifier

The Vertical Signal Out Amplifier provides the signal to the VERT SIG OUT connector, located on the rear panel. Transistors Q548 and Q558 are connected as a push-pull to single-phase converter. The DC Center adjustment, R547, sets the emitter current of Q548 and Q558 which determines the quiescent dc output voltage at J548. The source of the output signal is determined by the A TRIGGER SOURCE switch and the VERTICAL MODE switch as shown in Table 3-2.

B TRIGGER SELECTOR

The B Trigger Selector circuit determines the source of the internal triggering signals connected to the B HORIZ plug-in compartment. Figure 3-24 shows a detailed block diagram of the B Trigger Selector circuit. A schematic of the B Trigger Selector circuit is shown on diagram 6, at the rear of this manual.

B Trigger Channel Switch

The B Trigger Channel Switch provides control signals for the Left and Right Trigger Preamplifier stages. The front-

panel B TRIGGER SOURCE switch (S352) provides the control signals to operate the B Trigger Channel Switch. When the B TRIGGER SOURCE is set to LEFT, the B Trigger Channel switch allows the Left Trigger Preamplifier to pass trigger signals from the LEFT VERT plug-in compartment to the B Trigger Output Amplifier. When the B TRIGGER SOURCE switch is set to RIGHT, the B Trigger Channel Switch allows the Right Trigger Preamplifier to pass trigger signals from the RIGHT VERT plug-in compartment to the B Trigger Output Amplifier. When the B TRIGGER SOURCE switch is set to VERT MODE, the B Trigger Channel Switch allows the Left and Right Trigger Preamplifier stages to pass trigger signals from the LEFT and RIGHT VERT plug-in compartments to the B Trigger Output Amplifier.

Table 3-3 shows the input and output conditions of the B Trigger Channel Switch, for each combination of the B TRIGGER SOURCE switch and the VERTICAL MODE switch. Notice that only the B TRIGGER SOURCE switch controls the output to U620 and U680 when in the LEFT or RIGHT VERT positions. Also, notice that the VERTICAL MODE switch determines the output when the B TRIGGER SOURCE switch is in the VERT MODE position.

Left and Right Trigger Preamplifiers

The operation of the Left and Right Trigger Preamplifiers is similar. Therefore, only a discussion of the Left Trigger Preamplifier is given.

The Left Trigger Preamplifier U620 operates as a switching amplifier. Trigger signals from the LEFT VERT compartment are connected to the input pins 1 and 13 (U620). The logic levels applied to pins 11 and 12, determine if the trigger signal is coupled from the input to the output (pins 9 and 5) or is terminated within the stage. Table 3-3 shows the logic level combinations applied to pins 11 and 12 of both U620 and U680, with all combinations of the B TRIGGER SOURCE switch and the VERTICAL MODE SWITCH. When pin 11 is HI and pin 12 is LO, trigger signals are coupled through the stage. When pin 11 is LO and pin 12 is HI, trigger signals are terminated within the stage.

B Trigger Output Amplifier

The B Trigger Output Amplifier provides the internal trigger signal to the B HORIZ compartment. Transistors Q688 and Q698 are connected as a paraphase amplifier. The DC Center adjustment R686 balances the emitter current of Q688 and Q698 for equal dc output levels. Gain adjustment R689 sets the emitter degeneration of Q688 and Q698 to adjust the gain of the B Trigger Output Amplifier. Components R696 and C696 are selected for optimum amplifier bandwidth. The output impedance of this stage is 100 ohms differentially, determined primarily by R684 and R694.

VERTICAL INTERFACE 7

The Vertical Interface circuit selects the vertical deflection signal from the output of the LEFT and/or RIGHT VERT plug-in compartment(s) for display on the crt. Figure 3-25 shows a detailed block diagram of the Vertical Interface circuit. A schematic of the Vertical Interface circuit is shown on diagram 7, at the rear of this manual.

Left and Right Vertical Channel

The operation of the Left and Right Vertical Channel stages are identical. Therefore, only a discussion of the Left Vertical Channel stage is given.

The Left Vertical Channel stage operates as a switched amplifier. The vertical deflection signal from the left vertical plug-in unit is either terminated within the stage or coupled through to the Vertical Amplifier (diagram 14) as determined by the VERTICAL MODE switch. This stage is made up primarily of integrated circuit U4625. The input pins 13 and 16 provide a differential input for the signal from the left vertical plug-in unit. The output signal at pins 5 and 8 is a differential signal, which is connected to J4688 and J4689. Resistors R4625 and R4627 provide termination for

the left vertical signal when pin 3 is LO and pin 10 is HI; in this condition the vertical signal is now allowed to pass through the stage to the Vertical Amplifier circuit. Resistors R4610 and R4611 are selected in conjunction with C4610 and C4611 for optimum bandwidth of the stage.

Vertical Channel Selector

The Vertical Channel Selector controls the Left and Right Vertical Channel stages. The control signals are applied to U4625 and U4685 through pins 3 and 10 of both stages. When the VERTICAL MODE switch is set to LEFT, the Vertical Mode Command signal is LO. This level allows the signal from the left vertical unit to pass to the output while the signal from the right vertical unit is blocked. In the RIGHT position of the VERTICAL MODE switch, the Vertical Mode Command signal is HI. Now, the signal from the right vertical unit is connected to the output, while the signal from the left vertical unit is blocked.

When the VERTICAL MODE switch is set to either ALT, or CHOP, the Vertical Mode Command signal switches between the LO and HI levels at a rate determined by either the Chop Counter or Vertical Binary stages (see Logic Circuit description). This action allows the signal from the

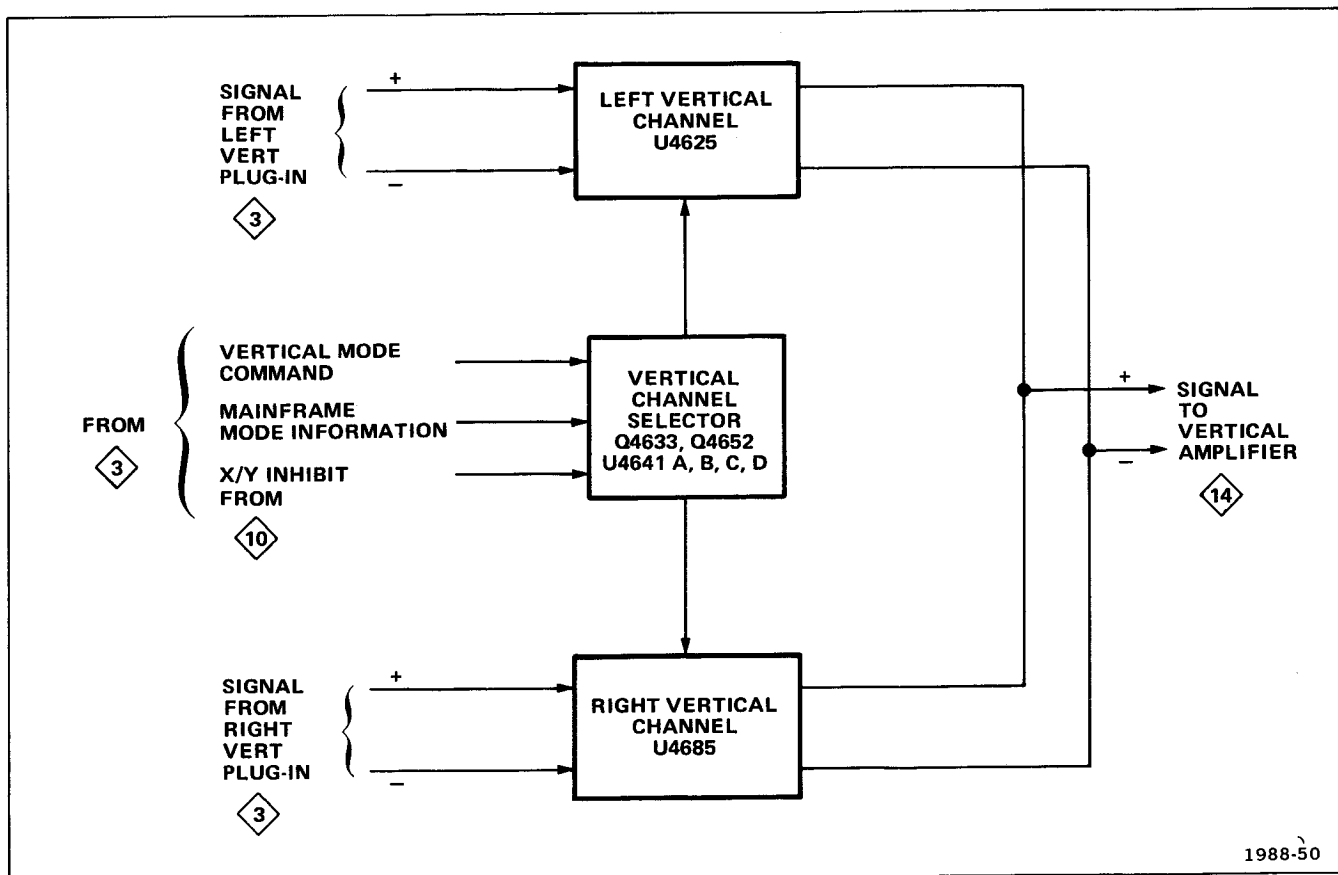


Figure 3-25. Detailed block diagram of the Vertical Interface circuit.

left vertical unit to be displayed when the Vertical Mode Command signal is LO and the signal from the right vertical unit to be displayed when the Vertical Mode Command signal is HI. When ADD vertical mode operation is selected, the Mainframe Mode Information signal is HI. This allows both the Right and Left Vertical signals to pass to the output. Now, the signal from both vertical units is algebraically added and the resultant signal determines the vertical deflection. The X/Y Inhibit signal from the Readout System has absolute control over the output from this stage. Quiescently, this signal is LO and the signal from the selected vertical unit can pass to the output. However, when the Readout System is ready to display information on the crt, this level goes HI, to block the signals from both vertical units.

HORIZONTAL INTERFACE

The Horizontal Interface circuit determines whether the signal from the output of the A horizontal or B horizontal plug-in unit provides the horizontal deflection signal. This circuit also accepts an input from the Readout System (diagram 10), which blocks the horizontal signal while the readout display is presented on the crt. A schematic of the Horizontal Interface circuit is given on diagram 8 at the rear of this manual. Refer to diagram 8 during the following discussion of the Horizontal Interface circuit.

B Horizontal X-Y Delay Compensation

The Horizontal Interface circuit includes the X-Y Compensation network (Option 2 only). This network provides a delay for the horizontal (X) signal from the B HORIZ plug-in compartment to match the delay of the vertical (Y) signal due to the delay line. The horizontal (X) signal from the A HORIZ plug-in compartment is coupled directly to the Horizontal Interface, without a delay compensation network.

TIME-BASE OPERATION. When the plug-in unit installed in the B HORIZ compartment is operated as a standard time-base unit to produce a horizontal sweep for deflection of the crt beam, the B Delay Compensation network is effectively disabled. The delay disable command, applied to pin BY, is a HI and relays K822-K838 are not actuated. Therefore, the relay contacts remain in the normally-closed position so the horizontal signal will pass directly through this network to the Horizontal Channel Switch.

X-Y OPERATION. If the time-base unit installed in the B HORIZ compartment is operated as an amplifier, or if an amplifier unit is installed in the B HORIZ compartment, the delay disable command to the B Delay Compensation network drops to the LO level (zero volts). This actuates relays K822-K838 to connect the B Delay Compensation network into the circuit. The B Delay (X-Y) Compensation network is an optional feature. For instruments which are

not equipped with this feature, the B horizontal signal from the B HORIZ plug-in compartment is connected directly to the Horizontal Channel Switch (U884) through the Horizontal Interconnect board.

Horizontal Channel Switch

The Horizontal Channel Switch operates as a switched amplifier and consists primarily of U884. The differential horizontal signal from the A HORIZ plug-in compartment is applied to pins 2 and 15. The differential horizontal signal from the B HORIZ plug-in compartment is applied to pins 7 and 10. The Display B control signal determines whether the A or B horizontal signal is coupled to the output pins 12 and 13.

When the HORIZONTAL MODE switch is set to A the Display B signal, applied to pin 4 of U884, is LO. This level allows the signal from the A horizontal unit to pass to the output while the signal from the B horizontal unit is blocked. In the B position of the HORIZONTAL MODE switch, the level at pin 4 of U884 is HI. Now, the signal from the B horizontal unit is connected to the output while the signal from the A horizontal unit is blocked. When the HORIZONTAL MODE switch is set to ALT or CHOP, the Display B signal at pin 4 of U884 switches between the HI and LO levels, at a rate determined by the Horizontal Binary stage in the Logic circuit. This action allows the signals from the A horizontal unit to be displayed when the Display B signal is LO and the signal from the B horizontal unit to be displayed when it is HI.

The X/Y Inhibit signal from the Readout System, diagram 10, applied to pin 6 of U884 has absolute control over the Horizontal Channel Switch stage. Quiescently, this signal is LO to allow the signal from the selected horizontal unit to pass to the output. However, when the Readout System displays information on the crt, this signal goes HI to block the signals from both horizontal compartments.

OUTPUT SIGNALS

The Output Signals circuit provides the + SAWTOOTH OUT and + GATE OUT signal to the rear panel. These output signals are samples of signals from the associated plug-in units. A schematic of the Output Signals circuit is given on diagram 9 at the rear of this manual. Refer to diagram 9 during the following discussion.

+ Sawtooth Out

The sawtooth signals from the A and B time-base units are connected to the Sawtooth Amplifier stage through series resistors R192 and R193 respectively (see Diagram 3). Sweep Selector S3320 determines whether the A-sweep or the B-sweep sawtooth signal provides the + SAWTOOTH OUT signal. The unused sawtooth signal is terminated by R3320.

Transistors Q3321-Q3323-Q3330 compose an inverting feedback amplifier. The gain of the stage is about 2, as determined by the ratio of feedback resistor R3328 to the input resistance (made up of R3321 and either R192 or R193 depending on which sawtooth source is selected). RC network R3330-C3320 provides frequency-response stabilization for this stage.

Gate Amplifier

The + GATE OUT signal is selected from three input gate signals by the Gate Selector switch S3340. In the A and B positions a positive gate signal from the selected horizontal compartment is connected to the base of Q3351, and the base of Q3353 is connected to ground. Before a gate occurs, Q3351 is biased off and Q3353 is conducting, its collector potential is low enough to cut off Q3361. When a gate occurs, it is coupled to the emitter of Q3353, cutting it off. The current through R3358 now flows through Q3361 to produce the + GATE OUT.

In the DLY'D position, the base of Q3351 is connected to ground. The other section of the Gate Selector switch opens to allow the negative-going Delayed Gate signal from the delaying time-base unit to reach the base of Q3353. When a gate occurs, Q3353 is cut off, producing a positive-going signal at the + GATE OUT connector, as in the case of the A and B Sweep Gates.

READOUT SYSTEM



The Readout System provides an alpha-numeric display of information encoded by the plug-in units. This display is presented on the crt, and is written by the crt beam, on a time-shared basis with the analog waveform display.

The following terms are used to describe the Readout System:

Character—A single number, letter, or symbol displayed on the crt, either alone or in combination with other characters.

Word—A group of related characters. In the Readout System, a word can consist of up to 10 characters.

Frame—A display of all words for a given operating mode and plug-in combination. Up to 8 words can be displayed in one frame. Figure 3-26 shows the position of each word in a complete frame.

Column—One of the vertical lines in the Character Selection Matrix (see Fig. 3-27). Columns C-0 (column zero) through C-10 (column 10) can be addressed by the system.

Row—One of the horizontal lines in the Character Selection matrix. Rows R-1 (row 1) through R-10 (row 10) and R-14 (row 14) can be addressed by the system.

Time-Slot—A location in a pulse train. In the Readout System, the pulse train consists of 10 negative-going pulses. Each time-slot pulse is assigned a number between 1 and 10. For example, the first time-slot is TS-1.

Time-Multiplexing—Transmission of data from two or more sources over a common path by using different time intervals for different signals.

Display Format

Up to 8 words of readout information can be displayed on the crt. The position of each word is fixed and is directly related to the plug-in unit from which it originated. Figure 3-26 shows the area of the graticule where the readout from each plug-in unit is displayed. Notice that Channel 1 of each plug-in unit is displayed within the top division of the crt, and Channel 2 is displayed directly below within the bottom division. Figure 3-28 shows a typical display where only Channel 2 of the Right Vertical and B Horizontal units is selected for display.

Each word in the readout display can contain up to 10 characters, although the typical display will contain between 2 and 7 characters per word. The characters are selected from the Character Selection Matrix shown in Figure 3-27. In addition, 12 operational addresses are provided for special instructions to the Readout System. The unused

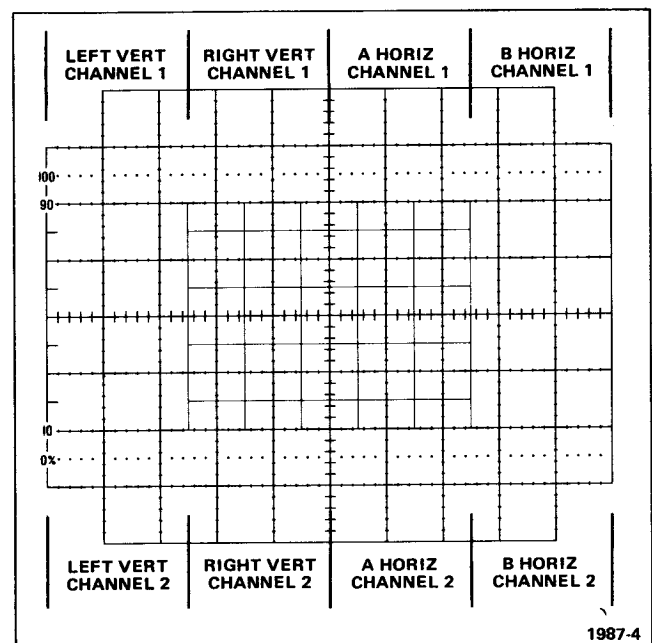


Figure 3-26. Location of readout display on the crt identifying the originating plug-in and channel.

COLUMN NUMBER	C-0	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10
ROW NUMBER	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	> 1.0
R-1	0	0	1	2	3	4	5	6	7	8	9
R-2	↕	<	I	/	/	+	-	+	C	Δ	>
R-3	ADD ¹ ONE ZERO	ADD ¹ TWO ZEROS	SHIFT ¹ PREFIX	SHIFT ¹ PREFIX AND ADD ONE ZERO							IDENTIFY ¹
R-4	m	μ	n	p	X	K		M	G	T	R
R-5	S	V	A	W	H	d		B	c	Ω	E
R-6	U	N	L	Z	Y	P		F	J	Q	D
R-7				DECIMAL ¹ POINT LOCATION NO. 3	DECIMAL ¹ POINT LOCATION NO. 4	DECIMAL ¹ POINT LOCATION NO. 5	DECIMAL ¹ POINT LOCATION NO. 6	DECIMAL ¹ POINT LOCATION NO. 7			
R-8										DECIMAL ² POINT	
R-9											
R-10	ADD SPACE IN DISPLAY ¹										

Figure 3-27. Character selection matrix for 7834 Readout System.

UNUSED LOCATIONS. AVAILABLE FOR FUTURE EXPANSION OF READOUT SYSTEM

¹ OPERATIONAL ADDRESS.

² DECIMAL POINT CHARACTER. SEE DECIMAL POINT CHARACTER DESCRIPTION IN TEXT.

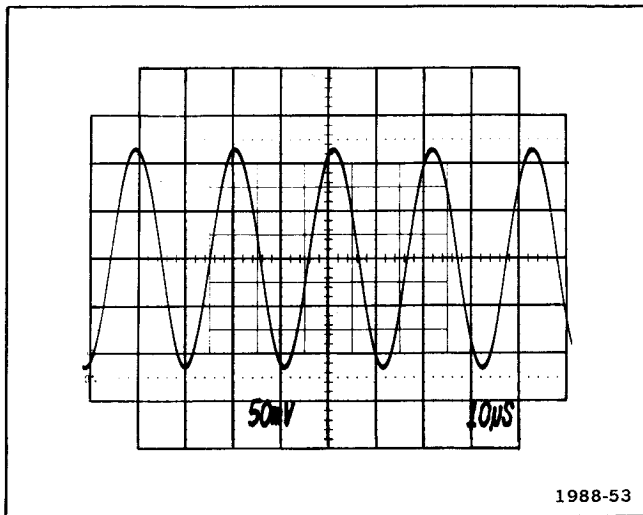


Figure 3-28. Typical readout display where only Channel 2 of the Right Vertical and B Horizontal units is displayed.

locations in the Matrix (shaded area) are available for future expansion of the Readout System. The method of addressing the locations in the Character Selection Matrix is described in the following discussion.

Developing the Display

The following basic description of the Readout System uses the block diagram shown in Figure 3-29. This description is intended to relate the basic function of each stage to the operation of the overall Readout System. Detailed information on circuit operation is given later.

The key block in the Readout System is the Timer Stage. This stage produces the basic signals that establish the timing sequences within the Readout System. The period of the timing signal is about 250 microseconds (drops to about 210 microseconds when Display-Skip is received; see detailed description of Timer stage for further information). This stage also produces control signals for other stages within this circuit and interrupt signals to the Vertical Amplifier, Horizontal Amplifier, and Logic circuits, which allow a readout display to be presented. The Time-Slot Counter stage receives a trapezoidal voltage signal from the Timer stage and directs it to one of ten output lines. These output lines are labeled TS-1 through TS-10 (time-slots 1 through 10) and are connected to the vertical and horizontal plug-in compartments as well as to various stages within the Readout System. The output lines are energized sequentially, so there is a pulse on only one of the 10 lines during any 250 microsecond timing period. After the Time-Slot Counter stage has counted time-slot 10, it produces an End-of-Word pulse which advances the system to the next channel.

Two output lines (row and column) are connected from each channel of the plug-in unit back to the Readout Sys-

tem. Data is typically encoded on these output lines by connecting resistors between them and the time-slot input lines. The resultant output is a sequence of 10 analog current levels that range from 0 to 1 milliampere (100 microamperes/step) on the row and column output lines. This row and column correspond to the row and column of the Character Selection Matrix in Figure 3-27. The standard format for encoding information onto the output lines is given in Table 3-4. (Special-purpose plug-in units may have their own format for readout; these special formats will be defined in the manuals for these units.)

The encoded column and row data from the plug-in units is selected by the Column Data Switch and Row Data Switch stages respectively. These stages take the analog current from the 8 data lines (2 channels from each of the 4 plug-in compartments) and produce a time-multiplexed analog voltage output containing all of the column and row information from the plug-ins. The Column and Data Switch and Row Data Switch are sequenced by the binary Channel Address Code from the Channel Counter.

The time-multiplexed output of the Column Data Switch is monitored by the Display-Skip Generator to determine if it represents valid information that should be displayed. Whenever information is not encoded in a time-slot, the Display-Skip Generator produces an output level to prevent the Timer stage from producing the control signals that normally interrupt the crt display and present a character.

TABLE 3-4
Standard Readout Format

Time-Slot Number	Description
TS-1	Determines Decimal Magnitude (number of zeros displayed or prefix change information) or the IDENTIFY function (no display during this time-slot).
TS-2	Indicates normal or inverted input (no display for normal).
TS-3	Indicates calibrated or uncalibrated condition of plug-in variable control (no display for calibrated condition).
TS-4	Scaling.
TS-5 TS-6 TS-7	Not encoded by plug-in unit. Left blank to allow addition of zeros by Readout System.
TS-8	Defines the prefix which modifies the units of measurement.
TS-9 TS-10	Defines the units of measurement of the plug-in unit. May be standard unit of measurement (V, A, S, etc.) or special units selected from the Character Selection Matrix.

The analog outputs of the Column Data Switch and Row Data Switch are connected to the Column Decoder and Row Decoder stages respectively. These stages sense the magnitude of the analog voltage input and produce an output current on one of ten lines. The outputs of the Column Decoder stage are identified as C-1 through C-10 (column 1 through 10) corresponding to the encoded column information. Likewise, the outputs of the Row Decoder stage are identified as R-1 through R-10 (row 1 through 10) corresponding to the encoded row information. The primary function of the row and column outputs is to select a character from the Character Selection Matrix (Fig. 3-27) to be produced by the Character Generator stage. These outputs are also used at other points within the system to indicate when certain information has been encoded. One such stage is the Zeros Logic and Memory. During time-slot 1 (TS-1), this stage checks if zero-adding or prefix-shifting information has been encoded by the plug-in unit, and stores it in the memory until time-slots 5, 6, or 8. After storing this information, it triggers the Display-Skip Generator stage so that there is no display during time-slot 1 (as defined by Standard Readout Format; see Table 3-4). When time-slots 5, 6, and 8 occur, the memory is addressed and any information stored there during time-slot 1 is transferred to the input of the Column Decoder stage to modify the analog data during the applicable time-slot.

Also, the Zeros Logic and Memory stage produces the IDENTIFY function. When time-slot 1 is encoded for IDENTIFY (column 10, row 3), this stage produces an output level, which connects the Column Data Switch and Row Data Switch to a coding network within the Readout System. Then, during time-slots 2 through 9, an analog current output is produced from the Column Data Switch and Row Data Switch, which addresses the correct points in the Character Selection Matrix (Fig. 3-27) to display the word "IDENTIFY" on the crt. The Zeros Logic and Memory stage is reset after each word by the Word Trigger pulse.

The Character Generator stages produce the characters which are displayed on the crt. Any of the 50 characters shown on the Character Selection Matrix of Figure 3-27 can be addressed by proper selection of the column and row currents. Only one character is addressable in any one time-slot; a space can be added into the displayed word by the Decimal Point Logic and Character Position Counter stage when encoded by the plug-in. The latter stage counts the number of characters generated and produces an output current to step the display one character position to the right for each character. In addition, the character position is advanced once during each of time-slots 1, 2, and 3, whether a character is generated during these time-slots or not. This action fixes the starting point of the standard-format display such that the first digit of the scaling factor always starts at the same point within each word regardless of the information encoded in time-slot 1, 2, or 3 preceding this digit. Also, by encoding row 10 and column 0 during any time-slot, a blank space can be added to the display.

Decimal points can be added to the display at any time by addressing the appropriate row and column. (See Character Selection Matrix, Fig. 3-27, for location of decimal points.) The Decimal Point Logic and Character Position Counter stage is reset after each word by the Word Trigger pulse.

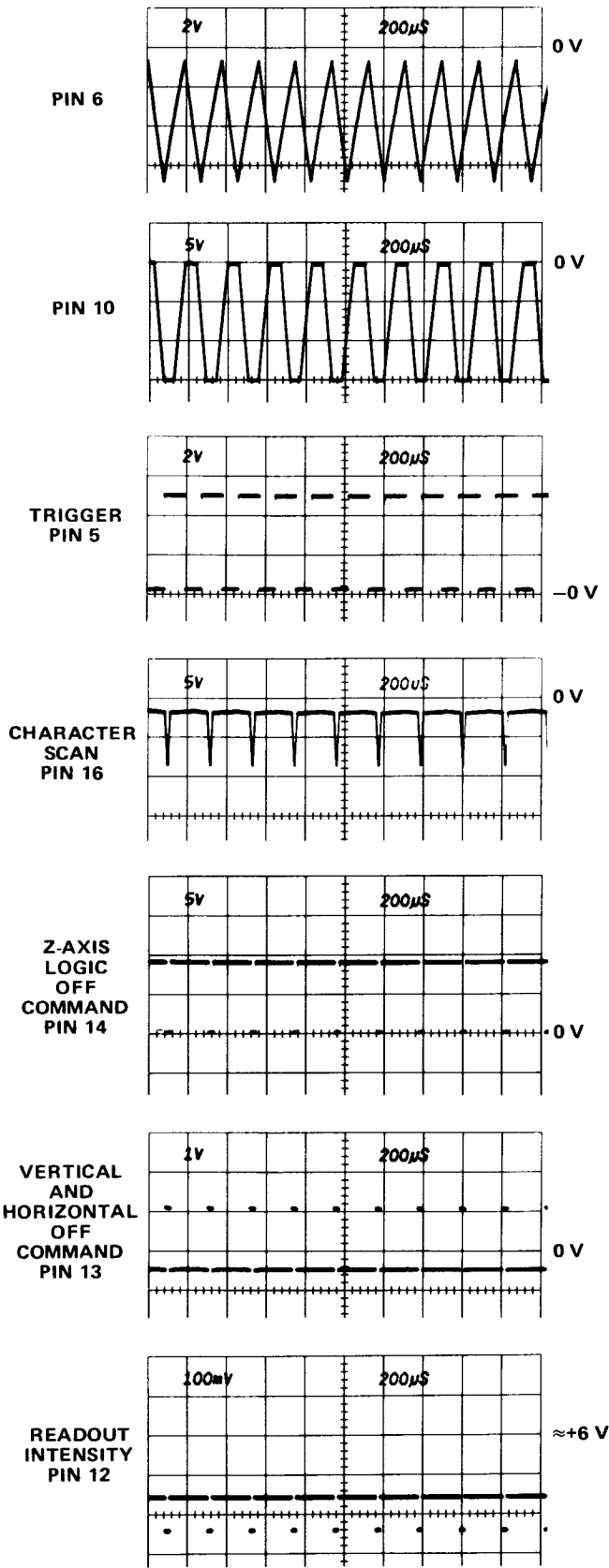
The Format Generator stage provides the output signals to the vertical and horizontal deflection systems of the instrument to produce the character display. The binary Channel Address Code from the Channel Counter stage is connected to this stage, so that the display from each channel is positioned to the area of the crt associated with the plug-in and channel originating the word (see Fig. 3-26). The positioning current or decimal point location current generated by the Decimal Point Logic and Character Position Counter stage is added to the Horizontal (X) signal at the input to the Format Generator stage to provide horizontal positioning of the characters within each word. The X- and Y-Readout signals are connected to the Horizontal Amplifier and Vertical Amplifier through the X- and Y-Buffer stages.

The Word Trigger stage produces a trigger from the End-of-Word pulse generated by the Time-Slot Counter stage after the tenth time-slot. This Word Trigger pulse advances the Channel Counter to display the information from the next channel or plug-in. It also provides a reset pulse to the Zeros Logic and Memory stage, and the Decimal Point Logic and Character Position Counter stage. This Word Trigger stage can also be advanced to jump a complete word or a portion of a word when a Jump Command is received from the Row Data Switch stage.

Timer

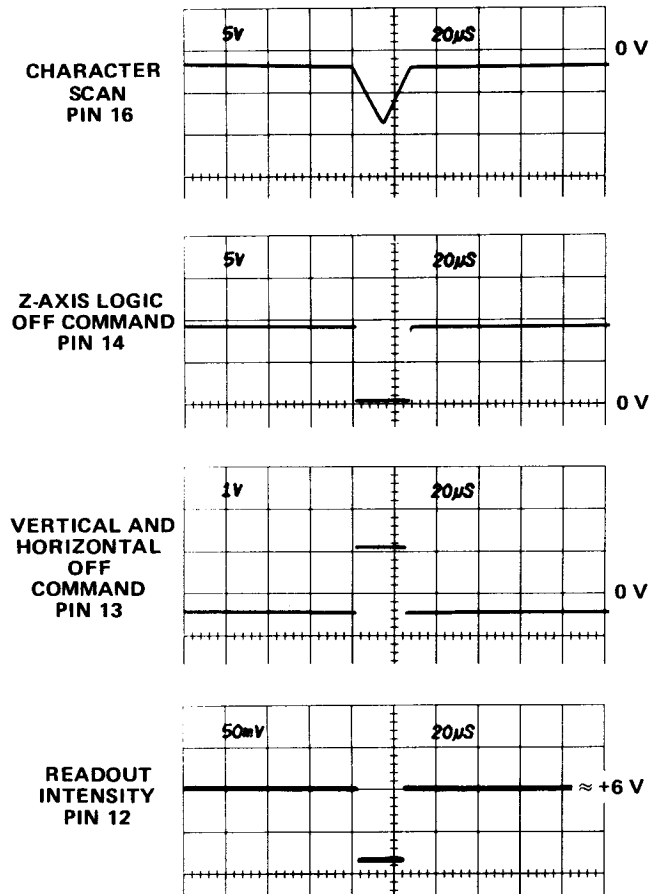
The timer stage establishes the timing sequence for all circuits within the Readout System. This stage produces 7 time-related output waveforms (see Fig. 3-30). The triangle waveform produced at pin 6 forms the basis for the remaining signals. The basic period of this triangle waveform is about 250 microseconds as controlled by RC network R3434 and C3434. The triangle waveform is clipped and amplified by U3433 to form the trapezoidal output signal at pin 10. The amplitude of this output signal is exactly 15 volts as determined by U3433 (exact amplitude necessary to accurately encode data in plug-in units; see Encoding the Data). The trigger output at pin 5 provides the switching signal for the Time-Slot Counter and Word Trigger stages.

The signals at pins 12, 13, 14, and 16 are produced only when the triangle waveform is on its negative slope and the trapezoidal waveform has reached the lower level. The timing sequence of these waveforms is important to the operation of the Readout System (see expanded waveforms in Fig. 3-31). The Z-Axis Inhibit command at pin 14 is produced first. This negative-going signal provides a blanking pulse to the Z-Axis Logic stage (see diagram 4) to blank the crt before the display is switched to the Readout System.



NOTE: TEST OSCILLOSCOPE EXTERNALLY TRIGGERED FROM TP3450 (1195-29) 1988-55

Figure 3-30. Output waveforms of the Timer stage.



NOTE: TEST OSCILLOSCOPE EXTERNALLY TRIGGERED FROM TP3450 (1195-30) 1988-56

Figure 3-31. Detail of output at pins 12, 13, 14 and 16 of U2126.

It also produces the Strobe pulse through Q3442 and CR3442 to signal other stages within the Readout System to begin the sequence necessary to produce a character. The collector level of Q3442 is also connected to Symbol Character Generator, U3463, through CR3443. This activates U3463 during the quiescent period of the Strobe pulse (collector of Q3442 negative) and diverts the output current of Row Decoder U3429 to row 2. The purpose of this configuration is to prevent the Zeros Logic and Memory stage U3401 from storing incorrect data during the quiescent period of the Strobe pulse. When the Strobe pulse goes positive, CR3443 is reverse-biased to disconnect Q3442 from U3463 and allow the Row Decoder to operate in the normal manner.

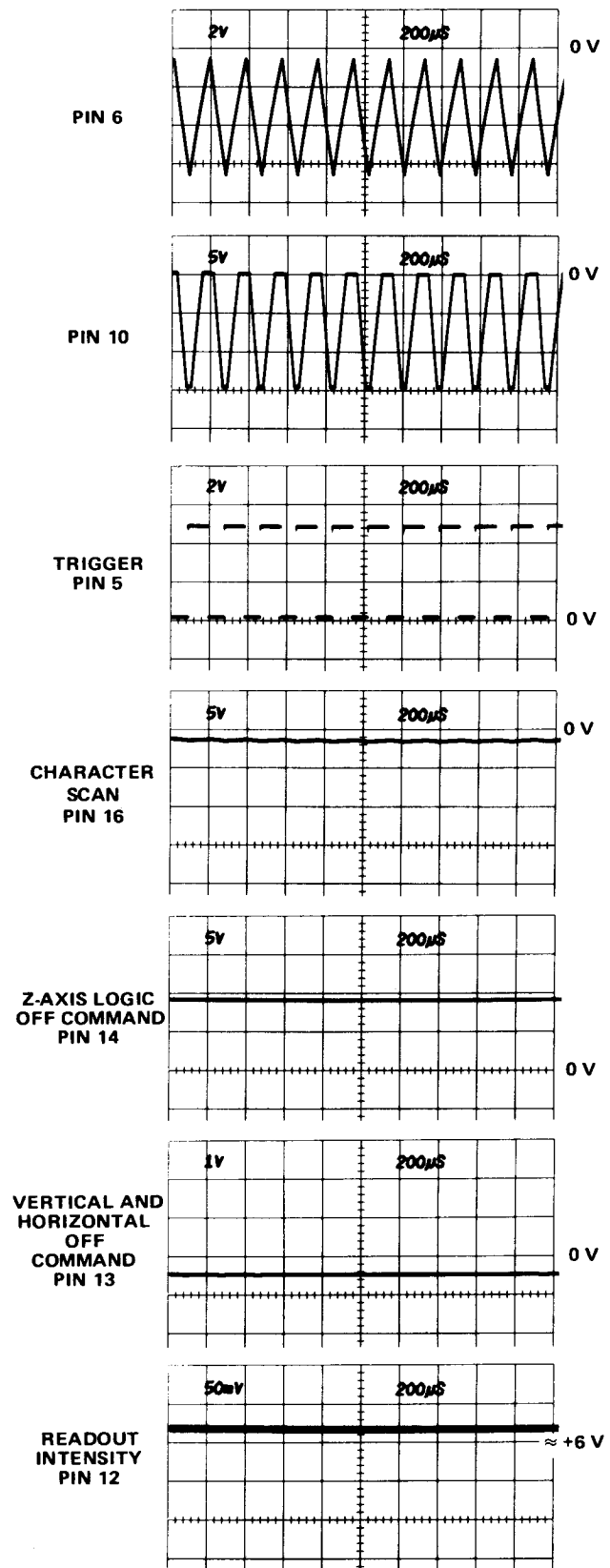
The next signal to be produced is the X-Y Inhibit command at pin 13. This positive-going signal disconnects the plug-in signals from the vertical and horizontal deflection systems. The Ready signal derived from this output is connected to the Decimal Point and Character Position Center stage and the Format Generator stage.

The Z-Axis Readout output at pin 12 is produced next. This current is connected to the crt circuit to unblank the crt to the intensity level determined by the voltage on the Gated Readout Intensity line. The Character Scan ramp at pin 16 started to go negative as this timing sequence began. However, character generation does not start until the readout intensity level has been established. The triangular Character Scan ramp runs from about -2 volts to about -8.5 volts, then returns back to the original level. This waveform provides the scanning signal for the Character Generator stages. Character Scan adjustment R3437 sets the dc level of the Character Scan ramp for complete characters on the display.

The Timer stage operates in one of two modes, as controlled by the Display-Skip level at pin 4. The basic mode just described is a condition that does not occur unless all ten characters of each word (80 characters total) are displayed on the crt. Under typical conditions, only a few characters are displayed in each word. The Display-Skip level at pin 4 determines the period of the Timer output signal. When a character is to be generated, pin 4 is LO and the circuit operates as just described. However, when a character is not to be displayed, a HI level is applied to pin 4 of U3433 through CR3432 from the Display-Skip Generator stage. This signal causes the Timer to shorten its period of operation to about 210 microseconds. The waveforms in Figure 3-32 show the operation of the Timer stage when the Display-Skip condition occurs for all positions in a word. Notice that there is no output at pins 12, 13, 14, and 16 under this condition. This means that the crt display is not interrupted to display characters. Also notice that the triangle waveform at pin 6 does not go as far negative, and that the negative portion of the trapezoidal waveform at pin 10 is shorter. Complete details on operation of the Display-Skip Generator are given later.

The Timer operation is also controlled by the Single-Shot Lockout level at pin 2. If this level is LO, the Timer operates as just described. However, if the Single-Shot Lockout stage sets a HI level at this pin, the Timer stage is locked out and can not produce any output signals (see Single-Shot Lockout description for further information).

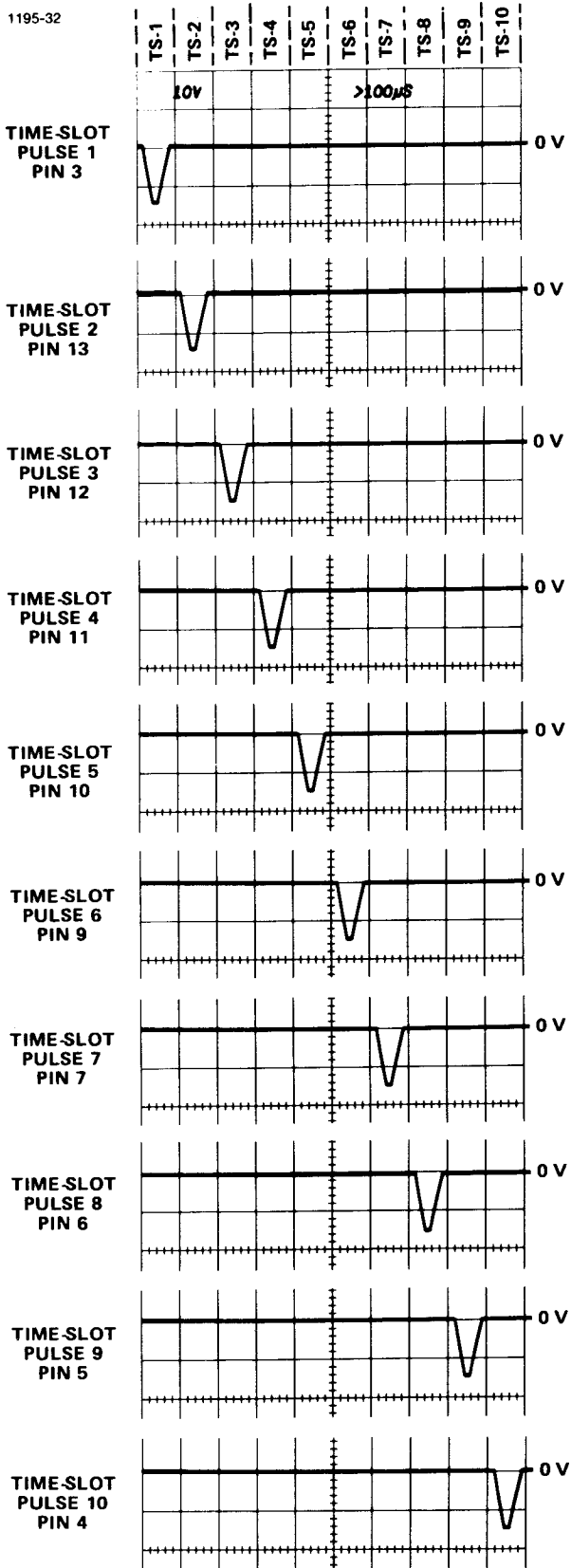
A negative voltage on the Gated Readout Intensity line sets the intensity of the readout display independently of the A or B INTENSITY controls. The Gated Readout Intensity line also provides a means of turning the Readout System off when a readout display is not desired. When the Gated Readout Intensity line is left open, the current from pin 11 of U3433 is interrupted, and at the same time, a positive voltage is applied to pin 4 through CR3431. The positive voltage switches the stage to the same conditions as were present under the Display-Skip condition. Therefore, the crt display is not interrupted to present characters. However, time-slot pulses continue to be generated.



NOTE: TEST OSCILLOSCOPE EXTERNALLY TRIGGERED FROM TP3450

(1195-31) 1988-57

Figure 3-32. Timer stage operation when display-skip condition occurs.



NOTE: TEST OSCILLOSCOPE EXTERNALLY TRIGGERED FROM TP3450. SWEEP RATE UNCALIBRATED.

Figure 3-33. Timer relationship of the time-slot (TS) pulses produced by Q3445.

Time-Slot Counter

Time-Slot Counter U3445 is a sequential switch which directs the trapezoidal waveform input at pin 8 to one of its 10 output lines. These time-slot pulses are used to interrogate the plug-in units to obtain data for the Readout System. The Trigger pulse at pin 15 switches the Time-Slot Counter to the next output line; the output signal is sequenced consecutively from time-slot 1 through time-slot 10. Figure 3-33 shows the time relationship of the time-slot pulses. Notice that only one line carries a time-slot pulse at any given time. When time-slot 10 is completed, a negative-going End-of-Word pulse is produced at pin 2. The End-of-Word pulse provides a drive pulse for the Word Trigger stage and also provides an enabling level to the Display-Skip Generator during time-slot 1 only.

Pin 16 is a reset input for the Time-Slot Counter. When this pin is held LO, the Time-Slot Counter resets to time-slot 1. The Time-Slot Counter can be reset in this manner only when a Jump-Command is received by U3447A and B (see following discussion).

Word Trigger

The Word Trigger stage is made up of U3447C and D. Quiescently, pin 8 of U3447C is LO as established by the operating conditions of U3447A and B. Therefore, the LO End-of-Word pulse produced by the Time-Slot Counter results in a HI level at pin 10 of U3447C. This level is inverted by U3447C to provide a negative-going Word Trigger pulse to the Channel Counter.

Also, a Word Trigger pulse is produced by U3447D when a Jump Command is received at pin 5 of U3447B. This condition can occur during any time-slot (see Row Decoder for further information on origin of the Jump Command). U3447A and B are connected as a bistable flip-flop. The positive-going Jump Command at pin 5 of U3447B produces a LO at pin 4. This LO is inverted by U3447A to produce a HI at pin 1, which allows pin 6 to be pulled HI through CR3447. The flip-flop has now been set and remains in this condition until reset, even though the Jump Command at pin 5 returns to its LO level. The HI output level at pin 1 turns on Q3445 to pull pin 16 of the Time-Slot Counter LO. This resets the Time-Slot Counter to time-slot 1 and holds it there until the Word Trigger is reset. At the same time, a HI level is applied to pin 4 of the Timer through CR3445 and CR3432. This HI level causes the Timer to operate in the Display-Skip mode, so a character is not generated.

The next Trigger pulse is not recognized by the Time-Slot Counter, since U3445 is locked in time-slot 1 by U3447. However, this Trigger pulse resets the Word Trigger stage through C3445. Pin 1 of U3447A goes LO to enable the Time-Slot Counter and Timer stages for the next time-slot pulse. Simultaneously, when U3447A switches output

states, the resulting negative-going edge is connected to pin 8 of U3447C. This results in a negative-going Word Trigger output at pin 13 to advance the Channel Counter to the next word. When the next Trigger pulse is received at pin 15, the Time-Slot Counter returns to the normal sequence of operation and produces an output on the time-slot 1 line.

Channel Counter

Channel Counter U3450 is a binary counter that produces the Channel Address Code for the Column and Row Decoder stages and the Format Generator stage. This code instructs these stages to sequentially select and display the 8 channels of data from the plug-ins. Table 3-5 gives the 8 combinations of the Channel Address Code and the resultant channel selected with each combination.

TABLE 3-5
Channel Address Code

Pin 11 U2250	Pin 8 U2250	Pin 9 U2250	Channel Displayed
LO	LO	LO	Channel 2 Left Vertical
LO	LO	HI	Channel 1 Left Vertical
LO	HI	LO	Channel 2 Right Vertical
LO	HI	HI	Channel 1 Right Vertical
HI	LO	LO	Channel 2 A Horizontal
HI	LO	HI	Channel 1 A Horizontal
HI	HI	LO	Channel 2 B Horizontal
HI	HI	HI	Channel 1 B Horizontal

Single-Shot Lockout

The Single-Shot Lockout stage allows a single readout frame (8 complete words) to be displayed on the crt, after which the Readout System is locked out, so further readout displays are not presented until the circuit is reset. U3449C and U3449D are connected to form a bistable flip-flop. For free-run operation, pin 8 of U3449C is held HI. This activates U3449C and results in a LO output level at pin 10, enabling the Timer stage to operate in a free-running manner.

The output of the Single-Shot Lockout stage remains LO to allow U3433 to operate in the free-running mode until a LO is received at pin 8 of U3449C. When this occurs, the

output level at pin 10 of U3449C does not change immediately. However, the Readout System is now enabled as far as the single-shot lockout function is concerned. If the Channel Counter has not completed word 8, the Readout System continues to operate in the normal manner. However, when word 8 is completed, the negative-going End-of-Frame pulse is produced at pin 11 of U3450 as the Channel Counter shifts to the code necessary to display word one. This pulse is coupled to pin 5 of U3449B. The momentary HI at pin 5 activates U3449D and its output stage goes LO to disable U3449C (pin 8 is already LO). The output of U3449C goes HI to disable the Timer stage, so it operates in the Display-Skip mode. The HI at pin 10 of U3449C also holds U3449D enabled, so it maintains control of the flip-flop.

The Single-Shot Lockout stage remains in this condition until a positive-going trigger pulse is applied to pin 8 of U3449C. This trigger pulse produces a LO at pin 10 of U3449C to enable U3433 and disable U3449D. Now, the Timer stage can operate in the normal manner for another complete frame. When word 8 is completed, the Channel Counter produces another End-of-Frame pulse to again lock out the Timer stage.

Encoding the Data

Data is conveyed from the plug-in units to the Readout System in the form of an analog (current level) code. The characters that can be selected by the encoded data are shown on the Character Selection Matrix (see Fig. 3-27). Each character requires two currents to define it; these currents are identified as the column current and the row current, corresponding to the column and row of the matrix. The column and row data is encoded by the programming of the plug-in units. Figure 3-34 shows a typical encoding scheme using resistors for a voltage-sensing amplifier plug-in unit. Notice that the 10 time-slot (TS) pulses produced by the Time-Slot Counter stage are connected to the plug-in unit. However, time-slots 5, 6, and 10 are not used by the plug-in unit to encode data when using the Standard Readout Format. (See Table 3-4 for Standard Readout Format.) The amplitude of the time-slot pulse is exactly -15 volts as determined by the Timer stage. Therefore, the resultant output current from the plug-in units can be accurately controlled by the programming resistors in the plug-in units.

For example, in Figure 3-34 resistors R10, R20, R30, R80, and R90 control the row analog data, which is connected back to the Readout System. Figure 3-35 shows an idealized output current waveform of row analog data, which results from the time-slot pulses. Each of the row levels of current shown in these waveforms correspond to 100 microamperes of current. The row numbers on the left-hand side of the waveform correspond to the rows in the Character Selection Matrix (see Fig. 3-27). The row analog data is connected back to the Readout System via terminal B37 of the plug-in interface.

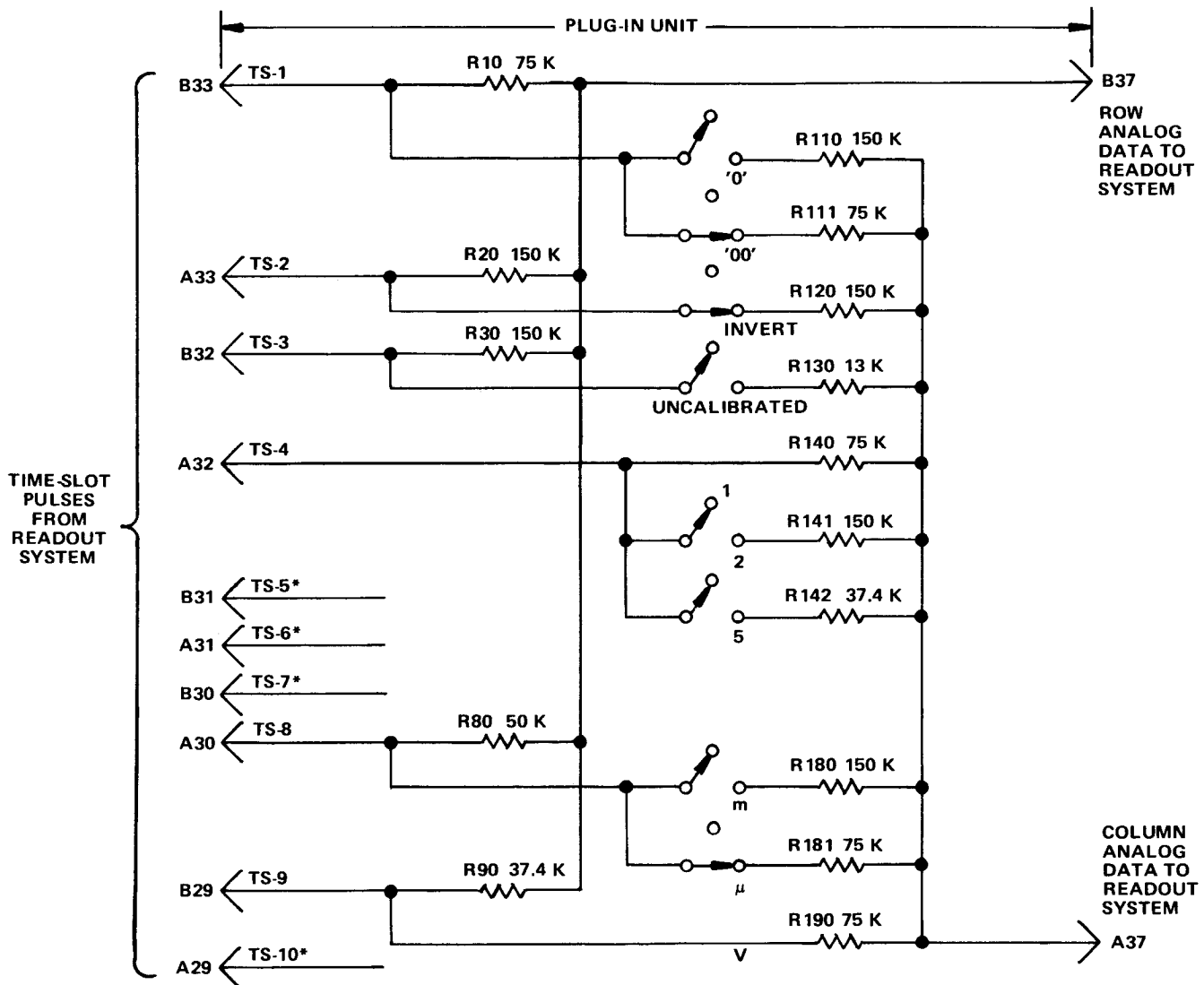
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The Column analog data is defined by the resistors shown between R110 and R190. The program resistors are connected to the time-slot lines by switch closures to encode the desired data. The data as encoded by the circuit shown in Figure 3-34 indicates a 100 microvolt sensitivity with the crt display inverted and calibrated deflection factors. This results in the idealized output current waveforms shown in Figure 3-35 at the column analog data output, terminal A37 of the plug-in interface.

Resistor R111, connected between time-slot 1 and the column analog data output, encodes two units of current during time-slot 1. Referring to the Character Selection Matrix (Fig. 3-27), two units of column current, along with the two units of row current encoded by resistor R10 (row 3), indicates that two zeros should be added to the display.

Resistor R120 adds one unit of column current during time-slot 2, and along with the one unit of current from the row output the Readout System is instructed to add an invert arrow to the display. Resistor R130 is not connected to the time-slot 3 line, since the deflection factor is calibrated. Therefore, there is no display on the crt. (See Display-Skip Generator for further information.)

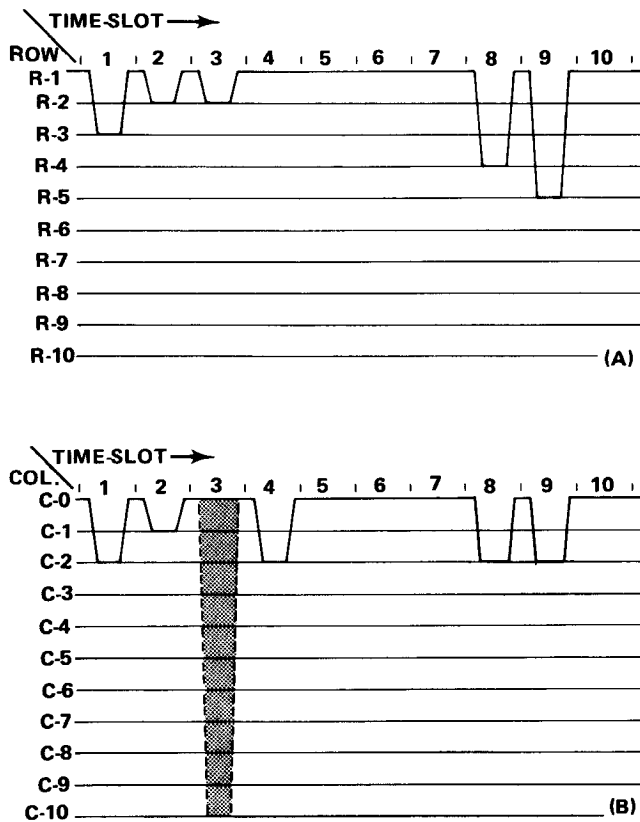
During time slot 4, two units of column current are encoded by R140. There is no row current encoded during this time-slot; this results in the numeral 1 being displayed on the crt. Neither row nor column analog data is encoded during time-slots 5, 6, and 7 as defined by the Standard Readout Format, shown in Table 3-4. During time-slot 8, two units of column current and three units of row current are encoded by resistors R181 and R80, respectively. This addresses the μ prefix in the Character Selection Matrix, Figure 3-27.



* NOT USED IN STANDARD FORMAT.

1195-33

Figure 3-34. Typical encoding scheme for voltage-sensing plug-in unit. Coding shown for deflection factor of 100 microvolts.



PROGRAM FOR 100 μ V, INVERTED, CALIBRATED (UNCALIBRATED OPERATION SHOWN BY SHADED AREA)

1195-34

Figure 3-35. Idealized current waveforms of (A) Row analog data and (B) Column analog data.

The final data output is provided from time-slot 9 by R190 connected to the column output and R90 to the row output. These resistors encode two units of column current and four units of row current to cause a V (volts) to be displayed. Time-slot 10 is not encoded, in accordance with the Standard Readout Format. The resultant crt readout will be \downarrow 100 μ V.

In the above example, the row analog data was programmed to define which row of the Character Selection Matrix was addressed to obtain information in each time-slot. The column data changes to encode the applicable readout data as the operating conditions change. For example, if the variable control of the plug-in unit was activated, R130 would be connected between time-slot 3 and the column analog data output line. This encodes 10 units of column current (see shaded area in time-slot 3 of the waveform shown in Fig. 3-35). Since one unit of row current is also encoded during this time-slot by R30, a $>$ (greater than) symbol is added to the display. The crt readout will now show $\downarrow >$ 100 μ V. In a similar manner, the other switches can change the encoded data for the column output and thereby change the readout display. See the descriptions which follow for decoding this information.

The column analog data encoded by most plug-in units can be modified by attenuator probes connected to the input connectors of amplifier plug-in units. A special coding ring around the input connector of the plug-in unit senses the attenuation ratio of the probe (with readout-encoded probes only). The probe contains a circuit that provides additional column current. For example, if a 10X attenuator probe is connected to a plug-in unit encoded for 100 microvolts as shown in Figure 3-34, an additional unit of current is added to the column analog data during time-slot 1. Since two units of current were encoded by R111, this additional current results in a total of three units of column analog current during this time-slot. Referring to the Character Selection Matrix (Fig. 3-27), three units of column current, along with the two units of row current encoded by R10, indicates that the prefix should be shifted one column to the left. Since this instruction occurs in the same time-slot that previously indicated that two zeros should be added to the display and only one instruction can be encoded during a time-slot, the zeros do not appear in the display. The crt readout will now be changed to 1 mV (readout program produced by plug-in same as for previous example).

Three other lines of information are connected from the plug-in compartments to the Readout System. The column and row analog data from channel 2 of a dual-channel plug-in are connected to the Readout System through terminals A38 and B38 of the plug-in interface, respectively. Force readout information is encoded on terminal A35; the function of this input is described under Column and Row Data Switches. The preceding information gave a typical example of encoding data from an amplifier plug-in unit. Specific encoding data and circuitry is shown in the individual plug-in unit manuals.

Column and Row Data Switches

The encoding data from the plug-in units is connected to the Column and Row Data Switch stages. A column-data line and a row-data line convey analog data from each of the 8 data sources (2 channels from each of the 4 plug-in compartments).

The Column Data Switch U3262 and the Row Data Switch U3232 receive the Channel Address Code from the Channel Counter, refer to diagram 10 at the rear of this manual. This binary code directs the Column Data Switch and the Row Data Switch IC's as to which channel should be the source of the encoding data. Table 3-5 gives the eight combinations of the Channel Address Code and the resultant channel selected with each combination. These stages have nine inputs and provide a time-multiplexed output at pin 7, which includes the information from all of the input channels. Eight of the nine inputs to each stage originate in the plug-in units; the ninth input comes from a special data-encoding network composed of Resistors R3241 through R3248 and R3251 through R3258. (See Zeros Logic and Memory description for further information on ninth channel.)

In addition to the encoding data inputs from the plug-in units, inputs are provided to the Column Data Switch IC from the VERTICAL MODE and HORIZONTAL MODE switches to inhibit the readout for any plug-in unit(s) not selected for display. When a unit is not selected, the line corresponding to the opposite channel is HI to forward bias the associated diodes; CR3217 and CR3216, CR3219 and CR3218, CR3213 and CR3212, or CR3215 and CR3414. The forward-biased diodes cause the channel switches to bypass the encoded data from the inhibited channel. However, since it may be desired to display information from special-purpose plug-in units (even though they do not produce a normal waveform display on the crt), a feature is provided to over-ride the channel inhibit. This is done by applying a LO to the associated Force Readout input. The LO level diverts the HI channel-inhibit current and allows the data from this plug-in unit to reach the Column Data Switch, even though it has not been selected for display by the mode switch.

Row Match adjustment R3422 sets the gain of the Row Data Switch to match the gain of the Row Decoder for correct output. Column Match adjustment R3407 performs the same function for the Column Data Switch stage.

Display-Skip Generator

The Display-Skip Generator is made up of Q3406, Q3411, Q3414, and Q3416. This stage monitors the time-multiplexed column data (at the output of the Column Data Switch) during each time-slot to determine if the information at this point is valid data that should result in a crt display. Quiescently, there is about 100 microamperes of current flowing through R3409 from Q3419 and the Zeros Logic and Memory stage. (The purpose of this quiescent current will be discussed in connection with the Zeros Logic and Memory stage.) This current biases Q3406A so that its base is about 0.2 volt more positive than the base of Q3406B in the absence of column data. Therefore, since Q3406A and Q3406B are connected as a comparator, Q3406A will remain on unless its base is pulled more negative than the base of Q3406B.

The analog data output from the Column Data Switch produces a 0.5 volt (approximately) change for each unit of column current that has been encoded by the plug-in unit. Whenever information appears at the output of the Column Data Switch, the base of Q3406A is pulled more negative than the base of Q3406B, resulting in a negative (LO) Display-Skip output to the Timer stage through Q3416. Recall that a LO was necessary at the skip input of the Timer so it could perform the complete sequence necessary to display a character.

Transistors Q3411 and Q3414 also provide Display-Skip action. The End-of-Word level connected to their emitters is LO only during time-slot 1. This means they are enabled

only during this time-slot. These transistors allow the Zeros Logic and Memory stage to generate a Display-Skip signal during time-slot 1 when information that is not to be displayed on the crt has been stored in memory. (Further information is given under Zeros Logic and Memory.)

Column and Row Decoders

The Column Decoder U3418 and Row Decoder U3429 sense the magnitude of the analog voltages at their inputs (pin 10) and produce a binary output on one of ten lines corresponding to the column or row data encoded by the plug-in unit. These outputs provide the Column Digital Data and Row Digital Data, which is used by the Character Generator stages to select the desired character for display on the crt. The column and row data is also used throughout the Readout System to perform other functions.

The input current at pin 9 of the Column Decoder stage is steered to only one of the ten Column Digital Data outputs. When a Display-Skip signal is present (collector of Q3416 HI), pin 9 is pulled HI through CR3416. This ensures that no current is connected to the Character Generator stage under this condition. Notice the corresponding input on the Row Decoder. This input is connected to ground and causes only one of the ten row outputs to saturate to ground.

The network at the input of the Row Decoder, made up of Q3427 and its associated components, is a Row-14 detector that produces the Jump Command. This row current is encoded by special-purpose plug-ins to cause all or part of a word to be jumped. Whenever row 14 (13 units of row current, or 1.3 milliamperes) is encoded, the base of Q3427 is pulled negative enough so that this transistor is reverse biased to produce a HI Jump Command output at its collector. The Jump Command is connected to the Word Trigger stage to advance the Channel Counter to the next word and to reset the Time-Slot Counter to time-slot 1.

Zeros Logic and Memory

The Zeros Logic and Memory stage U3401 stores data encoded by the plug-in units to provide zeros-adding and prefix-shifting logic for the Readout System. The Strobe pulse at pin 15 goes positive when the data has stabilized and can be inspected. This activates the Zeros Logic and Memory stage so that it can store the encoded data. A block representation of the memory sequence is shown in Figure 3-36.

Typical output waveforms of the five possible input conditions that can occur are shown in Figure 3-37. When time-slot 1 occurs, a store command is given to all of the memories. If the plug-in units encoded data for column 1, 2, 3, 4, or 10 during time-slot 1, the appropriate memory (0r memories) is set. Notice that row 3 information from the Row Decoder must also be present at pin 16 for data to be stored in the memory of U3401.

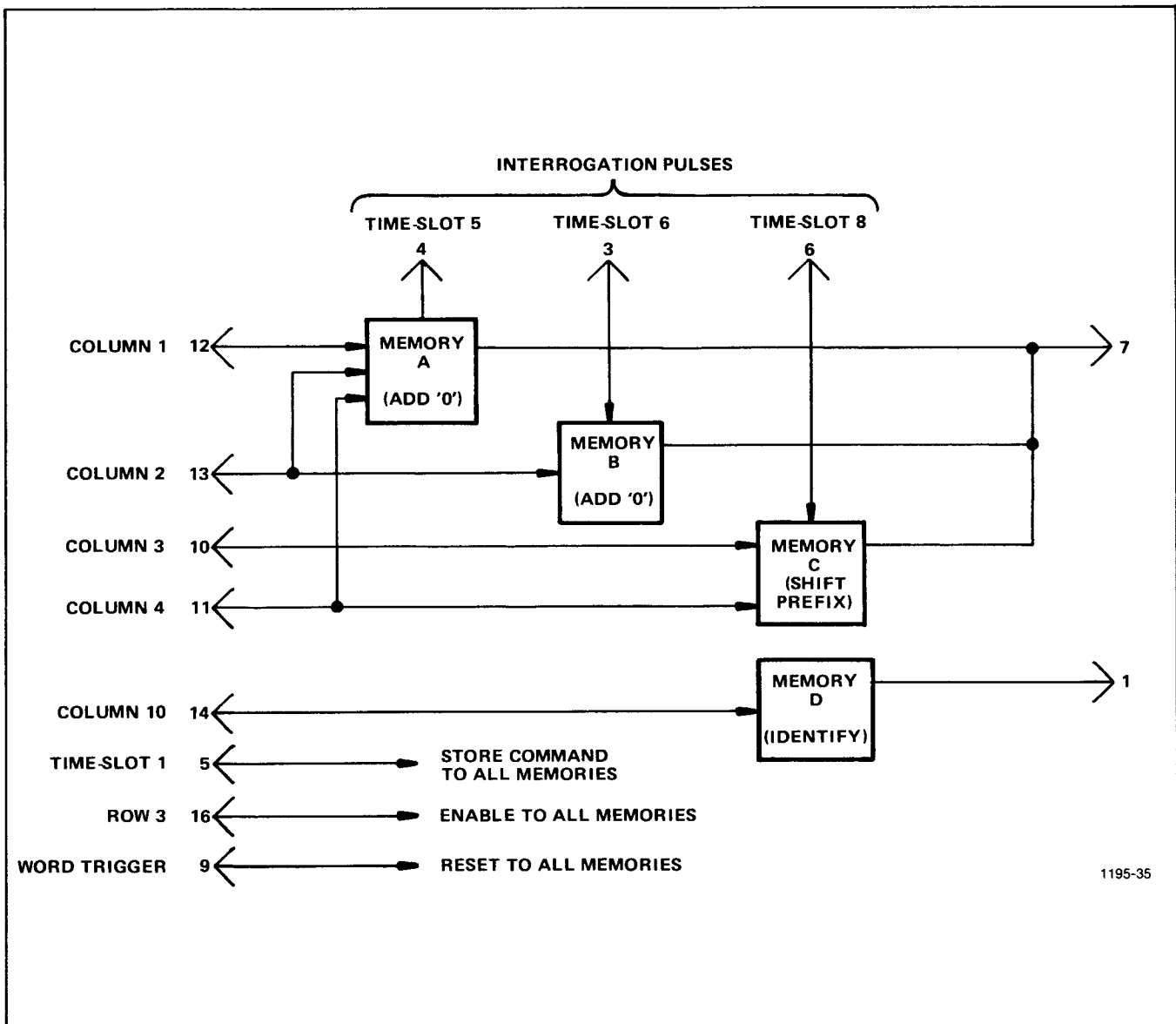


Figure 3-36. Block representation of memory sequence in U3401.

If data was encoded during time-slot 1, a negative-going output is produced at pin 7 while the memories are being set. This negative-going pulse is connected to the base of Q3414 in the Display-Skip Generator to produce a Display-Skip output. Since the information encoded during time-slot 1 was only provided to set the memories and not intended to be displayed on the crt at this time, the Display-Skip output prevents a readout display during this time-slot.

During time-slot 5, memory A is interrogated. If information was stored in this memory, a positive-going output is produced at pin 7. This pulse is connected to pin 10 of the Column Decoder through Q3419 to add one unit of current at the input of the Column Decoder. This produces a zero

after the character displayed during time-slot 4. During time-slot 6, memory B is interrogated to see if another zero should be added. If another zero is necessary, a second positive output is produced at pin 7, which again results in a column 1 output from the Column Decoder and a second 0 in the crt display.

Finally, memory C is interrogated during time-slot 8 to obtain information on whether the prefix should be changed, or left at the value that was encoded. If data has been encoded that calls for a shift in prefix, a negative-going output level is produced at pin 7. This negative level subtracts one unit of column current from the data at the input to the Column Decoder. Notice on the Character Selection

Theory of Operation—7834

Matrix, Figure 3-27, that when row 4 is programmed, a reduction of one column results in a one-column shift of the prefix. For example, with the 100 μV program shown in Figure 3-34, if the data received from the plug-in called for a shift in prefix, the crt readout would be changed to 1 mV (zeros deleted by program; see Encoding the Data).

The 100 microamperes of quiescent current through R3409 provided by Q3419 (see Display-Skip Generator) allows the

prefix to be shifted from m (100 microamperes of column current, column 1) to no prefix (0 column current, column 0) so only the unit of measurement encoded during time-slot 9 is displayed. Notice that reducing the prefix program from column 1 to column 0 programs the Readout System to not display a character at this readout location.

A further feature of the Zeros Logic and Memory is the Identify function. If 10 units of column current are encoded

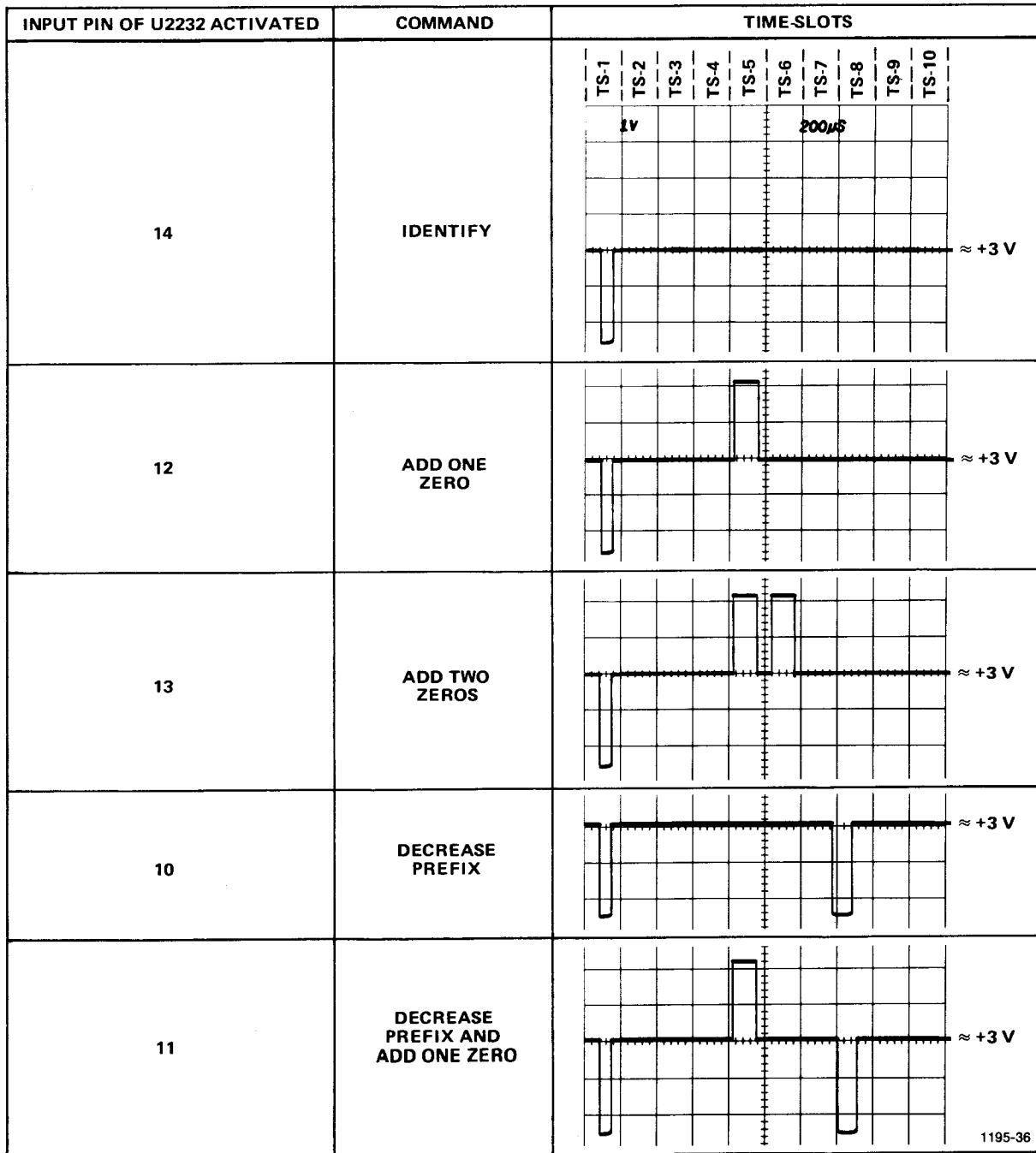


Figure 3-37. Typical output waveforms for Zeros Logic and Memory stage operation (at pin 7 of U3401).

by the plug-in unit along with row 3 during time-slot 1, the Zeros Logic and Memory produces a negative-going output pulse at pin 1 to switch the Column Data Switch and Row Data Switch to the ninth channel. Then, time-slot pulses 2 through 9 encode an output current through resistors R3242 and R3248 for column data and R3251 and R3258 for row data. This provides the current necessary to display the word IDENTIFY in the word position allotted to the channel that originated the Identify command. After completion of this word, the Column Data Switch and Row Data Switch continue with the next word in the sequence.

The Word Trigger signal from the Word Trigger stage is connected to pin 9 of U3401 through C3401. At the end of each word of readout information, this pulse goes LO. This erases the four memories in the Zeros Logic and Memory in preparation for the data to be received from the next channel.

Character Generator

The Character Generator stage consists of five similar integrated circuits (U3461 through U3469), which generate the X (horizontal) and Y (vertical) outputs at pins 16 and 1, respectively, to produce the character display on the crt. Each integrated circuit can produce 10 individual characters; U3461 (designated "Numerals") can produce the numerals 0 through 9 shown in row 1 of the Character Selection Matrix (Fig. 3-27). Integrated circuit U3463 can produce the symbols shown in row 2 of the Character Selection Matrix and U3465 produces the prefixes and some letters, used as prefixes, shown in row 4. Integrated circuits U3467 and U3469 produce the remaining letters shown in rows 5 and 6 of the Character Selection Matrix.

All of the Character Generator stages receive the Column Digital Data from the Column Decoder U3418 in parallel. However, only one of the Character Generators receives row data at a particular time, and only the stage receiving this row data is activated. For example, if column 2 is encoded, the five character Generators are enabled so that either a 1, >, μ , V, or an N can be produced. If row 4 has been encoded at the same time, only the Prefix Character Generator U3465 will produce an output to result in a " μ " being displayed. The activated Character Generator provides current output for the Format Generator to produce the selected character on the crt. In a similar manner, any of the characters shown in the Character Selection Matrix can be displayed by correct addressing of the row and column.

Decimal Point Logic and Character Position Counter

Decimal Point Logic and Character Position Counter U3470 performs two functions. The first function is to add a stair-

case current to the X (horizontal) signal to space the characters horizontally on the crt. After each character is generated, the negative-going edge of the Ready signal at pin 5 advances the Character Position Counter. This produces a current step output at pin 3 which, when added to the X signal, causes the next character to be displayed one character space to the right. This stage can also be advanced when a Space instruction is encoded so a space is left between the displayed characters on the crt. Row 10 information from the Row Decoder is connected to pin 4 of U3470. When row 10 and column 0 are encoded, the output of this stage advances one step to move the next character another space to the right. However, under this condition, no display is produced on the crt during this time-slot, since the Character Generators are not activated.

Time-slot pulses 1, 2, and 3 are also connected to pin 4 of U3470 through VR3470, VR3471, and VR3472 respectively and R3470, R3472 and R3473. This configuration adds a space to the displayed word during time-slots 1, 2, and 3 even if information is not encoded for display during these time-slots. With this feature, the information displayed during time-slot 4 (scaling data) always starts in the fourth character position whether data has been displayed in the previous time-slots or not. Therefore, the resultant crt display does not shift position as normal-invert or cal-uncal information is encoded. The Word Trigger pulse connected to pin 8 resets the Character Position Counter to the first character position at the end of each word.

The Decimal Point Logic portion of this stage allows decimal points to be added to the crt display. In accordance with the Standard Readout Format, row 7 encoded coincident with columns 3 through 7 addresses a decimal at one of five locations (identified in row 7 of the Character Selection Matrix, Fig. 3-27). This instruction refers to the decimal point location in relation to the total number of characters possible in one word (see Fig. 3-38). For example, column 3 encoded with row 7 during time-slot 1 places a decimal point in location No. 3. As shown in Figure 3-38, this displays a decimal point after the third character that can be displayed on the crt. (The first three time-slots produce a space whether data is encoded or not; see previous paragraph.)

When decimal-point data is encoded, the crt is unblanked so a readout display is presented. Since row 7 does not activate any of the five Character Generators, the crt beam is deflected vertically by the application of row-7 data to the Y input of the Format Generator through R3477. This places the decimal point between the characters along the bottom line of the readout word. After the decimal point is produced in the addressed location, the crt beam returns to the location indicated by the Character Position Counter to produce the remainder of the display.

Decimal-Point Character

The Decimal-Point Character address (see Fig. 3-27) allows a decimal point to be encoded for special formats. This decimal point can be placed in any character position by encoding column 9 with row 8 during the corresponding time slot. The application of row 8 data to the X and Y input of the Format Generator through R3478 and R3479 respectively, provides horizontal and vertical positioning current for the decimal points.

Format Generator

The X- and Y-deflection signals produced by the Character Generator stage are connected to pins 2 and 7, respectively, of the Format Generator (U3480). The Channel Address Code from the Channel Counter is also connected to pins 1, 8, and 15 of this stage. The Channel Address Code directs the Format Generator to add current to the X and Y signals to deflect the crt beam to the area of the crt associated with the plug-in channel that originated the information (see Fig. 3-26). The Channel Address Code and the resultant word positions are shown in Table 3-5. The Ready signal at pin 13 (coincident with the Vertical and Horizontal Off Command output) activates this stage when a character is to be displayed on the crt. Resistors R3466 and R3468 determine the horizontal and vertical size, respectively, of the displayed characters. The character position current from the Decimal Point Logic and Character Position Counter stage is added to the X (horizontal) input signal to space the characters horizontally on the crt (see previous discussion).

Y-Output Amplifier

The Y-output signal at pin 6 of Format Generator U3480 is connected to the Y-Output Amplifier Q3486 and Q3493. This stage provides a low impedance load for the Format Generator while providing isolation between the Readout System and the driven circuits. Vertical Separation adjustment R3490 changes the gain of this stage to control the vertical separation between the readout words displayed at the top and bottom of the graticule area.

X-Output Amplifier

The X-Output Amplifier Q3489 and Q3499 operates like the Y-Output Amplifier, to provide the horizontal deflection from the readout signal available at pin 4 of U3480. The gain of this stage is fixed by the values of the resistors in the circuit.

Display Sequence

Figure 3-39 shows a flow chart for the Readout System. This chart illustrates the sequence of events that occur in the Readout System each time a character is generated and displayed on the crt.

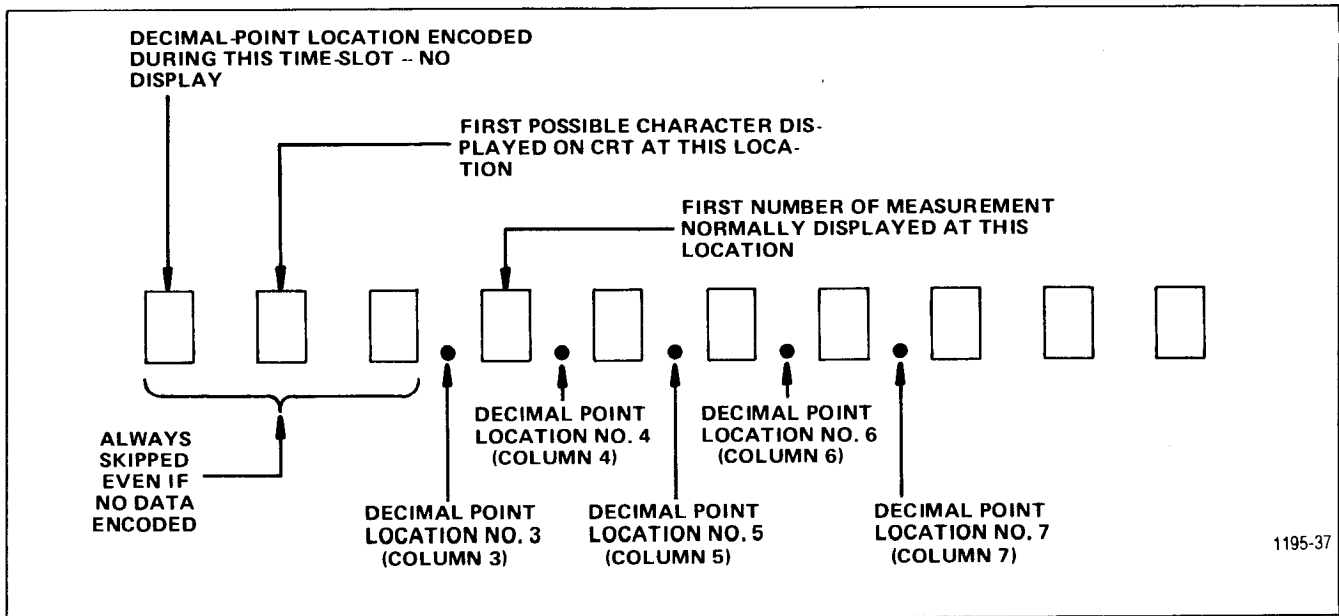


Figure 3-38. Readout word relating 10 possible character locations to the decimal point instructions that can be encoded, and the resultant crt display.

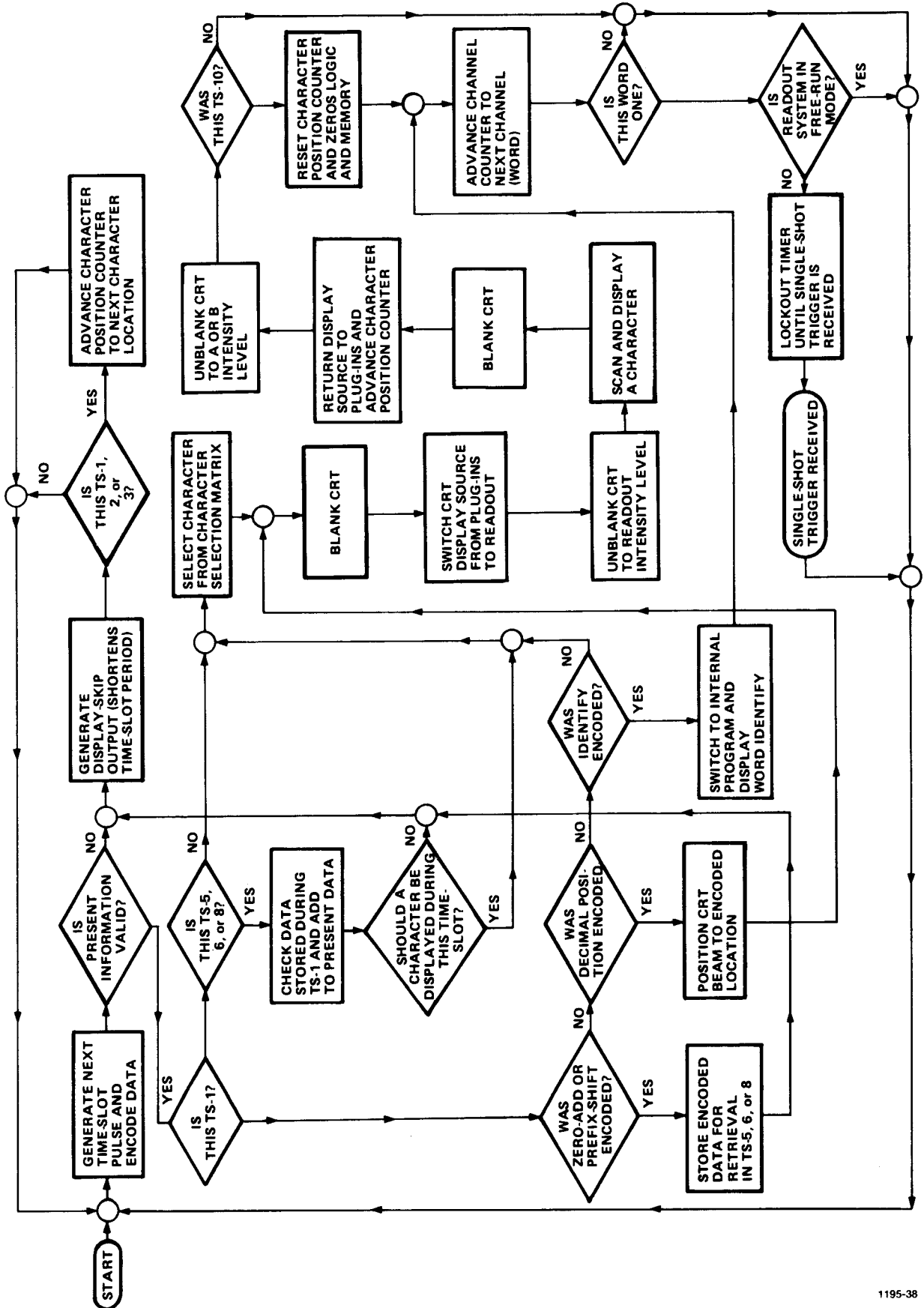


Figure 3-39. Flow chart for character generation by the Readout System.

1195-38

CONVERTER/RECTIFIERS 11

The Converter/Rectifiers circuit provides the operating power for this instrument from an ac line-voltage source. This circuit includes a LINE VOLTAGE SELECTOR switch, located on the rear panel. Figure 3-40 shows a detailed block diagram of the Converter/Rectifier circuit. A schematic is provided on diagram 11 in the Diagrams section of this manual.

Line Input

Power is applied through Line Filter FL1200, line fuse F1200, POWER switch S1200, and Line Selector switch S1212. The Line Filter is designed to keep powerline interference from entering the instrument and to keep the approximate 25 kilohertz Inverter signal from entering the power line. Components R1205, C1205, and C1206 suppress reverse-recovery transients of CR1215.

Line Selector switch S1212 allows the instrument to operate from either a 115 volt nominal or a 230 volt nominal line-voltage source. In the 115 volt position, rectifier CR1215 operates as a full-wave doubler with energy-storage capacitors C1216 and C1217, so the voltage across the two capacitors in series will be the approximate peak-to-peak value of the line voltage. For 230 volt operation, CR1215 is connected as a bridge rectifier and the voltage across C1216 and C1217 will be the approximate peak value of the line voltage. Thus, the dc voltage applied to the Inverter stage is about the same for either 115 volt or 230 volt operation.

Thermistors RT1209 and RT1213 limit the surge current when the power supply is first turned on. After the instrument is in operation, the resistance of these thermistors drops so that it has little effect on the circuit. When the instrument is turned off, the Inverter control stage turns off the Inverter which prevents it from discharging C1216

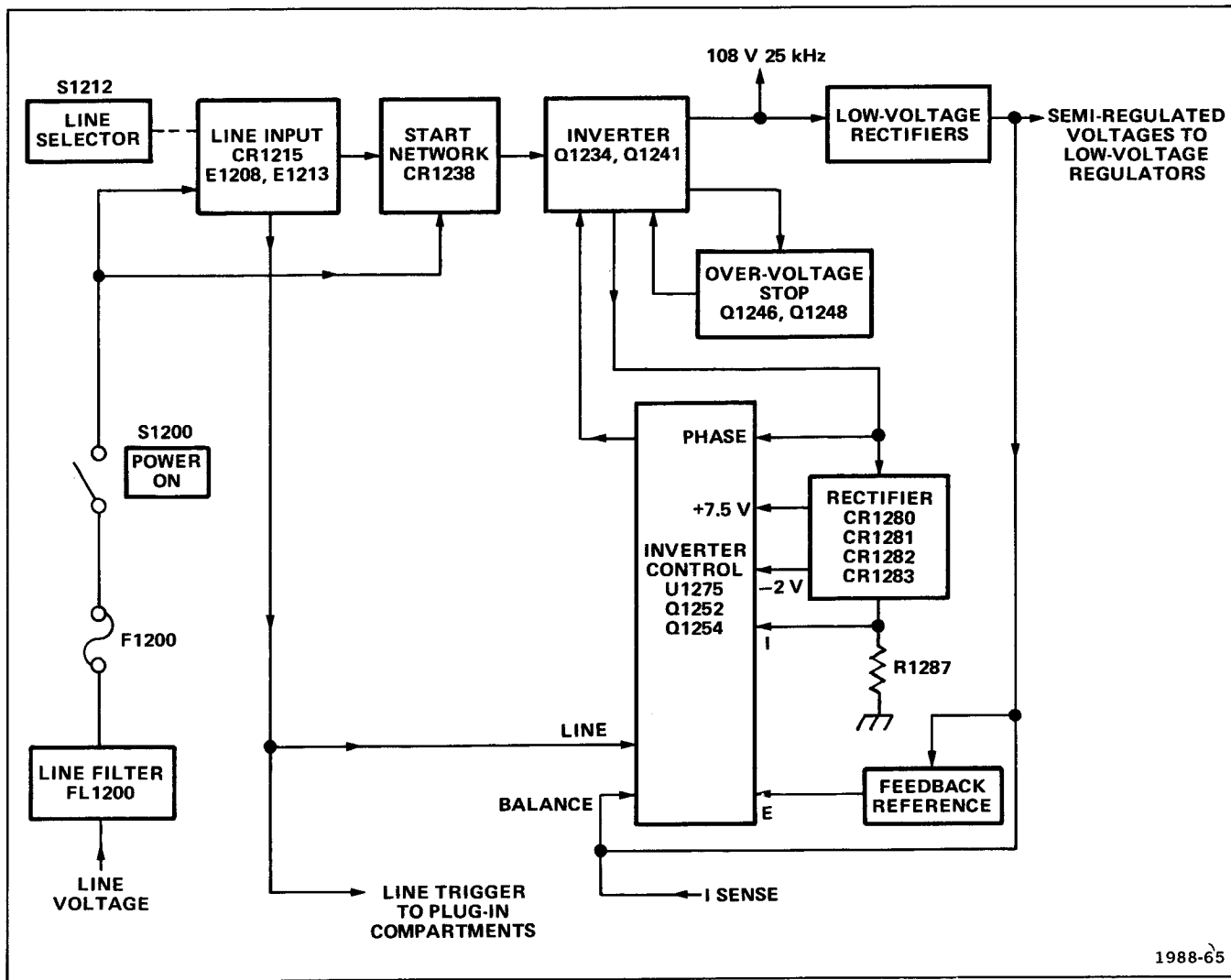


Figure 3-40. Detailed block diagram of Converter/Rectifiers circuit.

and C1217; C1216 and C1217 discharge slowly through R1221 to allow for thermistor thermal-recovery time. This ensures sufficient thermistor resistance to limit the turn-on surge current to a safe level. Since C1216 and C1217 discharge slowly, dangerous potentials exist within the power supply for several minutes after the POWER switch is turned off. The presence of voltage in the circuit is indicated by the relaxation oscillator R1219, C1219, and DS1219. Neon bulb DS1219 will blink until the potential across C1216 and C1217 drops to about 80 volts.

Spark gap electrodes E1208 and E1213 are surge-voltage protectors. When the Line Selector switch is in the 115 volt position, only E1208 is connected across the line input. If a peak voltage greater than 230 volts is present on the line, E1208 will conduct and quickly open line fuse F1200 to interrupt the input power before the instrument can be damaged. In the 230 volt position, E1208 and E1213 are connected in series across the line input to provide protection for peak voltages greater than 460 volts.

Transformer T1208 provides a sample of the line voltage to the plug-in connectors for triggering at line frequencies. This line-frequency signal is also connected to the Inverter control stage to sense when line voltage is present.

Start Network

Network R1210, R1242 and C1242 is connected between the input line (ac) and the negative side of C1217 (through T1225). C1242 charges on each cycle of the input line voltage. When the charge on C1242 reaches about 32 volts, trigger diode CR1238 conducts providing base drive to turn on Q1241 through C1239. When Q1241 turns on, it shock-excites series-resonant network L1237 and C1237 to generate a damped oscillation. This damped oscillation provides the drive necessary to start the Inverter switching action. After the Inverter is operating, the recurrent waveform at the collector of Q1241 keeps C1242 discharged through CR1242, thus disabling the Start Network while the instrument is on.

Inverter

The Inverter stage converts the dc voltage across C1216 and C1217 to a sine-wave current to drive Power Transformer T1310. Once the Inverter has been started by the Start Network, transformer T1230 provides feedback to the bases of Q1234 and Q1241 to sustain oscillation. These transistors operate at a forced beta of 4 due to the turns ratio of T1230. Also, T1230 provides a 60-turn, center-tapped winding for pre-regulation and fault protection shut-down. The Inverter Control stage short circuits one-half of this winding to either delay the turn-on of Q1234 and Q1241 or to completely stop their switching action.

The switching action of Q1234 and Q1241 generates a square-wave voltage with an amplitude approximately equal to the dc voltage at the input to this stage. The square-wave voltage at the emitter of Q1234 supplies the drive necessary to maintain a sine-wave current in the series-resonant network of L1237 and C1237. Diodes CR1234 and CR1241 provide paths for series-resonant current when Q1234 and Q1241 are held off for pre-regulation.

To aid in understanding circuit operation, Figure 3-41(A) shows a representation of the Inverter stage as a switch. The three possible states of the Inverter are depicted by the three possible switch positions: Q1234 is on in position (a); Q1241 is on in position (c); or both transistors are held off for pre-regulation in position (b). In the composite current waveform of Figure 3-41(B), the relative phase and amplitude of each component of I_t is shown for periods T_a , T_b , and T_c corresponding to the three switch positions. Figure 3-41(C) and Figure 3-41(D) show the relationship of the Inverter voltage and primary winding voltages with respect to the current waveform.

The normal sequence of operation is as follows: Assume that I_t is passing through zero and is increasing in the direction which forward biases CR1241 to conduct I_1 as shown in Figure 3-41(B). When the Inverter current crosses through zero the Inverter Control stage holds off Q1234 and Q1241. At a time determined by the Inverter Control stage, Q1234 is allowed to conduct I_2 which reverse biases CR1241. Q1234 conducts as I_2 goes through its peak and back to zero. At zero crossing, the Inverter Control stage again holds off Q1234 and Q1241. During this hold-off time, CR1234 conducts I_3 . Next, Q1241 is turned on to conduct I_4 which reverse biases CR1234. Q1241 conducts as I_4 goes through its peak and back to zero. The cycle then repeats itself.

During conduction of Q1234, power is delivered to the series resonant circuit L1237-C1237, and to T1310. Part of this power, stored in the resonant circuit, is returned to the supply when diode CR1234 conducts. Pre-regulation is achieved by varying the holdoff of the inverter transistors, T_b in Figure 3-41(B), thereby determining the net power delivered to T1310.

Over-Voltage Stop

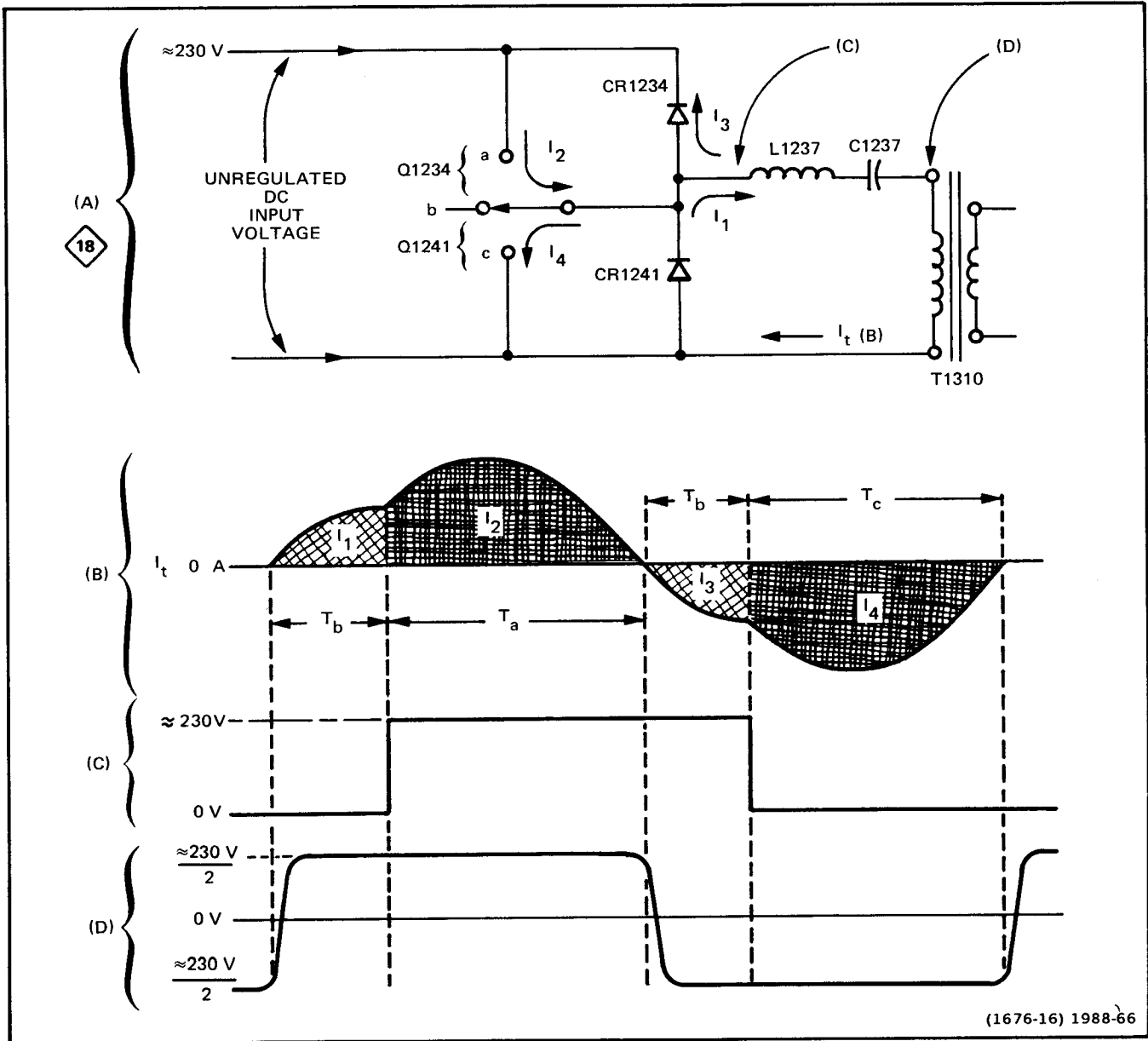
Whenever the voltage across the primary of T1310 exceeds a safe level, the Over-Voltage Stop stage stops the Inverter to protect Inverter components from damage. For example, this stage activates whenever the normal voltage regulating path through Q1252 and T1230 is inoperative.

Capacitor C1243 charges through CR1244 to the peak voltage across the primary of T1310. If this voltage exceeds a safe level, VR1246 conducts to trigger SCR Q1248 into its forward-conduction state. Capacitor C1243 then discharges through C1249, R1249, R1248, and Q1248 into the base-emitter junction of Q1246. Q1246 turns on, short-circuits the base-drive winding of T1230 and stops the Inverter switching action. Since CR1249 becomes forward biased when Q1248 is triggered on, C1242 in the Start Network is prevented from charging to the breakdown voltage of CR1238, thus preventing the Inverter from starting. Transistors Q1248 and Q1246 continue to conduct until the discharge current of C1243 through R1248 drops below the

holding current of Q1248. After Q1248 returns to its forward-blocking state, CR1249 continues to inhibit the Inverter Start Network while C1243 charges through R1247 and R1210 in the Inverter Start Network. When the voltage on C1243 is sufficient to fire CR1238, the Inverter will start.

Inverter Control

The Inverter Control stage, made up of primarily U1275, provides pre-regulation and fault protection functions. For pre-regulation purposes, U1275 varies the hold-off time (T_b , in Fig. 3-41B) of the Inverter switching transistors.



(1676-16) 1988-66

Figure 3-41. (A) Representation of Inverter stage. Idealized waveforms of (B) total inverter current, I_t , (C) voltage of CR1234 and CR1241, and (D) voltage across primary.

Under normal operating conditions, only the E Sense input at pin 15 controls the hold-off time. However, various fault conditions can affect hold-off time or stop Inverter operation altogether. The operation of each individual function of the Inverter Control stage is described in the following discussion.

Pre-Regulator

The Pre-Regulator operation of U1275, maintains constant voltages at the outputs of the Low-Voltage Rectifiers. It also provides constant peak-to-peak voltage to the High-Voltage supply.

Transformer T1235 provides Inverter phase information and power to U1275. The phase information is connected to pins 10 and 11 through C1275 and C1276. Bridge rectifier CR1280, CR1281, CR1282, and CR1283, provides positive and negative operating voltages to U1275. A shunt regulator in U1275 maintains +7.5 volts at pin 6. The -2 volt (nominal) supply connected to pin 7 is unregulated. Zener diode VR1279 is for protection against open circuit condition (U1275 removed) and is normally not conducting.

Pin 15 is the voltage sensing (E Sense) point of the Pre-Regulator circuit. Zero volts at pin 15 indicates proper regulation. Zener diode VR1297 provides a stable reference voltage for the sensing-divider resistors R1290, R1291, R1293, R1294, and R1296. Resistor R1293 in this divider adjusts the ratio of the divider to adjust the output of the +108 volt supply. Outputs of the other supplies are then set by the turns ratio of T1310.

Integrated circuit U1275 regulates the Inverter by varying the hold-off time of the switching transistors, Q1234 and Q1241. A variable pulse-width monostable multivibrator in U1275 is triggered at pins 10 and 11 whenever the Inverter current changes direction. The pulse width holds off the Inverter by turning on transistor Q1252 through pin 9 of U1275, thus shorting out the base drive to Q1234 and Q1241. The pulse width and therefore hold-off is controlled by a ramp at pin 12. If the voltage at the E Sense input, pin 15, is too low, the ramp is not allowed to rise very high and the pulse width and hold-off are short. As the E Sense voltage rises, the ramp is allowed to rise to a higher voltage level, increasing the hold-off time.

Fault Protection

The fault-protection portions of U1275 provide protection for the power-supply components from damage due to short circuits, turn-on surge currents, and other malfunctions. When a fault is detected at the Bal Sense input (pin 2) or I Sense input (pin 13), a current from the Fault Holdoff Time output (pin 1) charges C1264. If the detected fault lasts longer than about 10 milliseconds, C1264 will charge positive enough to initiate a positive output at pin 8. This output is applied through U1278B and U1278C to turn on Q1254 and Q1252 which turns off the Inverter. The Invert-

er will remain off while C1259 discharges through R1261 which keeps Q1254 and Q1252 turned on. The Inverter restarts in roughly 500 milliseconds when the current through R1261 is insufficient to keep Q1254 and Q1252 turned on. When the inverter restarts C1259 is recharged through CR1259 and R1259. This cycle repeats until the fault is corrected, with the Inverter on for about 10 milliseconds, and off for about 500 milliseconds.

Inverter Current Limiter

The Inverter current limiter provides protection for the Inverter components from damage due to excessive turn-on current or short circuits. Operation of this stage is similar to the Pre-Regulator (voltage regulation). The Inverter current limiter takes control of the Inverter hold-off time whenever pin 13 starts to go negative. T1235 is a current step-down transformer. The current is rectified and flows through R1287, the current-sensing resistor. The voltage across R1287 is negative and proportional to the Inverter current. The I Sense input at pin 13 is normally held positive through divider R1285 and R1286. The Inverter current limiter takes control of regulation when pin 13 approaches zero volts. Peak Inverter current is limited to about 5 amperes. If the voltage at pin 13 remains near zero for more than about 10 milliseconds, pin 8 will go positive to turn off the Inverter.

Balance

The Balance portion of U1275 provides overload protection for the +5 volt light supply, +108 volt supply, +130 volt supply, +600 volt supply, focus supply and cathode supply, as well as backup protection for several regulated supplies. The +5 volt, +108 volt and -17 volt supplies are applied to the Bal Sense input at pin 2 of U1275 through resistive network of R1303, R1304, and R1305. Other inputs are from a network on the Low-Voltage Regulator board and current sensing resistors on the Focus board. During normal operation, the voltage at the Bal Sense input remains near zero. If one of the inputs changes sufficiently to cause this voltage level to vary about 200 millivolts (positive or negative) for more than about 10 milliseconds, a positive output is produced at pin 8 of U1275 to stop the Inverter.

Line Stop

The Line Stop portion of U1275 stops the Inverter when the POWER switch is turned off. The Line Stop stage will also stop the Inverter if the ac line voltage falls below a minimum value.

The line-frequency signal from transformer T1208 is connected to pin 4, the Line Stop Sense input of U1275. During normal operation, the line-frequency signal causes the Line Stop Timer terminal (pin 3) to periodically discharge to ground. When the line-frequency signal is interrupted or falls below a minimum value, C1267 will charge to approximately +0.7 volt causing the Line Stop stage to produce a positive output at pin 8 of U1275 to stop the Inverter.

Power On Logic

The Power On Logic provides a signal to the Storage circuitry. When the instrument is first turned on the Power On circuit produces a low state output for about 2 seconds after which time a high state is produced indicating that power is on. The low state is produced by the 7.5 volt supply rising and turning on U1278A through CR1266, R1265, C1263, CR1265 and R1265. The high state is produced after 2 seconds, when C1263 changes through R1260, turning on CR1261 and thus removing base drive to U1278A.

When the instrument is turned off, this circuit produces a low state output before the regulated power supply voltages begin to drop. The inverter stop signal, pin 8 of U1275, goes high allowing U1278B to turn on, thus turning on U1278D through U1278E.

LV (LOW-VOLTAGE) REGULATORS

The Low-Voltage Regulators convert semi-regulated voltages from the Converter/Rectifiers circuit to stabilized, low-ripple output voltages. The regulators are series type, using the -50 volt supply as a reference. Figure 3-42 shows a detailed block diagram of the Low-Voltage Regulator circuits. A schematic is provided on diagram 12 in the Diagrams section of this manual.

-50 Volt Supply

The Semi-Regulated -54 volts from the Converter/Rectifiers circuit provides the unregulated voltage source for this supply. Transistors Q1508, Q1522, Q1534 and Q1538 operate as a feedback-stabilized amplifier to maintain a constant -50 volt output level. Transistor Q1508 is connected as a differential amplifier to compare the feedback voltage at the base of Q1508B against the reference voltage at the base of Q1508A. The error output at the collector of Q1508B reflects the difference between these two inputs. The change in error output level at the collector of Q1508B is always in the opposite direction to the change in the feedback input at the base of Q1508B. Zener diode VR1505 sets a reference level of about -9 volts at the base of Q1508A. A sample of the output voltage from the -50 Volt Supply is connected to the base of Q1508B through divider network R1512, R1513, and R1514. Resistor R1513 in this divider is adjustable to set the output level of this supply. Notice that the feedback voltage to this divider is obtained from a line labeled -50 V Sense. If the feedback voltage were obtained at the supply, the voltage at the load would not stay constant, due to the inherent resistance of the interconnecting cable between the supply and its load. The sense configuration overcomes this problem by sensing the voltage at the load. Since the current in the sense line is small and constant, the load voltage is held constant regardless of the load current.

Regulation of voltage occurs as follows: If the output level of this supply decreases (becomes less negative) due to an increase in load or a decrease in input voltage (as a result of line-voltage changes or ripple), the voltages across divider R1512, R1513, and R1514 decreases also. This results in a more positive level at the base of Q1508B than that established by the -50 Volt Reference stage at the base of Q1508A. Since the transistor with the more positive base controls the conduction of the differential amplifier, the output current at the collector of Q1508B increases. This increase in current through Q1508B also causes successive increases in current through Q1522 and Q1534 resulting in increased conduction of Q1538, the -50 V Series Regulator. The load current increases and therefore the voltage across the load also increases (becomes more negative) sufficiently to balance the input into differential amplifier Q1508A and Q1508B. The -50 Volts adjustment, R1513, sets the output level of this supply.

The -50 V Current Limiting stage (Q1526) protects the -50 Volt Supply if excessive current is demanded from this supply. Since the load is connected to this supply through R1537, all current from the -50 Volt Supply must flow through this resistor. Transistor Q1526 senses the voltage drop across R1537. Under normal operation there is insufficient voltage drop across R1537 to forward bias Q1526. However, when excessive current is demanded from the -50 V Series Regulator due to a short circuit or similar malfunction at the output of this supply, the voltage drop across R1537 increases until it is sufficient to forward bias Q1526. The collector current of Q1526 results in a reduction of current through Q1522 and finally to limit the conduction of Q1538. This current limiting protects Q1538 from damage due to excess power dissipation.

Several protection diodes are also included in this circuit. Diode CR1539 prevents the output of this supply from going more positive than about +0.6 volt if it is shorted to a positive supply. Zener diode VR1501 and diode CR1502 supply a turn-on voltage for Q1508 to start the -50 Volt Supply when the instrument is first turned on. As soon as the -50 Volt Supply turns on, CR1502 stops conducting.

-15 Volt Supply

Basic operation of all stages in the -15 Volt Supply is the same as for the -50 Volt Supply. Reference level for this supply is established by divider R1463 and R1464 between ground and the -50 V Sense voltage. The divider ratio of R1463 and R1464 sets a level of -15 volts at the base of Q1406A. The level on the -50 V Sense line is held stable by the -50 Volt Supply. Any change at the output of the -15 Volt Supply appears at the base of Q1406B as an error signal. The output voltage is regulated in the same manner as described for the -50 Volt Supply. Diode CR1499 limits the output of this supply from going more positive than about +0.6 volt if it is shorted to one of the more positive supplies. Diodes CR1468 and CR1469 provide reverse voltage protection for transistors Q1406B and Q1406A, respectively.

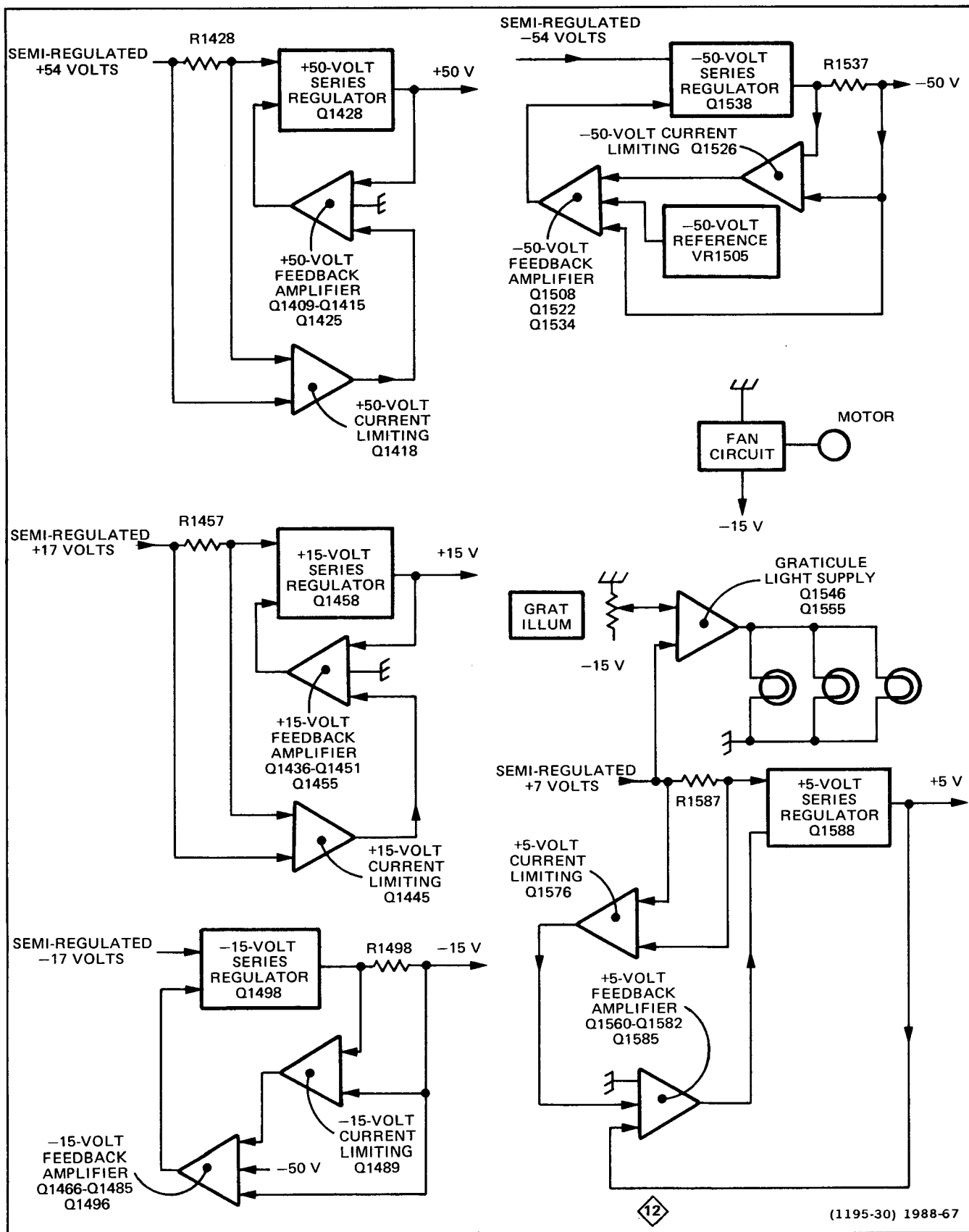


Figure 3-42. Detailed block diagram of the Low-Voltage Regulator circuit.

+5 Volt Supply

The operation of the +5 Volt Supply is basically the same as described for the previous supplies. Error voltage to the base of Q1560B is provided by divider R1564 and R1565, referenced to the -50 V Sense line, from the +5 V Sense line. The divider ratio of R1564 and R1565 is 10:1, so the base of Q1560B is at zero volt when the supply is operating normally. The level on the -50 V Sense line is held stable by the -50 Volt Supply. Therefore, any change at the output of the +5 Volt supply appears at the base of Q1560B as an error signal. The output voltage is regulated in the manner described previously for the -50 Volt Supply. Diode CR1589 limits the output of this supply to about -0.6 volt if it is shorted to one of the negative supplies.

The +5 Volt Current Limiting stage (Q1576A and B) protects this supply from excessive output current. Transistors Q1576A and Q1576B are connected as a comparator to detect excessive current through R1587. With normal supply current through R1587, the voltage drop across R1587 is such that the base of Q1576B is more positive than the base of Q1576A; therefore, Q1576A is cut off. If the current through R1587 increases above a safe level, the base of Q1576B becomes more negative than the base of Q1576A. Now, Q1576B is cut off and Q1576A conducts. The collector current of Q1576A forward biases CR1576 and decreases the voltage on the base of Q1582. This limits the conduction of Q1588 to a safe current level.

+15 Volt Supply

The +15 Volt Supply regulates in the same manner as the -50 Volt Supply; current limiting operates in the manner described for the +5 Volt Supply. Error feedback voltage to the base of Q1436B is provided through divider R1440 and R1459, referenced to the -50 V Sense line, from the +15 V Sense line. The divider ratio of R1440 and R1459 sets the base of Q1436B at zero volts. Any change in the output level of the +15 Volt Supply appears at the base of Q1436B as an error signal. This results in an opposite change at the collector of Q1436B. This change is conveyed to the +15 V Series Regulator stage through Q1455 to correct the error in the output voltage of the supply.

Diode CR1439 protects Q1436B against negative voltages if the +15 Volt Supply is shorted to ground. Diode CR1459 limits the output of this supply to about -0.6 volt if it is shorted to one of the negative supplies.

+50 Volt Supply

Operation of the +50 Volt Supply is basically the same as described for the -50 Volt Supply; current limiting operates in a similar manner as described for the +5 Volt Supply. Error voltage to the base of Q1490B is provided by divider R1412 and R1429, referenced to the -50 V Sense line, from the +50 V Sense line. The divider ratio of R1412 and

R1429 sets the base level of Q1409B at zero volts when the output of this supply is correct. The protection diodes in this circuit operate similarly to those in the other supplies.

Fan Circuit

The fan motor used in this instrument is a brushless dc motor, using Hall Effect devices. The 2 Hall Effect devices sequentially drive the 4 transistors (U1615 A, B, C, and D) which, in turn, control the current flow through the 4 field windings. The fan motor speed is regulated by limiting the current flow through Q1604. Diodes CR1611, CR1612, CR1613, and CR1614 rectify the back emf produced by the 4 field windings. This voltage is applied to the base of Q1603 through resistive divider network R1614 and R1613; the voltage developed by this circuit is proportional to the motor speed. If the motor speed starts to increase, the current drive to the base of Q1604 will decrease, reducing the current to the motor, thus maintaining a constant motor speed.

Graticule-Light Supply

The Graticule-Light Supply provides power to illuminate the graticule lights. The front-panel GRAT ILLUM control controls the output of this supply to set the brightness of the graticule lights. Transistors Q1546, Q1555, and CR1549 form a pseudo differential amplifier. The output voltage at the collector of Q1555 follows the voltage set at the base of Q1546 by the divider made up of R1544, R1545, R1543, and the GRAT ILLUM control R917 (see Diagram 13). Resistor R1551 limits the output current from this supply to protect Q1555 from damage due to a short circuit.

MAIN INTERCONNECT

The Main Interconnect diagram shows the signal and power interconnections between the Acquisition and Display Unit, diagram 13, in the Diagrams section of this manual.

VERTICAL AMPLIFIER

The Vertical Amplifier circuit provides final amplification for the vertical signal before it is applied to the vertical deflection plates of the crt. The Vertical Amplifier also accepts inputs from the Readout System to block the vertical signal while readout information is displayed and to produce the vertical portion of the readout display. An input is provided for the BEAMFINDER switch to compress an over-scanned display within the viewing area of the crt. In addition, the Vertical Amplifier accepts the Auxiliary Y-Axis input from the Main Interface circuit. Figure 3-43 shows a block diagram of the Vertical Amplifier circuit and a schematic is provided on diagram 14 in the Diagrams section of this manual.

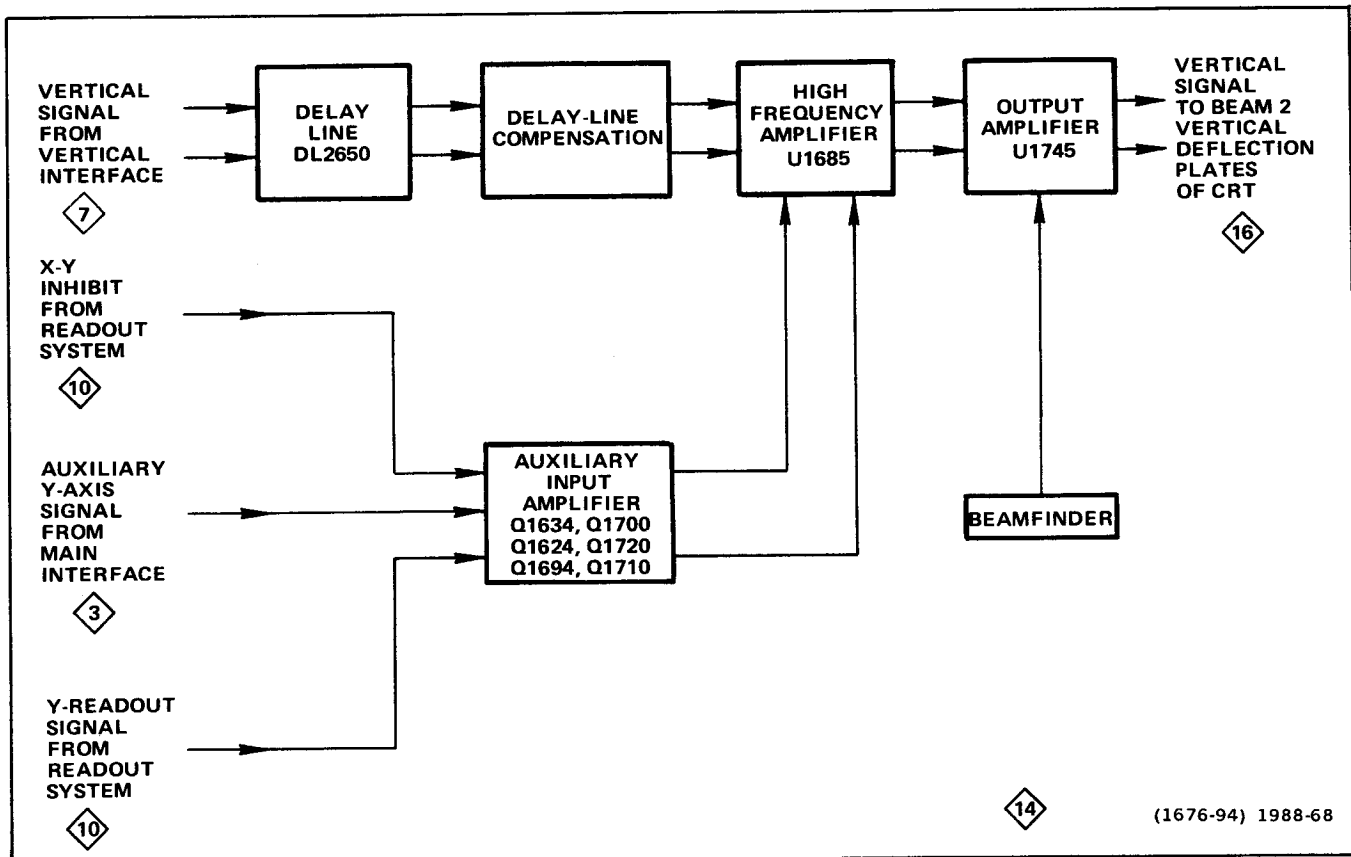


Figure 3-43. Detailed block diagram of the Vertical Amplifier circuit.

Delay Line

Delay Line DL650 provides approximately 65 nanoseconds of delay (for the vertical signal) to allow the horizontal circuits time to initiate a sweep before the vertical signal reaches the vertical deflection plates of the crt. This allows the instrument to display the leading edge of the signal originating the trigger pulse when using internal triggering. The delay line used in this instrument has a characteristic impedance of 100 ohms differentially. It is of the coaxial type that does not produce preshoot or phase distortion in the crt display.

High-Frequency Amplifier

The High-Frequency Amplifier stage, consisting primarily of integrated circuit U1685, provides a 50 ohm input impedance (100 ohms differentially) for the Vertical Amplifier circuit to permit accurate delay-line termination. The components connecting the input signal to U1685 provide forward termination and compensation for the delay line. Components R1658 and C1658 provide adjustable high-frequency compensation. Resistors R1688 and R1682 set the quiescent operating level of U1685 while R1683 and R1687 are selected to accurately set the gain of the stage. Resistors R1683 and R1687 connected to pins 6 and 12 provide a signal path for the output of the Auxiliary Y-Axis Amplifier stage. The Vert Gain adjustment R1730 sets the

resistance between the output terminals of U1685 to control the current gain of this stage. This adjustment sets the overall gain of the Vertical Amplifier circuit. Thermistor T1731 compensates for gain change with temperature changes.

Auxiliary Input Amplifier

The Auxiliary Input Amplifier controls the bias current to the High-Frequency Amplifier stage to provide centering for the overall Vertical Amplifier circuit. This stage also provides readout and auxiliary inputs to the Vertical Amplifier. The auxiliary Y-Axis signal originates from dual time-base units with alternate sweep switching and vertical positioning. This signal is amplified by Q1624 and applied to Q1720 through diodes CR1690, CR1696 and CR1697. Transistors Q1720 and Q1710 form a paraphase amplifier to convert the single-ended input signal to a push-pull signal which is coupled to the bias inputs of U1685.

The X/Y Inhibit signal and Y-Readout signals are developed by the Readout System. When readout is displayed, the X-Y inhibit signal goes HI at J1738 and turns Q1694 on. The collector of Q1694 drops which reverse biases CR1690 (blocking auxiliary Y-Axis signal) and turns Q1700 on providing readout centering current, adjustable by R1700. The Y-Readout signal at J1799 is coupled to the base of Q1720 through R1635.

Output Amplifier

The Output Amplifier stage, consists primarily of integrated circuit U1745; provides final amplification for the vertical signal to drive the crt vertical deflection plates. Pins 1, 6, 7, and 12 allow the use of discrete components to establish operating characteristic. Resistors R1741 and R1756 are selected to accurately set the gain of the differential channels. Resistors R1753, R1754, R1767, R1768, and R1770 set the operating level of U1745. The series RC networks in parallel with R1741 and R1756 provide frequency compensation for uniform gain at all frequencies within the bandwidth of the instrument. The BEAMFINDER switch changes the emitter current source for U1745 to provide the beam-finder function. Normally, the emitter current for U1745 is supplied from ground. However, when the BEAMFINDER switch is actuated, the only emitter current source for U1745 is through R1771. This limits the dynamic range of the stage by limiting its current, so the display is compressed vertically within the graticule area. The signal at the output pins 2 and 8 of U1745 is connected directly to the vertical deflection plates of the crt. A distributed deflection plate system is used in the crt for maximum frequency response and sensitivity. The signal at the output of U1745 is connected to the deflection-plate structure in the crt and then to termination network LR1780, R1782A, LR1784, and R1782B. As the signal passes through the deflection-plate structure in the crt, its velocity is essentially the same as the velocity of the electron beam passing between the vertical deflection plates. This synchronism of the deflection signal and the electron beam reduces the loss in high-frequency sensitivity due to electron-transit time through the deflection-plate structure.

Transistors Q1786 and Q1785 comprise a protection circuit for U1745, in case the +15 volt supply is shorted to ground. If this occurs Q1786 turns on causing the base of Q1785 to drop below +35 volts. Thus, the emitter voltage of Q1785 is kept at a safe level for U1745.

HORIZONTAL AMPLIFIER

The Horizontal Amplifier circuit amplifies the push-pull horizontal deflection signal from the plug-in unit installed in either horizontal compartment and connects it to the horizontal deflection plates of the crt. Figure 3-44 shows a detailed block diagram of the Horizontal Amplifier circuit. A schematic of this circuit is shown on diagram 15, in the Diagrams section of this manual.

Readout Positioning

When readout is displayed, the X-Axis Readout signal is applied to the Horizontal Amplifier through J1913. At the same time, the X-Y Inhibit signal (HI) causes Q1814 to conduct, connecting the center tap of the R.O. Pos (horizontal readout center) adjustment R1815 to ground. Grounding the center tap allows R1815 to horizontally position the readout display on the crt.

Input Amplifier

The Input Amplifier stage is a paraphase amplifier consisting of Q1824 and Q1924. Overall gain for the Horizontal Amplifier is determined by H Gain adjustment R1832. Thermal compensation for the horizontal amplifier is provided within this stage by thermistor RT1833. The emitter current for this stage is normally supplied from the +15 Volt Supply through R1932 and Q1932. However, when the BEAMFINDER switch is actuated, Q1932 is reverse biased, and emitter current to Q1824 and Q1924 is supplied only through R1932. Transistor Q1938 is then forward biased which causes CR1843 and CR1943 to conduct. The combination of Q1932 turning off and Q1938 turning on reduces the dynamic range of the horizontal system to keep the display within the horizontal limits of the graticule, regardless of the setting of the positioning controls or signal amplitude.

Left and Right Driver Amplifiers

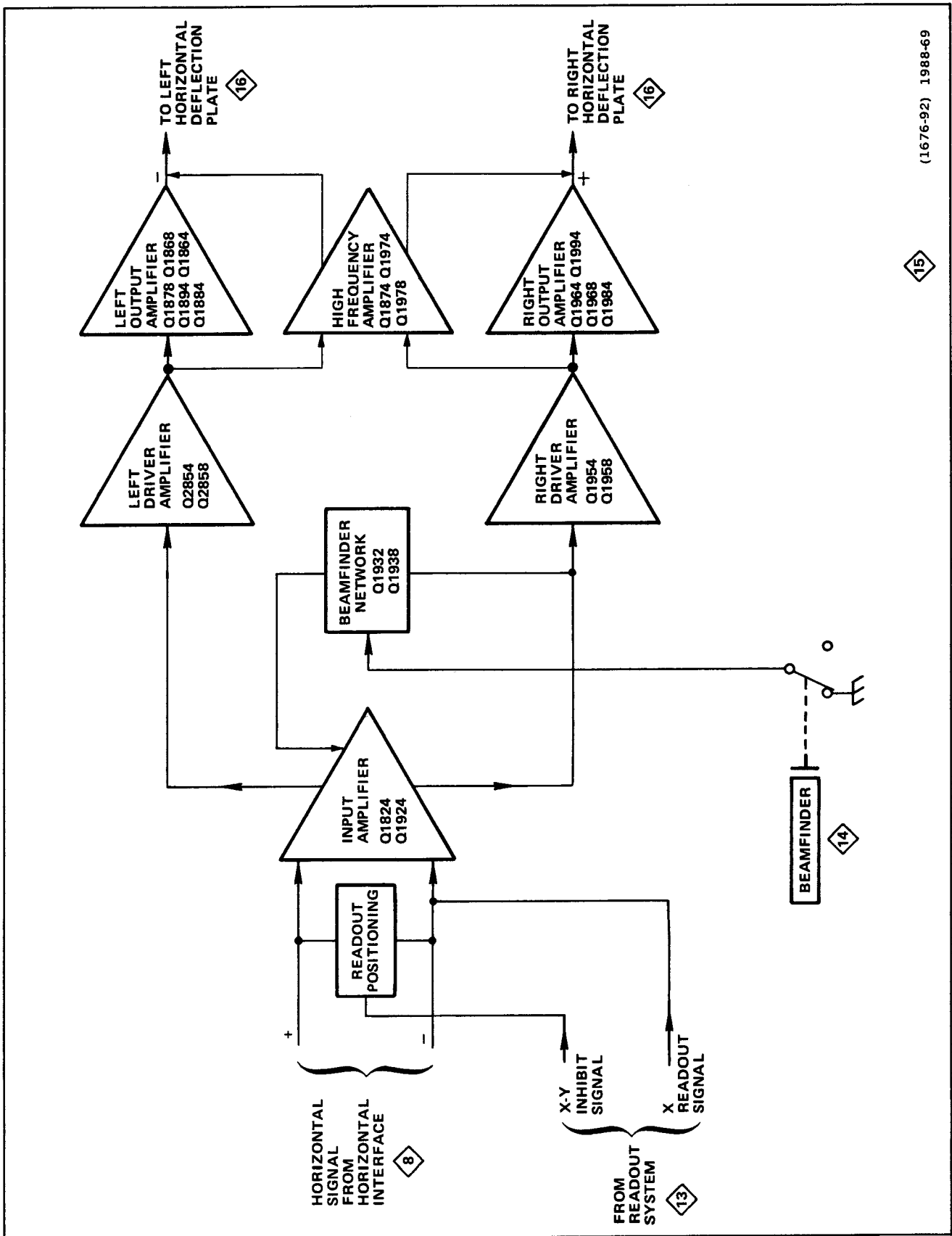
The Left and Right Driver Amplifiers each consist of an operational amplifier to drive their respective output amplifier stages. Transistors Q1854 and Q1858 comprise the operational amplifier for the Left Driver Amplifier. Transistors Q1954 and Q1958 comprise the operational amplifier for the Right Driver Amplifier. The Plate AVE. (average) adjustment R1935 sets the quiescent operating level of the driver amplifiers and output amplifiers. To prevent the Left Output Amplifier from being overdriven, signal limiting occurs in the Left Driver Amplifier when the collector of Q1854 is driven far enough in the negative direction for CR1851 and CR1852 to become forward biased. As CR1851 and CR1852 conduct, the effective gain of the stage is greatly reduced, and in turn the drive to the Left Driver Amplifier. Similarly, to prevent the Right Output Amplifier from being overdriven, signal limiting occurs in the Right Driver stage when the collector of Q1954 is driven far enough in the positive direction for CR1951 and CR1952 to become forward biased. As CR1951 and CR1952 conduct the gain of the stage is greatly reduced, and in turn, the drive to the Right Output Amplifier.

Left Output Amplifier

The Left Output Amplifier consists of a mid-frequency operational amplifier paralleled by a high-frequency signal path. The network of R1861, R1862, C1862, and C1863 comprise Z_i (input impedance), while R1865 and C1865 comprise Z_f (feedback impedance) for the mid-frequency operational amplifier. High-Frequency components of the horizontal signal are amplified by Q1874 and coupled directly to the common-base output transistor Q1884 by C1878. The 1 nanosecond linearity, and 1 nanosecond compensation adjustments determine the gain of the high-frequency signal path.

Right Output Amplifier

Basic operation of the Right Output Amplifier is the same as just described for the Left Amplifier.



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Figure 3-44. Detailed block diagram of the Horizontal Amplifier.

Z AXIS & CRT 16

The CRT circuit provides the high voltage and control circuits necessary for operation of the crt (cathode-ray tube). This circuit also includes the Z-Axis Amplifier and the Auto-Focus Amplifier (diagram 17, at the rear of this manual). Figure 3-45 shows a detailed block diagram of the CRT circuit. A schematic of this circuit is shown on diagram 16, at the rear of this manual.

Power Transformer

Power Transformer T2010 provides pre-regulated voltages for the high-voltage supplies, and 6.3 volts ac for the crt heater. The crt heater is elevated to the cathode potential through R2074. The high-voltage winding of T2010 provides a two-kilovolt peak square-wave voltage to the Anode Voltage Multiplier and CRT Cathode Supply. A 600 volt winding supplies ac to the Control-Grid DC Restorer stage and is also rectified to supply +600 volts dc. Taps on this winding provide the +130 volts, through CR2118 and CR2119 in full-wave configuration, and a means of current sensing through resistor R2121.

Anode Voltage Multiplier

Positive accelerating potential for the crt anode is supplied by the four-times voltage multiplier contained within U2012. The applied voltage to the input of U2012 from the high-voltage secondary of T2010 is about two kilovolts peak. This results in an output voltage of about +8 kilovolts at the crt anode. The internal resistance of this supply is about 15 megohms and subject to meter loading when measured.

CRT Cathode Supply

In the full scan mode (front-panel REDUCED SCAN push button out) the crt cathode supply voltage is about -2 kilovolts; in the reduced scan mode, about -4 kilovolts. The negative potential for the crt cathode is generated by a half-wave rectifier (CR2012) for the full scan mode and modified to a doubler in the Reduced Scan mode by activating K2014 which connects CR2014 in the circuit. Diode CR2023 provides the return path for the rectified current in the full scan mode; the reduced scan mode, and the X4 Multiplier require an ac return path which is provided by C2021, CR2021, CR2022 and VR2021.

Cathode-Supply Regulator

The Cathode-Supply Regulator maintains the potential on the crt cathode and actively reduces the ac ripple through C2034. A sample of the output of the CRT Cathode Supply is connected to amplifier U2224 through the resistor divider network R2218. High-frequency changes from the CRT Cathode Supply are coupled through C2282 and R2282. A tetrode voltage, which is maintained at about +2 kilovolts above cathode potential in either full or reduced scan, is also obtained from the high-voltage secondary. Filtering for this voltage is accomplished by R2015 and C2014. Resistor R2014 limits current under fault condi-

tions. Diode CR2016 clamps the tetrode voltage a few volts above ground in the Full Scan mode. Components C2016 and R2017 are an isolation filter.

The output of U2224 drives Q2132. The collector of Q2132 is in the dc current return path of the Cathode Supply. Any change in collector voltage directly changes the cathode voltage. Diodes VR2133 and CR2133 prevent the voltage on the collector of Q2132 from exceeding safe levels.

The -1955 V (full scan cathode voltage) adjustment R2285 sets the crt cathode voltage (-1955 V in Full Scan mode). The Reduced Scan Horiz Gain adjustment R2220 sets crt horizontal sensitivity by setting the crt cathode voltage when in Reduced Scan mode.

Z-Axis Amplifier

The Z-Axis Amplifier controls crt intensity by varying grid drive. High speed changes are coupled through C2289. Slow changes and dc levels are coupled through the Control Grid DC Restorer. The Logic circuit and the Readout System provide input signals to the Z-Axis Amplifier.

Transistors Q2206 and Q2216 are common-base amplifiers to establish a low input impedance for the Z-Axis Amplifier. Transistors Q2236, Q2242, Q2254, Q2264 and Q2274 form a current to voltage amplifier with feedback resistors R2233-R2248. The Z-Axis Amplifier is compensated by R2235 and C2235 for optimum square corner.

Control Grid DC Restorer

The Control Grid DC Restorer couples dc and low frequency components of the Z-Axis Amplifier signal to the crt control grid, where difference in potential prohibits direct coupling. The dc restorer is actually a cathode-referenced bias supply for the crt control grid. Quiescently, its output voltage is more negative than the cathode by an amount set by the Crt Bias (grid) adjustment R2135.

The Control Grid DC Restorer is current driven from the +600 volt winding of T2010 through C2041-R2041-R2042. This approximately 25-kilohertz drive signal is connected to the junction of CR2045-CR2055-C2052. Diodes CR2045 and CR2055 limit the peak-to-peak amplitude of the drive to the difference between their forward-bias levels. The crt bias adjustment R2135 and the output level of the Z-Axis Amplifier set the forward-bias levels of CR2045 and CR2055 respectively. Capacitor C2052 couples the limited-amplitude drive to the junction of CR2052-CR2054. During positive half cycles of the drive, CR2054 charges the control grid side of C2055 to a level equal to the peak-to-peak value of the drive signal. The resulting control-grid voltage is more negative than the cathode by an amount equal to the difference between the CRT Bias adjustment setting and the Z-Axis Amplifier output level.

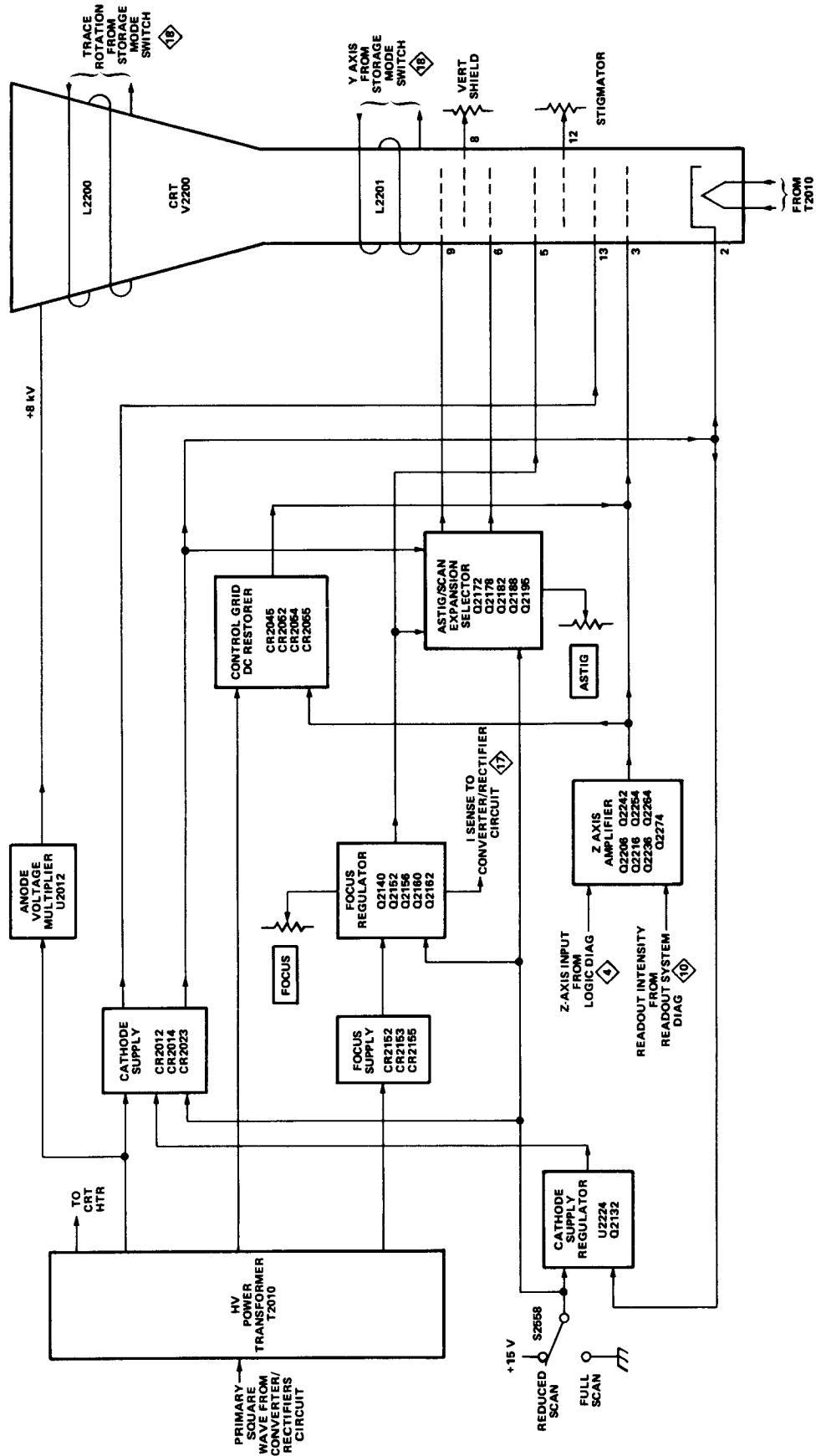


Figure 3-45. Detailed block diagram of the CRT Circuit.

Focus Supply

The Focus Supply provides a regulated dc voltage to the crt focus and astigmatism elements. The supply voltage is produced by the half-wave rectifier CR2155. In the Reduced Scan mode the contacts of K2155 close to connect CR2152 in the circuit to form a half-wave voltage doubler.

Regulation of the Focus Supply is accomplished by Q2156, Q2160 and Q2162. Normally the voltage at the base of Q2162 is +15 volts. Any error in this voltage changes the voltage at the collector of Q2156 to correct the Focus Supply voltage. The Focus adjustment R2165 determines the quiescent operating voltage of the Focus Supply for a well-defined crt display. In the Full Scan mode, feedback from the focus grid electrode is provided by two parallel resistor networks R2166-R2167 and R2141-R2142. In the Reduced Scan mode Q2140 turns on, routing the current flowing through R2141 and R2142 through R2140 to ground. This action doubles the effective feedback resistance, increasing focus grid voltage. The Reduced Scan Focus adjustment R2140 is operational only in the Reduced Scan mode. All of the load current for the Focus Supply flows through Q2156 and R2153. If the load current exceeds about 8 milliamperes the voltage across R2153 causes Q2152 to conduct. The additional current in the I Sense line will cause the low-voltage supply to turn off, preventing component damage.

CRT Control Circuits

The ASTIG adjustment, R2195 (used in conjunction with the FOCUS control to obtain a well-defined display) varies the potential on the astigmatism element of the crt. The range of adjustment of R2195 is determined by the current path through Q2188 and Q2182. In the Reduced Scan mode the current path is through Q2178 and Q2172, activating the Reduced Scan adjustment for optimizing the display.

The Stigmator adjustment, R2110, affects the focus of the crt beam. The Vert Shield adjustment, R2105, sets the voltage level on the vertical shield, which provides isolation for the vertical deflection plates.

The Reduced Scan Vert Gain adjustment R2175 determines the vertical sensitivity of the crt when the crt is operated in the Reduced Scan mode.

Two coils control the trace alignment by varying the magnetic field around the crt. The Y-Axis alignment coil L2201, affects the crt beam after vertical deflection but before horizontal deflection. Therefore, only the vertical (Y) components of the display is affected. The TRACE ROTATION coil, L2200 affects both the vertical and horizontal rotation of the crt beam.

AUTO FOCUS AMPLIFIER



The Auto Focus Amplifier provides control voltages to maintain optimum focus of the crt display with various settings of the front-panel A INTENSITY, B INTENSITY and READOUT INTENSITY controls. Figure 3-46 shows a detailed block diagram of the Auto Focus Amplifier. A schematic for the Auto Focus Amplifier is given on diagram 17 at the rear of the manual.

Data Switch

The output of the Data Switch is determined by the Display B and X-Y Inhibit input signals. The Logic Table given in Figure 3-46B shows the intensity controls that determine the output current of this stage for different combinations of Display B and X-Y Inhibit input levels.

Current to Voltage Amplifier

The Current to Voltage Amplifier stage, consisting of Q2322, Q2328, and Q2332, converts the current output from the Data Switch to a voltage in order to drive the Non-Linear Amplifier stage.

Non-Linear Amplifier

The Non-Linear Amplifier stage, consisting of Q2336 and CR2335, inverts the input signal in a nonlinear manner. When the input signal is too low to forward bias the emitter base junction of Q2336, no current flows, and the collector of Q2336 is at its most positive level. As the signal becomes more positive Q2336 will conduct current causing the collector voltage to decrease. When the voltage at the base of Q2336 becomes positive enough to cause CR2335 to conduct, the emitter degeneration is reduced, which increases the gain of the stage. Variable resistors R2365 and R2366 determine the gain of the Non-Linear Amplifier stage in the Full Scan and Reduced Scan modes.

Output Amplifier

The signal from the Non-Linear Amplifier stage is applied to the Output Amplifier for final amplification and then connected to pin 4 of the crt.

Emitter Follower

The signal applied to pin 4 of the crt is connected through a voltage divider to the Emitter Follower stage and applied to pin 10 of the crt. Variable resistors R2425 and R2435 determine the ratio of the divider in the Reduced Scan and Full Scan modes.

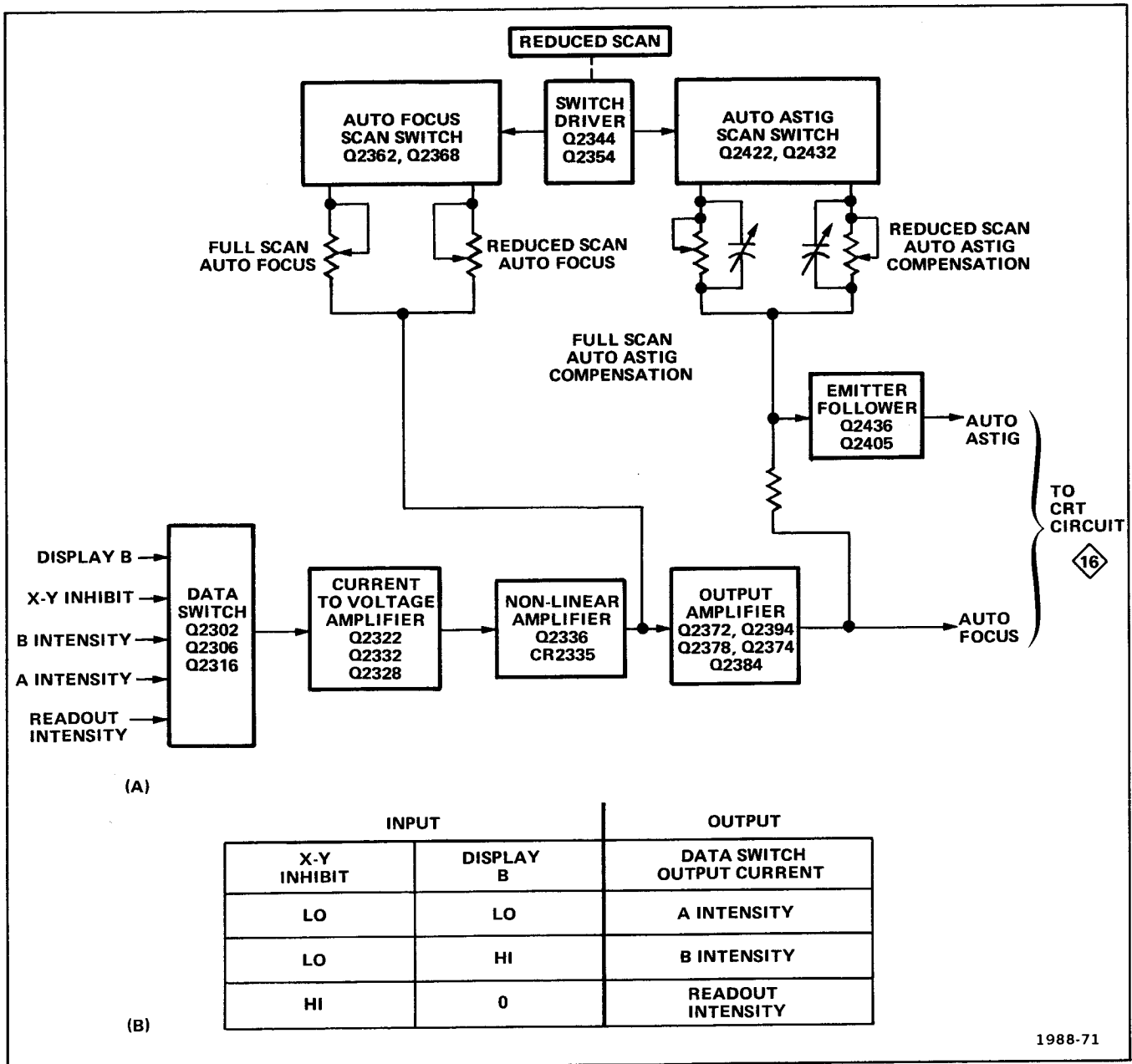


Figure 3-46. Detailed block diagram of the Auto Focus Amplifier circuit.

STORAGE CONTROL AND TRACE ALIGN 18 STORAGE DISPLAY 19

The Storage Control and Storage Display circuits comprise the Storage System. The Storage Control circuit develops digital and analog signals for input to the Storage Display circuit. The Storage Control circuit includes front-panel switching and rear-panel connectors for control of the Storage System. The Storage Control also includes circuits to coordinate the operation of the Readout System and associated time-base unit(s) with storage functions. The Storage Display circuit decodes the signals that are generated by the Storage Control circuit and develops the waveforms that are applied to the crt storage electrodes.

Figure 3-47 shows a detailed block diagram of the Storage System. The schematic for the Storage Control and the Storage Display circuits are on diagrams 18 and 19 respectively, in the Diagrams section at the rear of this manual. Figures 3-48, 3-49, 3-50 and 3-51 show the timing sequence of signals used throughout the Storage System in each of the four storage modes (BISTABLE, VAR PERSIST, FAST BISTABLE and FAST VAR PERSIST).

The Trace Alignment circuit develops outputs to drive the Trace Rotation and Y-Axis coils. The schematic for this circuit is shown on diagram 18.

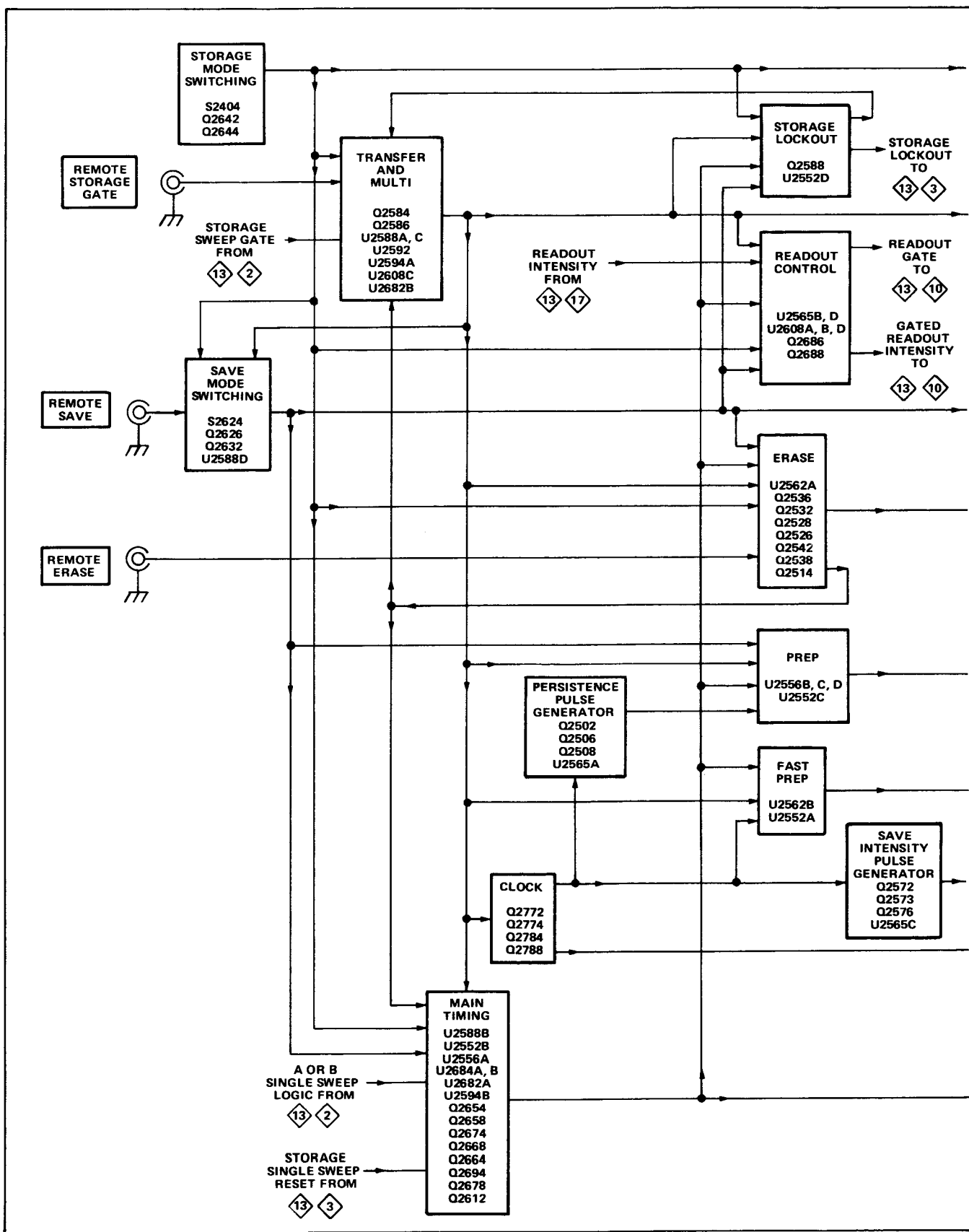
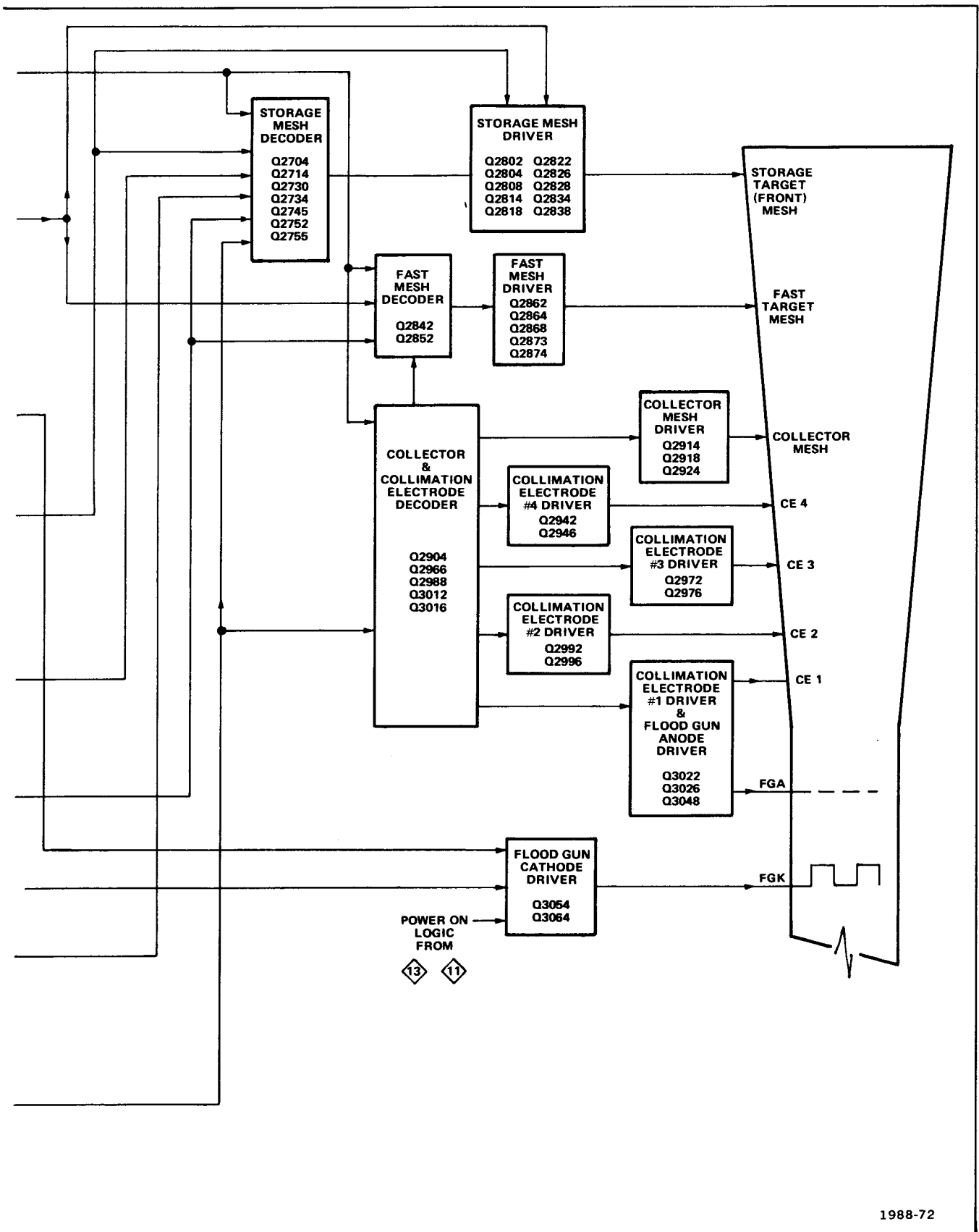
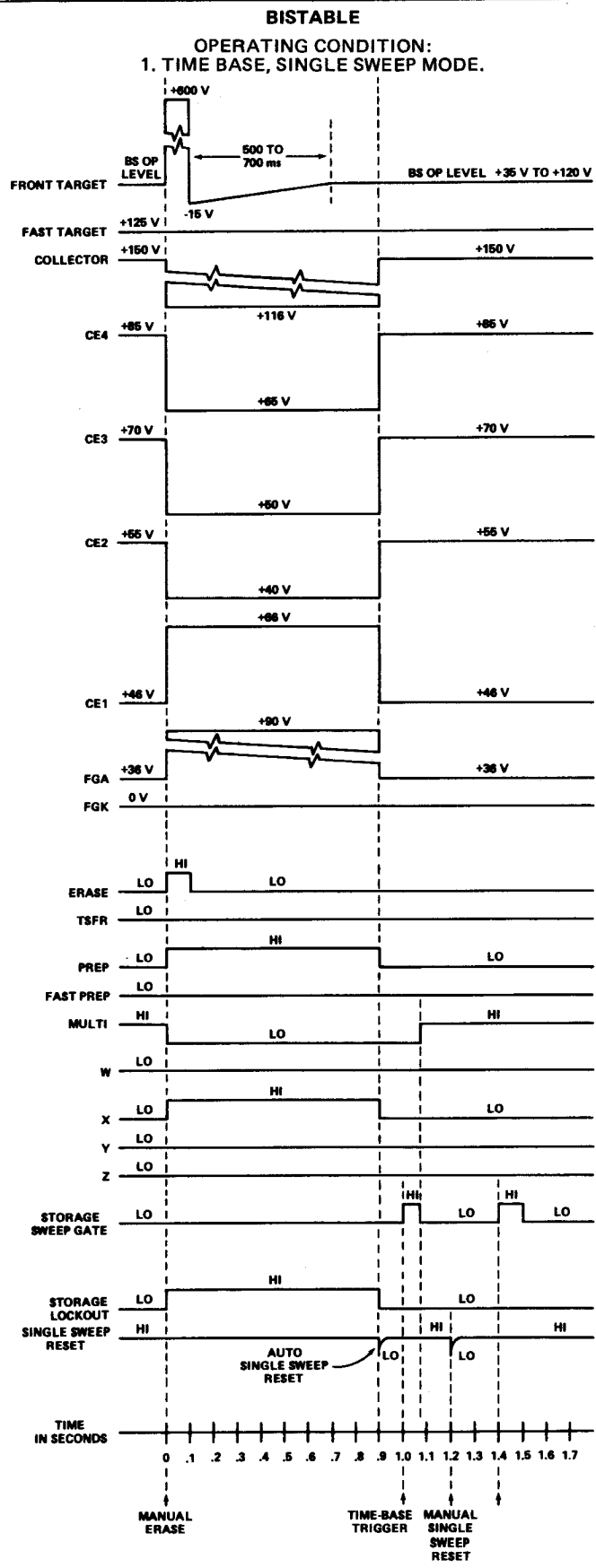


Figure 3-47. Detailed block diagram of the 7834 Storage System.



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Figure 3-47. Detailed block diagram of the 7834 Storage System (continued).



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Figure 3-48. Bistable storage mode timing diagram.

VARIABLE PERSISTENCE

- OPERATING CONDITIONS:
 1. TIME BASE, SINGLE SWEEP MODE.
 2. STORAGE LEVEL CONTROL, FULLY CW.
 3. PERSISTENCE CONTROL, FULLY CCW.

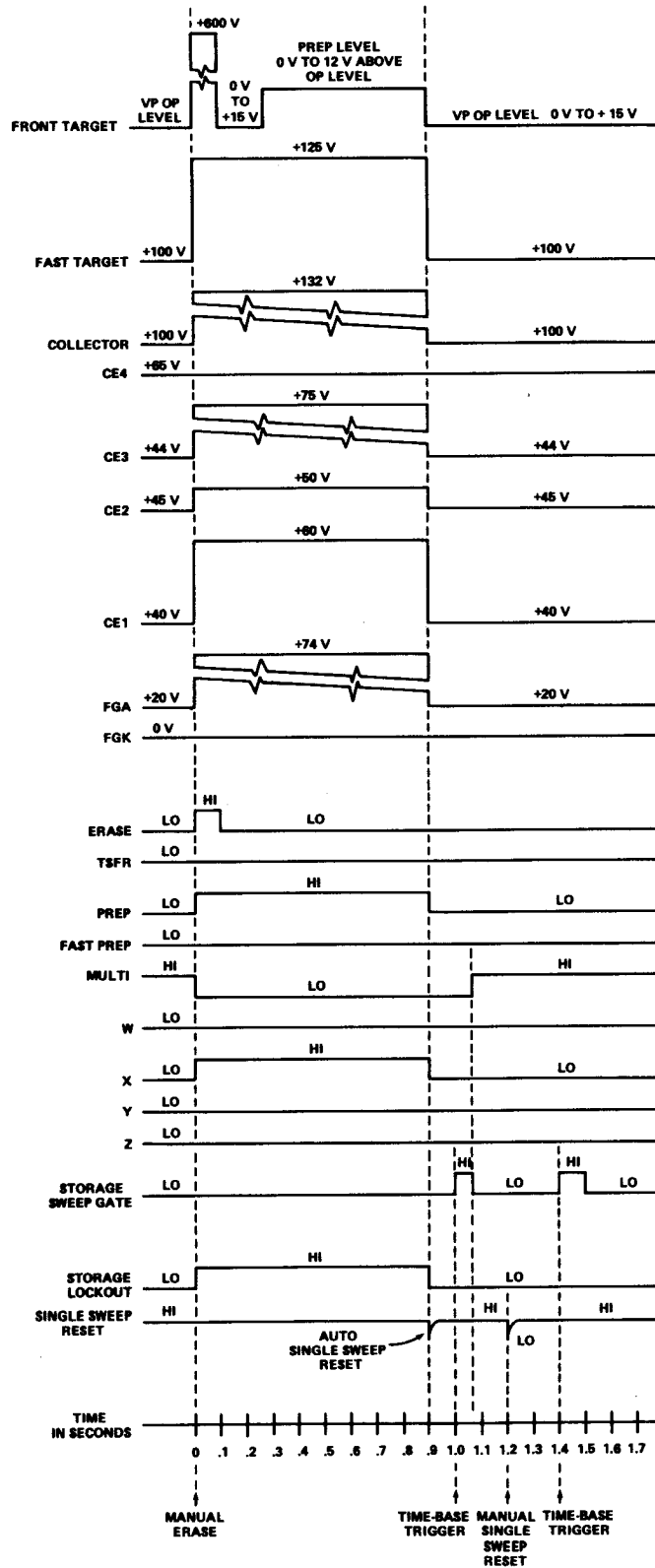
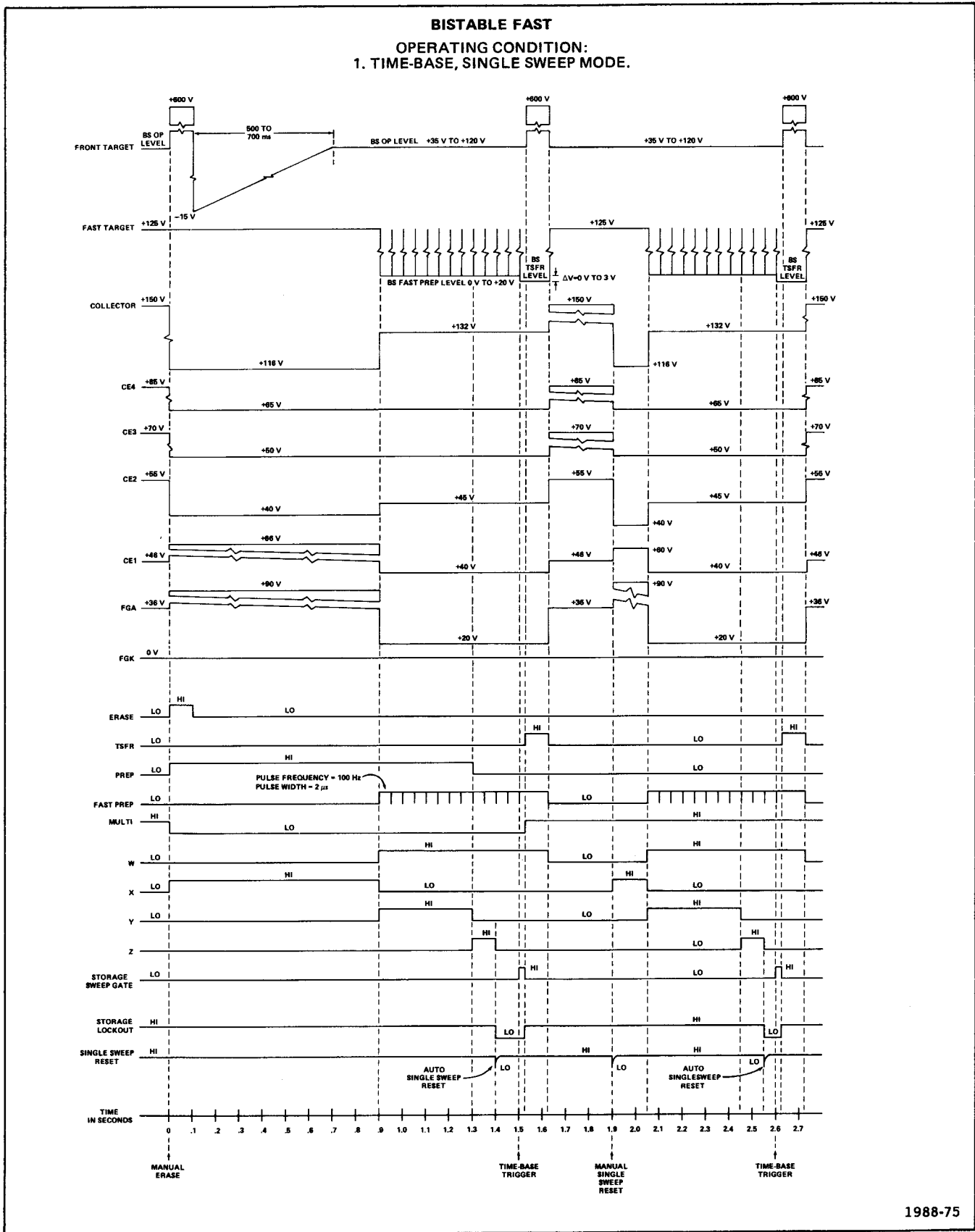


Figure 3-49. Variable persistence storage mode timing diagram.

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Figure 3-50. Bistable fast storage mode timing diagram.

TABLE 3-6
Storage Mode Switch Output Logic Levels

Storage Display Mode	NS	\overline{NS}	$\overline{NS} (+15 V)^1$	VP (+15 V) ¹	\overline{VP}	FAST
NON-STORE	HI	LO	LO	LO	HI	HI
BISTABLE	LO	HI	HI	LO	HI	HI
VAR PERSIST	LO	HI	HI	HI	LO	HI
FAST BISTABLE	LO	HI	HI	LO	HI	LO
FAST VAR PERSIST	LO	HI	HI	HI	LO	LO

¹ A HI logic level is +5 volts except for $\overline{NS} (+15 V)$ and $VP (+15 V)$ which are +15 volts in the HI state.

Storage Mode Switching

This stage, comprised of Q2642, Q2644, and S2404, provides dc control signals for the Storage System. Table 3-6 lists the logic levels of the control signals for the five positions of the Storage Mode Switch, S2404.

Erase

This stage develops the Erase and \overline{Erase} pulses, which initiate the storage erase cycle. It consists of three sections: (1) monostable multivibrator, U2562A, (2) input logic for the stage, Q2514, Q2526, Q2528 and Q2542, (3) oscillator Q2538, Q2532 and Q2536.

Each time pin 2 of U2562A goes HI and pin 1 is LO, an Erase pulse is generated. However, if pin 1 of U2562A is HI (see Save Mode Switching) no Erase pulse can be generated by the signal on pin 2. The width of the erase pulse (determined by R2562 and C2562) is approximately 100 milliseconds.

When the front-panel ERASE push button (S2538) is pressed, the $\overline{NS} (+15 V)$ logic level is connected to R2516. In all storage modes the $\overline{NS} (+15 V)$ signal is at +15 volts. Therefore, current from the +15 volt supply passes through C2521 to momentarily turn on Q2526. When Q2526 conducts, Q2542 turns off, and a HI is applied to pin 2 of Q2562A to generate an Erase pulse.

Whenever a position on the Storage Mode Switch (S2404) is selected, or the REDUCED SCAN switch (S2558) is pressed, the switching transitions coupled through C2523 and Q2526 or C2528 and Q2528 initiate an Erase pulse.

Transistors, Q2532, Q2536, and Q2538, comprise a variable frequency low-speed oscillator controlled by the front-panel AUTO ERASE control. The PUT (programmable unijunction transistor) Q2538, is connected as a relaxation oscillator with C2534 as the timing capacitor. Current to charge

C2534 is provided by a variable-current source, Q2536, controlled by the AUTO ERASE viewtime control R2537. Each time Q2538 turns on to discharge C2534, a voltage spike is applied to R2540 which turns Q2542 off and triggers an Erase pulse.

Transistor Q2532, when on, inhibits the operation of the oscillator by holding C2534 discharged. When P2531 is set for Periodic operation, the X+Y logic signal (see Main Timing) turns Q2532 on for approximately 1.4 seconds after the start of each Erase pulse, and then allows C2534 to resume charging. When P2531 is set for After Sweep operation the Multi signal (see Transfer and Multi) turns Q2532 on at the beginning of the Erase pulse and holds it on until the end of the next sweep. When the AUTO ERASE switch (S2537) is set to the OFF Position Q2532 is biased on to inhibit the Auto Erase function.

When the Save signal (see Save Mode Switching), connected to R2539, goes HI the auto erase oscillator is inhibited; however, Q2538 is allowed to turn on immediately after the Save signal returns LO, providing C2534 is sufficiently charged.

Transfer and Multi

This stage develops the Tsfr and \overline{Tsfr} pulses which initiate the transfer operation in the fast storage modes, the Multi and \overline{Multi} signals which indicate whether a display has been stored since the last erase cycle occurred, and the $\overline{Swp+Tsfr}$ signal which indicates whether a waveform is being written or the transfer operation is occurring.

When the Storage Sweep Gate is HI, current flows into R2584 turning off Q2586 and causing a HI level to appear at its collector. Also, HI level applied to the REMOTE STORAGE GATE INPUT turns off Q2586 to provide a HI level at its collector. U2588A inverts the HI and applies it to pin 8 of U2588C. If the Storage Lockout signal (see Storage Lockout) at pin 9 of U2588C is LO, the signal is inverted to provide a replica of the Storage Sweep Gate or the Remote Storage Gate signals at pin 10 of U2588C.

The four gates of U2592, along with C2592, comprise a monostable multivibrator which generates a short positive pulse whenever the output of U2588C goes LO. This end-of-sweep circuit operates as follows: Assume that the output of U2588C is LO and that the output of U2592D is HI. Then, the outputs of U2592A and U2592C will be LO. When the output of U2588C goes HI, the flip-flop comprised of U2592A and U2592D changes states. The output of U2592C, however, still remains LO. When the output of U2588C returns LO, the output of U2592C immediately goes HI since both of its inputs are now LO.

Both inputs to U2592B are also LO so its output switches to the HI state. Capacitor C2592 loads the output of U2592B to provide a delay of approximately 100 nanoseconds in the LO to HI transition. At the end of this delay the flip-flop, U2592A and U2592D, switches back to its initial state and the output of U2592C returns LO.

The 100 nanosecond end-of-sweep pulse from U2592C provides a trigger to U2592A, to generate a 100-millisecond wide Tsfr pulse at the end of the sweep whenever the $\overline{\text{Fast}}$ signal is LO. The pulse also clocks U2682B so that the Multi signal goes HI at the end of the first sweep after an erase pulse occurs; the Erase pulse clears this flip-flop. The end-of-sweep pulse is also coupled to U2608B in the Readout Control stage (see Readout Control). U2608C generates the $\overline{\text{Swp}} + \overline{\text{Tsfr}}$ signal through a combination of inputs from U2588C and U2594A.

Save Mode Switching

This stage, consisting of Q2626, Q2632 and U2588D, develops the Save signal which enters the Storage System into the Save mode of operation. Pressing the front-panel SAVE push button switch, S2624, or grounding the rear-panel REMOTE SAVE INPUT, J2625, will initiate the Save signal by turning off Q2626 which in turn saturates Q2632. However, if one of the storage modes is not selected, $\overline{\text{NS}}$ (+15 V) connected to the collector of Q2626 will be at zero volts and Q2632 will remain off to prevent the Save signal from occurring.

When Q2632 saturates to produce the Save signal, the SAVE front-panel light, DS2624, turns on and a LO is applied to pin 12 of U2588D. The Save output signal goes HI only if the $\overline{\text{Multi}}$ signal at pin 11 is LO. That is, the Save signal can only be produced if a sweep has occurred since the last Erase pulse. This action performs the Auto Save function.

Main Timing

This stage develops the W, X, Y, and Z signals, their complements, the X + Y signal, and the X·Multi signal. These signals control the major sequence of voltages applied to

the crt during the Erase and Multi-Trace cycles. This stage also accepts input information from the time-base unit(s) via the A or B Single Sweep Logic line and the Storage Single Sweep Reset line, and generates the Storage Single Sweep Reset signal to reset the time-base unit(s) during any Erase or Multi-Trace cycle.

The X signal, developed by U2684A, is a positive pulse with a duration of 150 milliseconds to 4 seconds. The X signal goes HI when Q2674 turns on pulling pin 1 of U2684A LO. This occurs under one of the three following conditions: (1) When an Erase pulse occurs, (2) in the Fast Storage modes when the MULTI TRACE DLY control S2616 is in the detent (∞) position, or the time-base unit(s) is in the Single Sweep mode and a Multi-Trace cycle is externally initiated, and (3) in the Fast Storage modes when S2616 is out of the detent, the time-base unit(s) is in a repetitive sweep mode, and the Multi-Trace cycle automatically recurs.

The input path for condition number 1 above is through R2673 when Erase goes HI. The input path for condition number 2 is through CR2664, C2668, and Q2668 when the Storage Single Sweep Reset line is pulled LO (time base unit(s) single sweep reset button is pushed or the REMOTE RESET input is grounded). Transistor Q2658 must be off so W (explained later) must be LO insuring that any previously initiated Erase or Multi-Trace cycle has been terminated. The input path for condition number 3 is through C2671 when $\overline{\text{Tsfr}}$ returns HI after the transfer operation. Transistor Q2654 must be off so the time-base unit(s) must be in a repetitive sweep mode and the MULTI TRACE DLY control must be out of the detent.

The width of the X pulse is determined by Q2612, Q2678, and U2552B. When the X pulse is triggered by an Erase pulse, Multi (emitter of Q2612) is LO and $\overline{\text{Multi}}$ is HI. Diodes CR2610 and CR2615 are reverse-biased and charging current for the timing capacitor C2676 passes through CR2614, R2613, and R2676. In this condition, the X pulse lasts approximately 900 milliseconds. When the Multi-Trace cycle is externally initiated, Multi is HI and the output of U2552B is LO (A or B Single Sweep Logic line is HI or S2616 is in the (∞) detent position), so Q2612 is on. Diode CR2614 is reverse-biased so charging current for C2676 passes through Q2612, CR2610, and R2676. Under this condition, the X pulse duration is approximately 150 milliseconds. When the Multi-Trace cycle automatically recurs, the output of U2552B is LO. If Multi is HI, timing current passes through R2616, the MULTI TRACE DLY control, and the pulse width is variable from approximately 150 milliseconds to 4 seconds. If Multi is LO, timing is as in condition number 1. Transistor Q2678 is a current stage which insures adequate drive for pin 15 of U2684A under any of the above timing conditions. The connection at pin 3 of U2684A inhibits the X pulse when $\overline{\text{NS}}$ is LO. Resistors R2652, R2653, R2655, and R2657 inhibit the X pulse when SAVE or $\overline{\text{FAST}}$ are HI.

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At the end of the X pulse (if the A or B Single Sweep Logic line is HI) current from the rising edge of \bar{X} is coupled through R2662 and C2663 into the base of Q2664 producing a negative reset pulse on the Storage Single Sweep Reset line.

The Y signal, generated by U2684B, is a positive pulse which occurs at the end of the X pulse. The Y pulse is triggered by \bar{X} coupled through C2684 to pin 10 of U2684. Transistor Q2694 inhibits the generation of the Y pulse whenever X, Save or $\bar{\text{Fast}}$ is HI. Components R2685 and C2685 set the width of the Y pulse to approximately 400 milliseconds.

The W signal is generated by U2682A. W goes HI at the beginning of the Y pulse and is normally reset LO at the end of the Tsfr pulse by the coupling of $\bar{\text{Tsfr}}$ through C2683. However, if X, Save, or $\bar{\text{Fast}}$ go HI, Q2694 will also reset W LO. The Z signal, generated by U2594B, is a positive pulse which occurs at the end of the Y pulse. Components R2696 and C2696 set the width of the Z pulse at approximately 100 milliseconds. The X+Y signal is formed directly by U2556A, and the X·Multi signal is formed directly by U2588A.

Clock

This stage generates the Clock and 10-kilohertz Ramp signals for use by the rest of the storage system. The PUT Q2772, and components R2770, C2770 and R2779 form a relaxation oscillator operating at a frequency of approximately 100 hertz. Components Q2774, R2774, R2775, R2779 and C2774 form a similar oscillator operating at a frequency of approximately 10 kilohertz. Both oscillators have a common gate-biasing resistor, R2779, that provides synchronous oscillations. To illustrate, consider that C2770 is initially discharged and Q2772 is nonconducting. The time constant of C2774 and R2774 is much shorter than the time constant of C2770 and R2770. Therefore, Q2774 oscillates at approximately 10 kilohertz while the anode voltage of Q2772 slowly rises. Each time Q2774 turns on, gate current is drawn from R2779 causing the gates of Q2772 and Q2774 to drop approximately 350 millivolts. Thus, the anode firing voltage for Q2772 is lower when Q2774 is on. This causes Q2772 to synchronize with Q2774.

When Q2772 is on, it draws sufficient gate current to temporarily stop the oscillation of Q2774 and turn Q2784 on for approximately 50 microseconds. This action generates the Clock pulses. The amplitude of the Clock pulses is approximately 10 volts with a -5 volt base line, set by Q2788, R2785, R2786, and R2787. The 10-kilohertz Ramp signal is taken directly from the anode of Q2774.

Persistence Pulse Generator

This stage, comprised of Q2502, Q2506, Q2508, and U2565A generates a Clock frequency pulse train, at the

collector of Q2508, with pulse width continuously variable by the PERSISTENCE control. These pulses control the persistence of the display in both of the Variable Persistence modes. Operation of the stage is as follows.

Transistors Q2502 and Q2506 are connected as a comparator. The PERSISTENCE control determines the voltage level applied to the base of Q2502. When the CLOCK pulse goes HI, Q2508 switches on to discharge C2507 to about -5 volts. When the PERSISTENCE control is adjusted away from the MAX position, Q2502 turns on and Q2506 turns off. At the same time, the output of U2565A goes LO to hold the collector of Q2506 LO. When the Clock pulse returns LO, a positive pulse begins at the collector of Q2506. Current through R2507 begins to charge C2507, raising the base voltage of Q2506. When the base voltage of Q2506 exceeds that of Q2502, transistor Q2506 turns on and the collector of Q2506 again goes LO. When the PERSISTENCE controls is set to the MIN position, the pulse width is approximately 1.8 milliseconds. If the PERSISTENCE control is set to MAX, Q2506 never turns off and no positive pulses are produced at the collector of Q2506.

Save Intensity Pulse Generator

This stage, comprised of Q2572, Q2576, Q2578, and U2565C generates a Clock frequency pulse train at the collector of Q2576 with pulse width continuously variable by the SAVE INTENSITY control. These pulses are applied directly to the Flood Gun Cathode Driver stage to adjust the display intensity in the Save mode. With the SAVE INTENSITY control set to MIN, pulses are not produced; with the SAVE INTENSITY control set to MAX, the pulse width is approximately 10 milliseconds. Operation of this stage is identical to the previously described Persistence Pulse Generator Stage.

Prep

This stage, comprised of U2556B, C, and D and U2552C, develops the Prep signal. This signal directs the Storage Mesh Logic Decoder to switch the Storage Mesh to the Prep Level when operating in the Variable Persistence storage modes (see Fig's. 3-49 and 3-51). The inputs to this stage are from the Persistence Pulse Generator, Save Mode Switching, Transfer and Multi, and Main Timing stages.

Fast Prep

This stage, comprised of U2562B and U2552A, generates the Fast Prep signal. The Fast Prep signal is used by the Storage Mesh Decoder and Fast Mesh Decoder stages in the transfer (FAST BISTABLE or FAST VAR PERSIST) modes. U2562B produces a clock frequency pulse train, the width of the pulses (set by R2565 and C2565) is approximately 1.8 microseconds. When \bar{W} is LO, these pulses are inverted by U2552A to form the Fast Prep signal. When $\text{SWP}+\bar{\text{TSFR}}$ is LO, and \bar{W} is LO, the Fast Prep signal remains HI. When \bar{W} is HI, the Fast Prep signal stays LO.

Storage Lockout

This stage, comprised of Q2588, U2552D, CR2551, CR2552, CR2553, CR2554, and CR2555, develops the Storage Lockout signal when the storage system is unprepared to produce a stored display. The Storage Lockout signal inhibits the time-base unit(s), the Storage Sweep Gate, the Remote Storage Gate and blanks the crt. The 5 diodes connected to the base of Q2588 form a 5 input OR gate. A HI level applied to the anode of any one of these 5 diodes will produce a HI Storage Lockout signal at the emitter of Q2588 (pins 11 and 12 of U2552D must both be LO for a HI to be applied to the anode of CR2553).

Readout Control Logic

This stage provides two signals to the Readout System: the Readout Gate and the Gated Readout Intensity. The Readout Gate signal is generated by U2608A, B, and D, U2565B and D, and S2610. When S2610 is set to the FREE RUN position the Readout Gate is HI, which allows the Readout System to operate continuously in a free-running manner. When S2610 is set to the GATED position, the state of the Readout Gate depends upon the end-of-sweep pulse from U2592C (see Transfer and Multi stage) and the setting of the Storage Mode Switch. In the NON-STORE or the VAR PERSIST mode, the Readout Gate duplicates the end-of-sweep pulses causing the Readout System to produce one complete frame (eight words) at the end of each sweep. In the FAST VAR PERSIST mode a Readout Gate is also produced at the end of each sweep. However, the Gated Readout Intensity (explained below) inhibits the Readout System so it will not write on the Fast Mesh. Instead, R2608 and C2608 differentiate the \bar{W} signal and couple the rising edge into the Readout Gate circuit to initiate one complete frame of readout at the end of each transfer operation.

In BISTABLE and FAST BISTABLE modes the writing speed of the Storage Target is too low to store a single frame of readout. For this reason, the Readout System free runs at the end of a sweep until the next Erase pulse occurs. The Readout Gate goes LO at the initiation of the Erase pulse since \bar{MULTI} is HI and applied to pin 2 of U2608. The \bar{MULTI} signal goes LO at the first end-of-sweep pulse, causing the Readout Gate signal to go HI.

The Gated Readout Intensity is an analog current signal which controls the crt intensity during the readout display. At zero current it also inhibits the Readout System. When Q2688 is on, the Readout Intensity control adjusts this current to control the brightness of the readout display. When Q2688 is off, the current is zero, turning off the readout. Transistor Q2688 is off during the Erase and Multi Trace cycles (X or W HI) and in the fast storage modes up to the end of the transfer operation (W HI). Additionally, Q2686 is turned on when the Save signal is HI. The delay of R2686 and C2686 allows the readout to run for a suffi-

cient time, upon entering the SAVE mode, to store the readout display in the Bistable or Fast Bistable modes. When the Save mode is entered during a Multi Trace cycle, CR2686 holds C2686 discharged until the end of the X pulse to allow the readout to be stored.

Flood Gun Cathode Driver

Transistors Q3054 and Q3064 comprise the FGK (Flood Gun Cathode) Driver stage. The output of this stage has two states. When Q3064 is saturated, the FGK is at ground potential and the flood guns are on. When Q3064 is off, CR3066 clamps the FGK at approximately 1 volt above the FGA (Flood Gun Anode) and the flood guns are off. The flood guns are on continuously in all display modes except Save. In the Save mode, the flood guns are modulated by the Save Intensity signal, turning the flood guns on and off at duty cycle that is determined by the setting of the front-panel SAVE INTENSITY control. Resistor R3052 and capacitor C3053 delay the turning off of the flood guns when the Save signal switches HI, allowing the Readout System to turn off before flood gun modulation begins.

The Power On signal overrides all other inputs, turning the flood guns off when the 7834 power is switched on or off. This prevents spurious erasure of the stored display due to rapid changes in supply voltages applied to the storage circuits.

Collimation Electrode #1 and Flood Gun Anode Driver

This stage consists of a current input operational amplifier, Q3022 and Q3026, and an emitter follower Q3048 driven by a resistive divider. The inverting input (base of Q3022) operates at zero volts; R3026 is the feedback resistor. The input current signal is provided by the Collector and Collimation Electrode Decoder stage. This amplifier drives the Flood Gun Anode (FGA) through R3027. The drive for Collimation Electrode #1 (CE1) is taken from the emitter of Q3048 which drives the output of the Flood Gun Anode Driver through resistive divider R3045, R3046, R3047.

Collimation Electrode Drivers #2, #3, and #4

These driver stages are operational amplifiers similar to that discussed above for the FGA Driver. Transistors Q2992 and Q2996 comprise the driver for CE2, Q2972-Q2976 for CE3, and Q2942-Q2946 for CE4. Note that the output resistor for the CE2 Driver, R2978, is contained within the feedback loop of this amplifier to provide a lower effective output impedance.

Collector Mesh Driver

This stage consisting of Q2914, Q2918, and Q2924 is an operational amplifier similar to those just discussed for the

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Collimation Electrode Driver stages. Transistor Q2924 is an emitter follower stage added within the feedback loop to reduce the amplifier output impedance for ac and transient signals which are coupled into the output of this amplifier from the Fast Mesh Driver stage through the inter-mesh capacitance of the crt. Capacitor C2915 increases the amplifier response to these injected transients and provides high-frequency compensation.

Collector and Collimation Electrode Decoder

This stage consists of Q3012, Q3016, Q2566, Q2988, Q2904, and associated diode-resistor networks. This stage decodes the logic inputs from the Main Timing, Transfer and Multi, and Storage Mode Switching stages, into discrete current level signals for input to the collector mesh, collimation electrodes and flood gun anode driver stages. The stage uses transistor switches and diode current steering networks to convert the input logic signals into currents.

Fast Mesh Driver

This stage consisting of Q2862, Q2864, Q2868, Q2873 and Q2874 is an expanded version of the simple operational amplifiers previously discussed. Transistor Q2864 is a voltage shifter stage which permits the output transistors to operate from a negative supply. Transistor Q2873 provides current limiting to protect the amplifier from output short circuits. Transistor Q2874 is an emitter follower for low ac output impedance.

Fast Mesh Decoder

This stage, consisting of Q2842, Q2852, CR2848, and CR2849, decodes inputs from the Storage Mode Switching, Tsfr and Multi, and Fast Prep stages into discrete current levels for the Fast Mesh Driver stage. When Fast Prep is LO, CR2849 is reverse biased and CR2848 is forward biased. If VP (+15 V) is LO or Q2944 is on, all of the current in R2902 provides input to the Fast Mesh Driver stage, and the output voltage to the Fast Mesh is +125 volts. When VP (+15 V) is HI and Q2904 is off, the current flow through R2901 offsets some of the current in R2902 causing the Fast Mesh to drop to +100 volts. When Fast Prep is HI, CR2848 is reverse biased and Q2852 is off. Resistors R2850 and R2855, in Fast Variable Persistence and Fast Bistable respectively, adjust the Fast Prep Level in each Fast Storage mode between zero and +20 volts. The "Pump Pulses" which appear on the Fast Mesh when it is at the Fast Prep Level are the result of the oscillation of the Fast Prep logic signal.

During a sweep or a transfer operation, Q2842 turns off. Resistors R2845 and R2846, in Fast Bistable and Fast Var Persist respectively, adjust the Fast Transfer Level (ΔV) in each Fast Storage mode between zero and 3 volts below the Fast Prep Level. The STORAGE LEVEL control, R2720, provides offset to the Fast Transfer Level in both Fast storage modes through R2748.

Storage Mesh Driver

This driver stage consists of two parts: an operational amplifier Q2802, Q2804, Q2808, and Q2814 which is similar to the Fast Mesh Driver stage, and a 600 volt switching circuit Q2818, Q2822, Q2826, Q2828, Q2834, and Q2838.

When Tsfr and Erase are both LO, Q2818 and Q2833 are off; Q2826 and Q2828 are saturated. Diode CR2834 conducts current from R2833 and holds the Storage Mesh potential at approximately 0.8 volts above the output level of the operational amplifier.

When the Erase or Tsfr signal go HI, Q2818 and Q2822 turn on and Q2826 and Q2828 turn off. Transistors Q2834 and Q2838 turn on and drive the Storage Mesh to the +600 volt supply. CR2839 disconnects the operational amplifier from the Storage Mesh at this time. Bootstrap capacitor C2833 maintains base drive to Q2834 and Q2838 throughout the 100 millisecond duration of either the Erase or Tsfr pulse.

Current limiting is provided in both the operational amplifier and 600 volt switch by Light emitting diodes in the output sections.

Storage Mesh Decoder

This stage, consisting of Q2704, Q2714, Q2730, Q2734, Q2745, Q2752, Q2755, and associated diode-resistor networks, develops discrete current levels for input to the Storage Mesh Driver.

Consider operation in the Bistable mode. Initially, the currents in R2715, R2717, CR2726, R2727, and R2736 are all zero. Transistors Q2745 and Q2755 are saturated and the net current into the Storage Mesh Driver is the sum of the currents in R2746, R2747, and R2716. Resistor R2745 sets the Bistable Operating Level between +35 volts and +120 volts. When Erase goes HI, Q2752 saturates, turning off Q2755 and Q2745 and charging C2753. At the end of the Erase pulse, the voltage on the Storage Mesh is at -15 volts set by R2716. However, C2753 discharges through R2753 and R2754, causing the Storage Mesh voltage to ramp back up to the Bistable Operating Level in approximately 600 milliseconds. In Fast Bistable mode the operation of the Storage Mesh Decoder is unchanged.

Consider operation in the Variable Persistence mode. Initially, the currents in R2736, Q2745, R2727, and R2717 are zero. Diode CR2726 is forward biased and Q2714 is off so the net current into the Storage Mesh Driver is the sum of the currents in R2724, R2726, R2715, and R2716. Resistor R2725 sets the Variable Persistence Operating Level between zero and +15 Volts, while the STORAGE LEVEL control, R2720, provides an adjustable offset of

zero to -5 Volts. The coupling of the 10 kilohertz Ramp waveform through C2718 and R2718 produces a 2 volt ramp at the Storage Mesh superimposed on the Variable Persistence Operating Level.

When Erase goes HI, Prep also goes HI turning Q2714 on and Q2730 off. Transistor Q2755 also turns off momentarily interrupting the current flow through R2733 which turns Q2734 on. After the Erase pulse, Q2734 is still on so the voltage on the Storage Mesh is at the level set by R2725. As C2753 discharges, the emitter of Q2755 falls turning off Q2734 after approximately 200 milliseconds. This causes current to flow through R2736 to raise the Storage Mesh to the Variable Persistence Prep Level, adjusted by R2735 from zero to 12 volts above the Operating Level. At the end of the X pulse, the Prep signal goes LO returning the decoder to its initial state.

In the Fast Variable Persistence mode, operation of the Storage Mesh Decoder is unchanged until the end of the X pulse. In this mode, however, the Y pulse follows the X pulse holding the Prep signal HI and the Storage Mesh at the Prep Level for another 400 milliseconds. In addition W goes HI and remains HI until the end of the Tsfr pulse and Fast Prep oscillates at the Clock signal frequency. These

signals cause the Storage Mesh to drop to the Hold Level at -35 Volts after the Y pulse and remain at that level until the Tsfr pulse occurs. Superimposed on the Hold Level are the "Pump Pulses", logically inverted from the Fast Prep signal and with height adjustable by R2705 from zero to 15 Volts above the Operating Level.

Trace Alignment

The Trace Rotation supply, consisting of U2468A, Q2468, and Q2469, is an operational amplifier providing a low-impedance adjustable voltage source for the trace rotation coil. The TRACE ROTATION control R2465 determines the amplifier's output voltage and therefore the current in the coil. The Reduced Scan Trace Rotation adjustment, R2470, sets the difference in current required for the trace rotation coil in the Reduced Scan mode. Resistor R2470 is activated only in the Reduced Scan mode when +15 Volts and -15 Volts are applied to pins 9 and 10 of P2504 respectively.

The Y-Axis alignment supply, consisting of U2468B, Q2478, and Q2479, operates similarly to the Trace Rotation supply, except that the difference in current required between Full Scan and Reduced Scan modes is provided by fixed resistors R2471 and R2472.

MAINTENANCE

This section of the manual contains information for performing preventive maintenance, troubleshooting, and corrective maintenance for the 7834 Storage Oscilloscope.

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

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect power before cleaning the instrument or replacing parts.

The side, top, and bottom cabinet panels provide protection to personnel from operating potentials present within the instrument. In addition, they reduce radiation of electromagnetic interference from the instrument. 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. Operate the instrument with the panels in place to protect the interior from dust.

CLEANING

The 7834 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 side panels reduce the amount of dust reaching the interior of the instrument. Operation without the panels in place necessitates more frequent cleaning.

CAUTION

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

Exterior

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

CRT

Clean the plastic light filter, implosion shield, and the crt faceplate with a soft, lint-free cloth dampened with denatured alcohol.

The crt mesh filter (furnished with Options 1, 2, and 3 only) can be cleaned as follows:

1. Hold the mesh filter in a vertical position and brush lightly with a soft, No. 7 water color brush to remove light coatings of dust or lint.

2. Greasy residues, or dried-on dirt, can be removed with a solution of warm water and a neutral-pH liquid detergent. Use the brush to lightly scrub the filter.

3. Rinse the filter thoroughly in clean water and allow to air dry.

4. If any lint or dirt remains, use clean low-pressure air to remove it. Do not use tweezers or other hard cleaning tools on the filter, as the special finish may be damaged.

5. When not in use, store the mesh filter in a lint-free dust-proof container, such as a plastic bag.

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/in²). 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 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 7834 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, correcting the cause of overheating is important 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 5, 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 7834 Storage Oscilloscope. 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 3, Theory of Operation, for this information.

TROUBLESHOOTING AIDS

Diagrams

Complete schematic diagrams are given on the pullout pages in Section 8, Diagrams and Circuit Board Illustrations. The component number and electrical value of each component in this instrument are shown on these diagrams. (See the first page of the Diagrams and Circuit Board Illustrations section for definitions of the reference designators and symbols used to identify components in this instrument.) Important voltages and numbered waveform test points are also shown on the diagrams. Important waveforms, and the numbered test points where they were obtained, are located adjacent to each diagram. The portions of circuits mounted on circuit boards are enclosed with heavy, solid-black lines.

Circuit Board Illustrations

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

Troubleshooting Chart

A troubleshooting chart is given in Section 8, Diagrams and Circuit Board Illustrations to aid in locating a defective circuit. The shaded blocks on the Troubleshooting Chart indicate circuit(s) that may cause the indicated malfunction. The circuits listed are discussed in detail in Section 3, Theory of Operation.

Adjustment and Test Point Locations

To aid in locating test points and adjustable components called out in the various sections of the Performance Check and Adjustment procedure, the Adjustment and Test Point Locations pullout pages are provided in Section 8, 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. 4-1). Metal-film resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

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. 4-1).

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

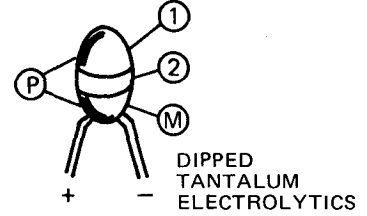
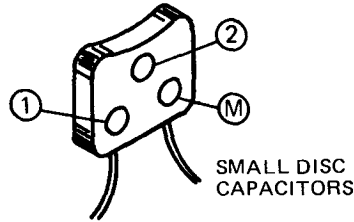
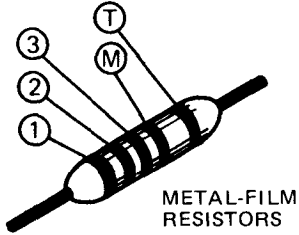
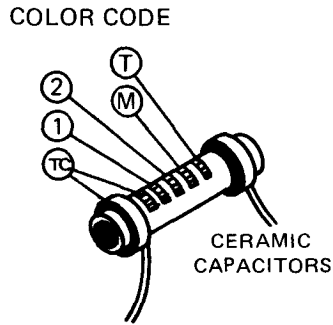
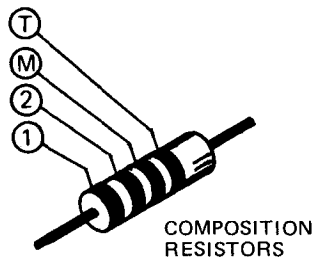
Cam switches shown on the diagrams are coded to indicate the position of the contact in the complete switch assembly counting from the front, or knob end of the switch, toward the rear. The contact closure chart on the diagrams indicates when each contact is closed.

Semiconductor Lead Configurations

Figure 8-3, in the Diagrams and Circuit Board Illustrations section and Figure 4-13 later in this section, shows the lead configurations of the semiconductor devices used in the 7834 Storage Oscilloscope.

Multi-Connector Holders

The multi-connector holders are keyed with two triangles, one on the holder and one on the circuit board. When a connection is made perpendicular to a circuit board surface, the orientation of the triangle on the end-lead multi-pin connector holder is determined by the placement of the multi-pin connector index, (see Fig. 4-2).



① ② and ③ - 1ST, 2ND, AND 3RD SIGNIFICANT FIGS. ① AND/OR ② COLOR CODE MAY NOT BE PRESENT ON SOME CAPACITORS;
 ④ - MULTIPLIER ⑤ - TOLERANCE;
 ⑥ - TEMPERATURE COEFFICIENT. ⑦ - POLARITY AND VOLTAGE RATING

COLOR	SIGNIFICANT FIGURES	RESISTORS		CAPACITORS			DIPPED TANTALUM VOLTAGE RATING
		MULTIPLIER (OHMS)	TOLERANCE	MULTIPLIER (pF)	TOLERANCE		
					OVER 10pF	UNDER 10pF	
BLACK	0	1	---	1	±20%	±2pF	4VDC
BROWN	1	10	±1%	10	±1%	±0.1pF	6VDC
RED	2	10 ² or 100	±2%	10 ² or 100	±2%	---	10VDC
ORANGE	3	10 ³ or 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 ⁵ or 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	---

Figure 4-1. Color code for resistors and capacitors.

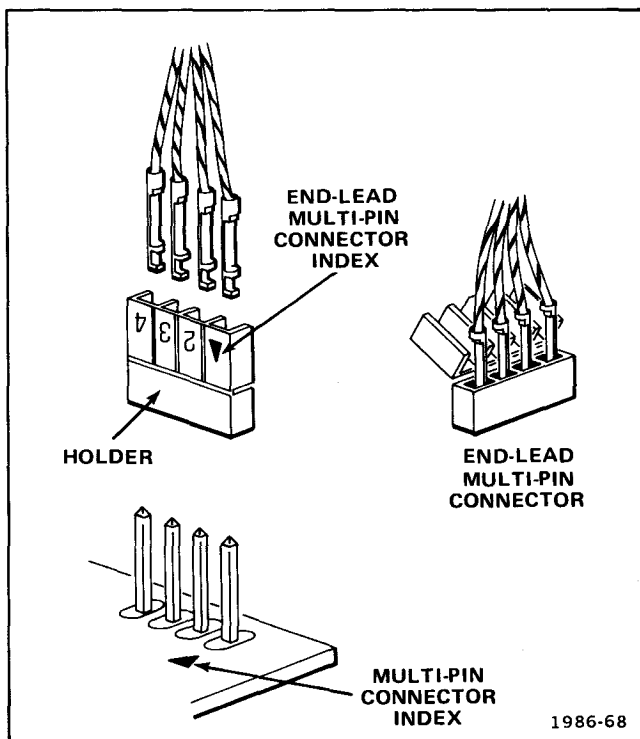


Figure 4-2. Orientation of multi-connector holders.

TROUBLESHOOTING EQUIPMENT

The following equipment is useful for troubleshooting the 7834 Storage Oscilloscope:

1. Transistor Tester

Description: Dynamic-type tester.

Purpose: Test semiconductors.

Recommended type: Tektronix 577/177 Curve Tracer, Tektronix 576 Curve Tracer, 7CT1N Curve Tracer plug-in unit and a 7000-series oscilloscope system, or a 5CT1N Curve Tracer plug-in unit and a 5000-Series oscilloscope system.

2. Multimeter

Description: 10 megohm input impedance and 0 to 500 volts range, ac and dc; ohmmeter, 0 to 50 megohms; accuracy, within 0.1%. Test probes must be insulated to prevent accidental shorting.

Purpose: Check voltages and resistances.

3. Test Oscilloscope

Description: Frequency response, dc to 100 megahertz minimum; deflection factor, 5 millivolts to 5 volts/division and 1 milliampere to 1 ampere/division. A 10X, 10-megohm voltage probe should be used to reduce circuit loading for voltage measurements. For current waveforms, use a Tektronix P6021 Current Probe with passive termination, or the equivalent.

Purpose: Check operating waveforms.

Recommended type: Refer to the Tektronix Products catalog for applicable oscilloscope system.

4. Variable Autotransformer

Description: Output variable from 0 to 140 volts, 10 amperes minimum rating. Must have three-wire power cord, plug, and receptacle.

Purpose: Vary input line voltage when troubleshooting in the power-supply unit.

Recommended type: General Radio W10MT3W Variac Autotransformer.

TROUBLESHOOTING TECHNIQUES

This troubleshooting procedure is arranged to check the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks ensure 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 following the replacement procedures given under Corrective Maintenance.

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 7834, 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.

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 5, 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 measurements. Also check for the correct output signals at the rear-panel output connectors with a test oscilloscope. If the signal is correct, the circuit is working correctly up to that point. For example, correct sawtooth output indicates that the time-base unit and sawtooth output portion of the Output Signals circuit is operating correctly. If a malfunction in the Readout System is suspected of causing trouble to appear in the Z-Axis Amplifier, Vertical Amplifier, or Horizontal Amplifier circuits, the trouble can be localized by removing the Readout System circuit board. This board can be removed without significantly affecting the operation of other circuits in the instrument.

Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltage of the individual supplies. However, a defective component elsewhere in the instrument can appear as a power-supply trouble and may also affect the operation of other circuits. If incorrect operation of the power supplies is suspected, refer to Troubleshooting the High-Efficiency Power-Supply Unit given later in this section.

Figure 8-48 provides a guide for locating a defective circuit. Start at the top of the chart and perform the checks given on the left side of the page until a step is found that does not produce the indicated results. Further checks, or the circuit in which the trouble is probably located, are listed to the right of the step. This chart does not include checks for all possible defects; use steps 6 and 7 in such cases.

After the defective circuit has been located, proceed with steps 6 and 7 to locate the defective component(s).

6. Check Voltages and Waveforms

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

NOTE

Voltages and waveforms given in Section 8, Diagrams and Circuit Board Illustrations, are not absolute and may vary slightly between 7834 Storage Oscilloscopes. To obtain operating conditions similar to those used to take these readings, see the appropriate schematic.

7. Check Individual Components

The following procedures describe methods of checking individual components in the 7834. Components which are soldered in place are best checked by first disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

WARNING

To avoid electric-shock hazard, always disconnect the 7834 from the power source before removing or replacing components.

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 previously checked). 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 3, Theory of Operation and Section 8, Diagrams and Circuit Board Illustrations. Use care when checking voltages and waveforms around the integrated circuits so that adjacent leads are not shorted together. A convenient means of clipping a test probe to the in-line, multi-pin integrated circuits is with an integrated-circuit test clip. This device also doubles as an integrated-circuit extraction tool.

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

CAUTION

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

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

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 Adjust 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.

TROUBLESHOOTING THE HIGH-EFFICIENCY POWER-SUPPLY UNIT

General

The following information is provided to facilitate troubleshooting the high-efficiency power-supply unit. Information contained in other sections of this manual should be used in conjunction with this procedure to aid in locating a defective component. An understanding of the circuit operation is valuable in locating troubles. See Section 3, Theory of Operation, for this information. Specifications for the troubleshooting equipment referred to in this procedure are given earlier in this section under Troubleshooting Equipment.

WARNING

Extreme caution must be used when troubleshooting in the power-supply unit due to the line voltage and the high-voltage/high-current potentials present in the unit.

When a fault condition occurs which is not of sufficient magnitude to open the line fuse, power-supply protection circuitry will cause the inverter to operate in a pulse mode. In this mode the inverter will turn on for a short period of time, and then turn off for a longer period of time. This cycle repeats until the malfunction is corrected. This pulse mode causes either a "ticking" or a "chirping" sound. Whenever either of these sounds is heard, turn off the 7834 and proceed with the Preliminary Procedure given below.

Preliminary Procedure

WARNING

To avoid electric shock, always disconnect the instrument from the power source before removing or replacing components or plug-in units.

1. Remove all plug-in units from the mainframe.
2. Set the CONTROL ILLUMINATION switch on the rear panel to the OFF position, and the GRAT ILLUM switch on the front panel to the fully clockwise position.
3. Remove the power-supply unit from the mainframe following the procedure given later in this section under Component Removal and Replacement.
4. Connect the power-cord plug of the 7834 to the output of a variable autotransformer which is set for 115 volts.
5. Push the 7834 POWER button in (to turn the instrument on) and note the trouble symptoms.

6. Turn the 7834 off and proceed to the appropriate step in the Troubleshooting Procedure as indicated by the Trouble Symptom column in Table 4-1.

TABLE 4-1
Recommended Power Supply Troubleshooting Sequence

Trouble Symptom	Procedure	Proceed to Troubleshooting Step:
7834 inoperative; no pulse mode.	1. Check line fuse.	A
7834 inoperative; no pulse mode; line fuse open.	1. Isolate malfunction from the main-frame circuitry.	B
	2. Check line input circuit.	D
	3. Check inverter circuit.	G
7834 inoperative; no pulse mode; line fuse normal.	1. Check inverter circuit.	G
7834 operating in the pulse mode.	1. Isolate malfunction from the main-frame circuitry.	B
	2. Check pre-regulated power supplies.	C
	3. Check crt and high-voltage circuits.	E
	4. Check inverter control circuit.	F
	5. Check inverter circuit.	G

Troubleshooting Procedure

STEP A: CHECK LINE FUSE. To check the line fuse, perform the following procedure:

1. Check the line fuse (F1200), located on the rear panel of the power-supply unit, for continuity and proper rating as given in Section 7, Replaceable Electrical Parts.
2. If the line fuse is open, replace with a new one of proper rating.

STEP B: ISOLATE MALFUNCTION FROM THE MAIN-FRAME CIRCUITRY. To isolate the malfunction, perform the following procedure:

WARNING

Use extreme caution when troubleshooting in the Power-Supply Unit, to avoid electric shock. Stored dc potentials on the Power-Supply Inverter circuit board remain long after the instrument is disconnected from the power source. Verify that the power-cord plug is disconnected and that the line storage capacitors (C1216 and C1217) are completely discharged before attempting any repairs or ohmic measurements. (A warning-indicator neon bulb, located on the Power-Supply Inverter board, flashes when this stored voltage exceeds about 80 volts. However, simply because the neon bulb is not flashing does not mean that the capacitors are fully discharged.)

1. Remove the 7834 power-cord plug from the power source.
2. Remove the protective cover from the power-supply unit following the procedure under Access to Components in the Power-Supply Unit.
3. Manually discharge the line storage capacitors using the procedure given later in this section under Access to Components in the Power-Supply Unit.
4. Check the resistance of the power supplies at the test points given in Table 4-2 (see Fig's. 8-42 and 8-43 for the location of these test points).

NOTE

Place the Common lead of the ohmmeter to ground when measuring power-supply resistance.

TABLE 4-2
Typical Power-Supply Resistance

Power Supply	Test Point	Ohmmeter Scale	Typical Resistance Reading
+130 V	TP1901	X 1k	6.6 kΩ
+50 V	TP1793	X 1k	1.8 kΩ
+15 V	TP1794	X 100	70 Ω
+5 V	TP1795	X 100	9 Ω
-15 V	TP1796	X 100	100 Ω
-50 V	TP1906	X 100	500 Ω

5. If any of the resistance readings are significantly lower than that listed, remove the electrical connections between the mainframe and the power-supply unit. Disconnect P1417, P1482, P1483 on the LV Regulator board (see Fig. 8-18). This isolates the circuitry in the mainframe from the power-supply unit. Recheck the resistance. If the readings remain low, the malfunction is located within the mainframe circuits. If the readings increase to normal or above, the malfunction is in the power supplies.

6. Replace all electrical connections which were disconnected in part 5.

STEP C: CHECK THE PRE-REGULATED POWER SUPPLIES. To check the pre-regulated power supplies, perform the following procedure:

1. Connect a 10X voltage probe from the test oscilloscope to resistor R1287 on the Cap-Rectifier board (see Fig. 8-16). Set the test oscilloscope vertical deflection factor as necessary for an on-screen display; set the horizontal sweep rate for 2 milliseconds/division.

2. Set the variable autotransformer for 115 volts. Connect the 7834 power-cord plug to the variable autotransformer; turn on the 7834.

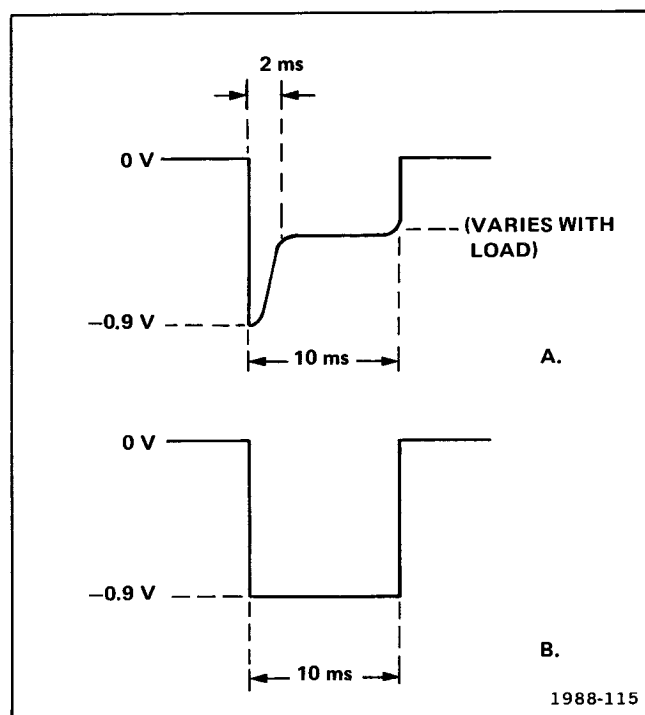


Figure 4-3. Current sensing waveform at R1287 showing: A. Power supplies not in current limit operation. B. Power supplies in current limit operation.

3. Compare the waveform on the test oscilloscope to those shown in Figure 4-3. If the waveform resembles that of Figure 4-3A, proceed to Step E of this procedure. If it resembles that of Figure 4-3B, proceed with part 4 of this step.

4. Remove the 10X voltage probe from R1287. Set the test oscilloscope vertical coupling to dc and the horizontal sweep rate to 10 milliseconds/division.

5. Connect the 10X probe to each power supply at the test points given in Table 4-3. Note the polarity, amplitude, and shape of the waveform present at each test point. (Adjust the vertical deflection factor of the test oscilloscope as necessary to maintain an on-screen display.)

NOTE

Look for a power supply where the burst voltage is very low in relation to the specified supply voltage.

TABLE 4-3
Burst Voltage Test Points

Pre-Regulated Power Supply	Test Point Located on Cap-Rectifier Board
+108 V	Pin 4 of P1354
+54 V	Pin 3 of P1352
+17 V	Pin 4 of P1352
-17 V	Pin 2 of P1352
+7 V	Pin 8 of P1354
-54 V	Pin 6 of P1352
+5 V Lights	Pin 7 of P1354

6. When a low supply voltage is found, disconnect the 7834 from the power source and discharge the line storage capacitors following the procedure given under Access to Components in the Power-Supply Unit. Check for shorted components in the suspected power supply; also check the filter capacitors for leakage.

STEP D: CHECK LINE INPUT CIRCUIT. To check the input circuit, perform the following procedure:

1. Disconnect the 7834 from the variable autotransformer and discharge the line storage capacitors following the procedure given under Access to Components in the Power-Supply Unit.

2. Replace the line fuse.
3. Check diode bridge CR1215 on the Power-Supply Inverter board (see Fig. 8-17) and the associated line input circuit for a shorted component. If the circuit appears normal, connect the power-cord plug to the variable autotransformer.
4. Attach a 10X voltage probe from the test oscilloscope to one of the screws used to discharge C1216 and C1217 (see Fig. 4-10). Set the variable autotransformer for 20 volts and turn the 7834 on. Set the test oscilloscope for line triggering.
5. Check for an ac waveform on the test oscilloscope (see Fig. 4-4). Note the amount of dc the waveform is offset. Move the probe tip to the other capacitor screw. Check for an ac waveform which is both offset an equal amount of dc, and is opposite in polarity, from the previous waveform. (This checks the condition of the line storage capacitors.)

STEP E: CHECK CRT AND HIGH-VOLTAGE CIRCUITS.

To check the crt circuitry, perform the following procedure:

1. Disconnect the 7834 from the power source and discharge the line storage capacitors following the procedure given under Access to Components in the Power-Supply Unit.
2. Remove multi-lead cable P1340 from the Cap-Rectifier board (see Fig. 8-16).
3. Set the variable autotransformer for 115 volts. Connect the 7834 power-cord plug to the variable autotransformer; turn the 7834 on.

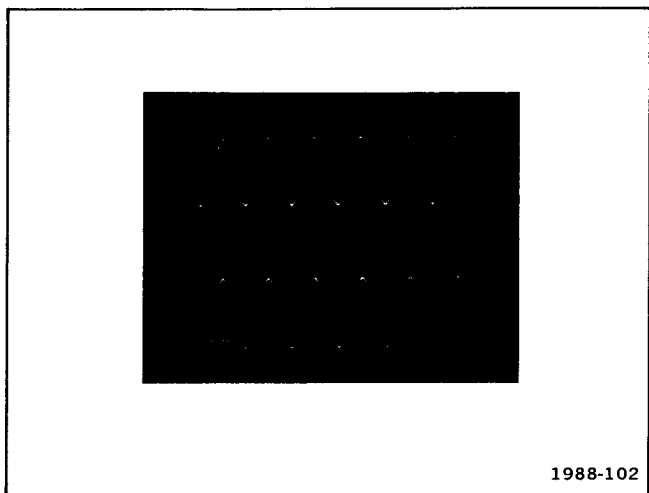


Figure 4-4. Typical waveforms on C1216 and C1217 with the line voltage set to about 20 V.

4. Check for stable operation (no pulse mode) of the power supplies. If the power supplies operate properly, a crt failure or malfunction in the high-voltage circuitry is indicated.

STEP F: CHECK THE INVERTER CONTROL CIRCUIT.

To check the inverter control circuit, perform the following procedure:

1. Disconnect the 7834 from the power source and discharge the line storage capacitors following the procedure given under Access to Components in the Power-Supply Unit.
2. Remove Q1254 (see Fig. 8-16) from the Cap-Rectifier board.
3. Connect the 7834 power-cord plug to the variable autotransformer. Turn the 7834 on and apply 115 volts from the variable autotransformer. If the power supplies stabilize, check the inverter control circuit for a malfunction. If the 7834 continues in pulse mode, proceed to part 4 of this step.
4. Repeat part 1 of this step. Then remove Q1252 from the Cap-Rectifier board.
5. Set the variable autotransformer to 0 volts. Connect the 7834 power-cord plug to the variable autotransformer. Turn the 7834 on. While monitoring the +108 V test point on the LV Regulator board (see Fig. 8-30) with a voltmeter, slowly increase the output of the variable autotransformer until the voltmeter just reads +108 volts.

NOTE

If the variable autotransformer's output is increased past the point where the voltmeter just reaches a reading of +108 volts, the 7834 will switch to pulse mode.

6. If the power supplies stabilize, check U1275 and the inverter control circuit for a malfunction. If the 7834 continues in the pulse mode, proceed to Step G of this procedure.

STEP G: CHECK INVERTER CIRCUIT. To check the inverter circuit, perform the following procedure:

1. Disconnect the 7834 power-cord plug from the power source and discharge the line storage capacitors following the procedure given under Access to Components in the Power-Supply Unit.

2. Remove Q1234, Q1241, CR1234, and CR1241 on the Power-Supply Inverter board (see Fig. 8-17) and check the characteristics of each with a curve tracer. Install the checked or replaced components in the Power-Supply Inverter board. Replace the line fuse, if it is open.

3. If the faulty component was not found, check Q1248 and VR1246 with a curve tracer.

NOTE

A shift in the zener voltage of VR1246 can cause erratic operation of the inverter circuit.

4. If the 7834 continues in the pulse mode or to open the line fuse, check the current waveform through T1230. To do this, first repeat part 1 of this step. Then connect a current probe from the test oscilloscope to the gray lead that passes through toroid transformer T1230. Set the test oscilloscope for a vertical deflection factor of about 1 volt/-division and a horizontal sweep rate of 2 milliseconds/-division. Connect the 7834 power-cord plug to the variable autotransformer which is set for 0 volt. Turn the 7834 on and slowly increase the variable autotransformer's output to about 60 volts. Check for a burst waveform on the test oscilloscope (similar to that shown in Fig. 4-5).

NOTE

The burst waveform indicates that the inverter circuit is attempting to start. If no burst waveform occurs, proceed to part 6; if a burst waveform is obtained, proceed to part 5.

5. If a burst waveform was obtained in part 4 above, check for stable inverter operation when the line input voltage is increased to about 85 volts. Figure 4-6 shows the current waveform at T1230 for normal inverter operation at a line source of 115 volts. (NOTE: The test oscilloscope horizontal sweep rate has been changed to about 50 microseconds/-division for Fig. 4-6.)

6. If no burst waveform occurred in part 4, repeat part 1 of this step. Then remove the current probe from the 7834 and the test oscilloscope. Connect a 10X voltage probe from the test oscilloscope to TP1234 on the Power-Supply Inverter board (see Fig. 8-17). Set the variable autotransformer for 20 volts and check for a line ripple waveform which is about dc centered (see Fig. 4-7). If the waveform is not centered, check Q1246, CR1232, CR1240, CR1242, CR1249, and CR1244 for shorts or leakage.

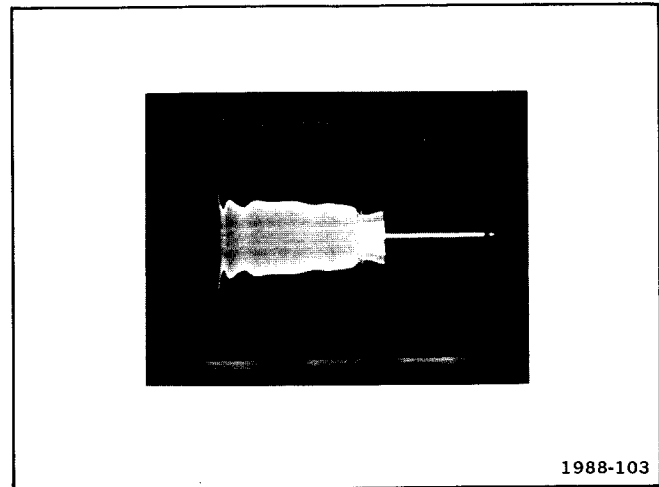


Figure 4-5. Current waveform at T1230 showing burst operation at line voltage of about 60 V.

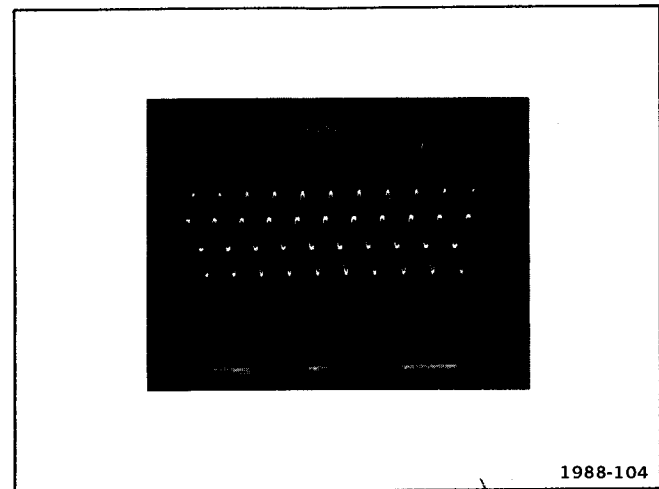


Figure 4-6. Current waveform at T1230 for normal inverter operation at line voltage of 115 V.

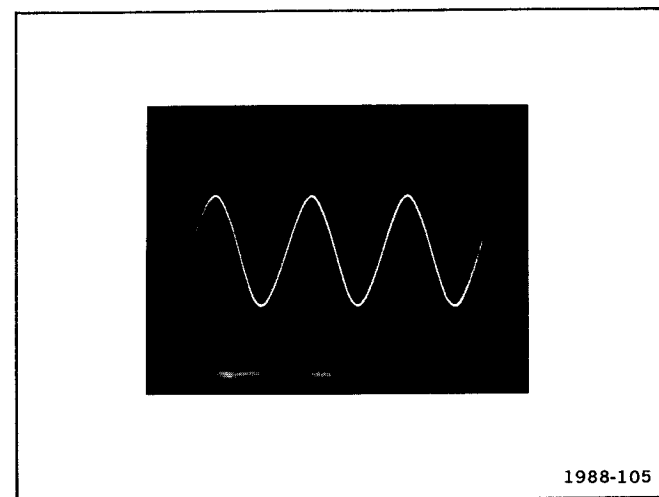


Figure 4-7. Waveform at TP1234 on the Power-Supply Inverter board with the line voltage at about 20 V.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in the 7834 Storage Oscilloscope are given here.

OBTAINING REPLACEMENT PARTS

All electrical and mechanical part replacements for the 7834 can be obtained through your 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 purchasing or ordering 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.

Some parts are manufactured or selected by Tektronix, Inc. to satisfy particular requirements, or are manufactured for Tektronix, Inc. to our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. To determine manufacturer of parts, refer to Parts List, Cross Index Mfr. Code Number to Manufacturer.

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 circuit number).
4. Tektronix part number.

SOLDERING TECHNIQUES

WARNING

To avoid electric-shock hazard, disconnect the instrument 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.

CAUTION

Several of the circuit boards in the 7834 are multi-layer type boards with a conductive path laminated between the top and bottom board layers. All soldering on these boards should be done with extreme care to prevent breaking the connections to this center conductor. Only experienced maintenance personnel should attempt repair of these boards: A3—Main Interface, A6—Logic, A7—Trigger Amplifier, A8—Vertical Interface, A14—Cap-Rectifier, and A25—Storage circuit board.

When soldering on circuit boards or small wiring, use only a 15-watt, pencil-type soldering iron. A higher wattage soldering iron can cause the etched circuit wiring to separate from the board base material and melt the insulation from small wiring. Always keep the soldering-iron tip properly tinned to ensure the best heat transfer to the solder joint. Apply only enough heat to remove the component or to make a good solder joint. To protect heat-sensitive components, hold the component lead with a pair of long-nose pliers between the component body and the solder joint. Use a solder-removing wick to remove excess solder from connections or to clean circuit board pads.

The following technique should be used to replace a component on any of the circuit boards not mentioned in the preceding Caution. Most components can be replaced without removing the board(s) from the instrument.

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

2. Melt a small amount of solder onto the component lead connection. This replaces the flux, which may have been removed during instrument cleaning, and facilitates removal of the component.
3. Grip the component lead with a pair of long-nose pliers. When the solder begins to flow, gently pull the component lead from the board. If unable to separate the lead from the board, try removing the other end of the component.

NOTE

Some components are difficult to remove from the circuit 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 to the connection and apply enough solder to make a firm solder joint.
6. Cut off any excess lead protruding through the board (if not clipped in step 4).
7. Clean the area around the solder connection with a flux-removing solvent. Be careful not to remove information printed on the circuit board.

COMPONENT REMOVAL AND REPLACEMENT

WARNING

To avoid electric-shock hazard, always disconnect the instrument from the power source before removing or replacing components or plug-in units.

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.

Disassembly of Acquisition and Display Units

The Acquisition and Display units of the 7834 Storage Oscilloscope can be disassembled to ease access to interior components of the units. Disassemble the units by first disconnecting the power-cord plug from the power source. Then remove the side and top panels as described under Cabinet Panel Removal. Unplug the Main Interconnect (located on the right side of the 7834; see Fig. 4-8) and place it upon the storage fixture. Remove the two screws on each side of the 7834 which connect the two units (see Fig. 4-8). The two units can now be separated. To assemble the units, reverse the disassembly procedure.

Power-Supply Unit Removal

The power-supply unit can be slid out of the rear of the 7834 to gain better access to the Logic board, Trigger Amplifier board, LV Regulator board, or for power-supply maintenance and troubleshooting. To remove the power-supply unit from the mainframe, first remove the four screws which hold the power-supply unit to the rear frame of the instrument (see Fig. 4-9). Slide the power-supply unit out of the mainframe until it can be set down on the work surface (be sure to guide the interconnecting cables so they do not catch on other parts of the instrument). The power-supply unit remains electrically connected to the rest of the instrument in this position, allowing for troubleshooting. If it is necessary to operate this instrument with the power-supply unit removed for a period of time, we recommend that the power-supply unit be secured to the instrument with spacers between the rear frame and the power-supply unit.

Reverse the above procedure when placing the power-supply unit into the mainframe of the instrument; be careful not to pinch the interconnecting cable when replacing the unit. Be sure that all the securing screws are tight enough to hold the power-supply unit properly in place.

Access to Components in the Power-Supply Unit

To reach the components located inside the power-supply unit for maintenance or repair, use the following procedure:

WARNING

Disconnect the instrument from the power source and allow the line storage capacitors to discharge before removing the power-unit cover. The line storage capacitors remain charged with high voltage dc for several minutes after the line power is disconnected unless they are manually discharged. A warning-indicator neon bulb, located on the Power-Supply Inverter board, flashes when this stored voltage exceeds about 80 volts. Do not remove the power-unit cover while this light is flashing.

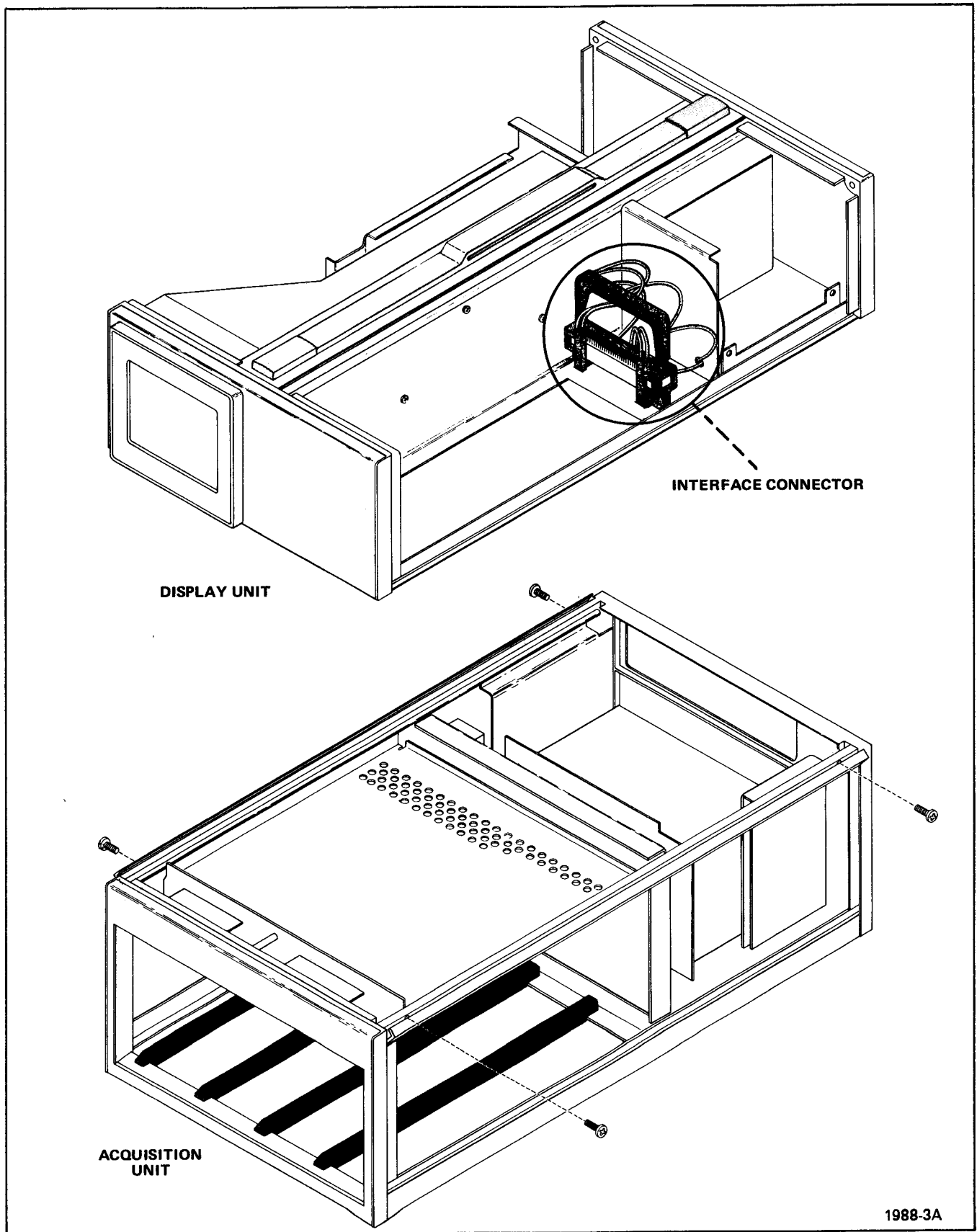


Figure 4-8. Disassembly and assembly of Display and Acquisition units.

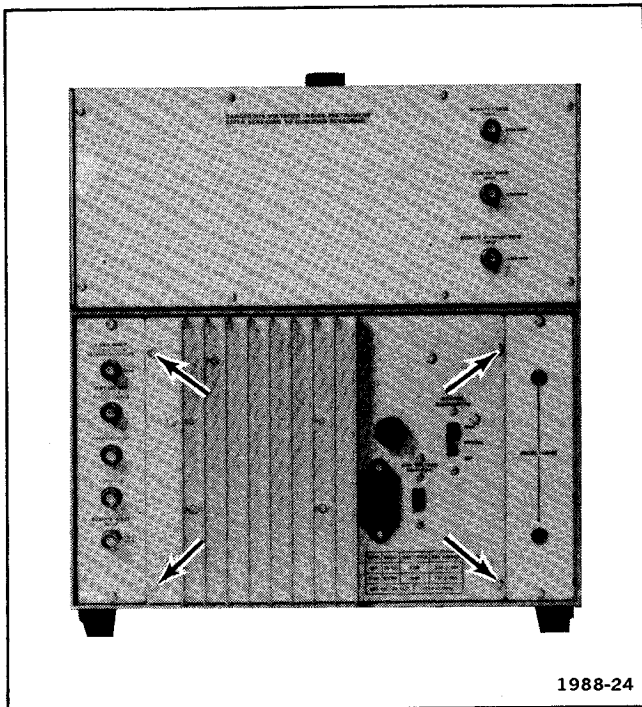


Figure 4-9. Power-supply unit securing screws.

1. Slide out the power unit as previously described.
2. Remove the four small screws that secure the cover to the rear heatsink.
3. Remove the 9 screws that attach the sides of the cover to the power unit chassis.
4. Disconnect the two coaxial connectors from P1340 on A14, Cap-Rectifier board.
5. Remove the cover from the power-supply unit.
6. The power-supply unit is now open for maintenance or repair. If the 7834 is to be operated with the cover removed, first reconnect the coaxial cables to A14, Cap-Rectifier board.
7. Reverse the order of removal to replace the power-unit cover.

Before performing maintenance or taking ohmic measurements in the power-supply unit, manually discharge the line storage capacitors (C1216 and C1217) as follows:

1. Remove the protective cover from the power-supply unit following the preceding procedure.
2. Apply a 1.5 kilohm, 2-watt, insulated resistor across the capacitor screws as indicated in Figure 4-10.

Cathode-Ray Tube Removal

Remove the cathode-ray tube (crt) as follows:

WARNING

The crt may retain a dangerous electrical charge. Before removing the crt, the anode must be fully discharged by shorting the anode lead from the crt to the chassis. Wait approximately ten minutes and again firmly short this lead to the chassis. Then remove the crt. After removal, short the anode lead to the silvered patch on the funnel portion of the crt just prior to further handling.

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

1. Remove the crt base-pin socket from the rear of the crt.

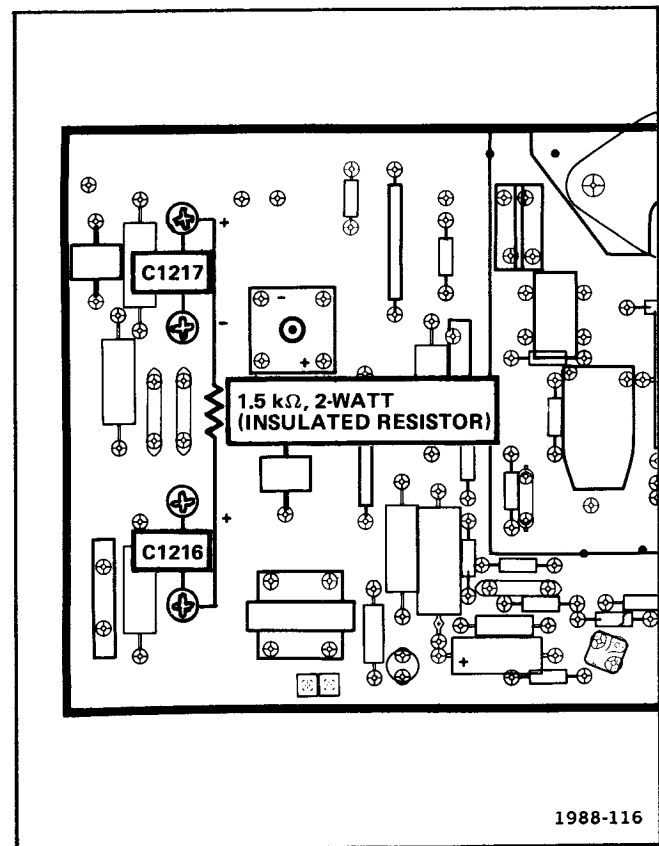


Figure 4-10. Location of line storage capacitor screws used for manually discharging C1216 and C1217.

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2. Loosen the two screws located above and below the crt base pins until the tension of the springs on these screws is released. Then, press in upon the screws to be certain that the crt clamp inside the crt shield is loose.
3. Disconnect the four vertical deflection-plate connectors from the left side of the crt.
4. Disconnect the two horizontal deflection-plate connectors and the geometry connector from the top of the crt.
5. Disconnect the storage cables from P2976 and P3068 on the Storage board (see Figure 8-29), and the Y-Axis coil cable from P2443 on the Storage Mode Switch board (see Figure 8-27). Note the location and dress of the cables so they may be correctly replaced.
6. Disconnect the crt anode lead from the jack located at the high-voltage box on the right of the instrument. Ground this lead to the chassis to dissipate any stored charge remaining in the crt.
7. Remove the plastic mask which covers the crt bezel.
8. Remove the two screws and the metal tabs securing the light filter to the crt bezel. Remove the light filter and frame.
9. Remove the two remaining screws securing the crt bezel to the front panel. Remove the bezel while disconnecting the three-pin connector from the left rear of the bezel.
10. Remove the plastic face-plate protector, the graticule light assembly, and the black crt face-plate mask. (The graticule light assembly need not be unsoldered from its leads.)
11. Hold one hand on the crt face-plate and gently push forward on the crt base with the other. Slowly pull the crt out from the front of the instrument while guiding the storage and Y-Axis coil cables, and the crt anode lead, through the holes in the crt shield.

Cathode-Ray Tube Replacement

Replace the cathode-ray tube (crt) as follows:

1. Insert the crt into the shield, guiding the crt anode plug and the storage and Y-Axis coil cables through the holes in the crt shield. Set the crt firmly against the cushions mounted at each corner of the face-plate.

2. Clean the crt face-plate, plastic face-plate protector, and the light filter with the denatured alcohol.
3. Place the black crt mask over the face-plate. Reconnect the multi-pin connector to the crt bezel (align the arrow on the connector with the arrow on the bezel).
4. Hold the face-plate protector in position and replace the crt bezel, graticule light assembly, light filter frame, and light filter. Firmly tighten the four screws making sure that the two metal clips securely hold the light filter.
5. Gently push forward on the crt base to ascertain that the crt is as far forward as possible. Then tighten the two screws beside the crt base until the springs on the screws are fully compressed.
6. Place the crt base-pin socket onto the crt base pins.
7. Reconnect the crt anode plug.
8. Carefully reconnect all cables and crt neck-pin connectors.
9. Replace the plastic crt bezel mask.

NOTE

The replacement of the crt will require that the instrument be re-adjusted. Refer to Section 5, Performance Check and Adjustment.

Circuit Boards

If a circuit board is damaged beyond repair, replace the entire board assembly. Part numbers are given in section 7, Replaceable Electrical Parts, for the completely wired boards.

The pin connectors, except for coaxial-type connectors, used for interconnection between circuit boards are color-coded to aid in identification and circuit tracing. The color of the connector body matches the resistor color-code for the last digit of the connector circuit number; e.g., P601 is brown, P603 is orange, etc.

Most of the circuit boards in this instrument are mounted on the chassis; pin connectors are used for electrical interconnection with chassis mounted components and other

circuit boards. Several boards plug onto the front and rear or the Main Interface board; feed-thru connectors connect the plug-on board to the Main Interface board.

CHASSIS-MOUNTED BOARDS. Remove and replace all chassis-mounted circuit boards as follows:

1. Disconnect all pin connectors attached to the board, or which connect the board to other parts of the instrument.
2. Remove the securing screws.
3. Remove the chassis-mounted board.
4. Replace chassis-mounted boards in the reverse order of removal. Match the index arrow on the multi-pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in section 8, Diagrams and Circuit Board Illustrations.

PLUG-ON BOARDS. Remove and replace the plug-on boards as follows:

1. Remove the plug-in units or the power-supply unit (see Power-Supply Unit Removal) as necessary to gain access to the boards mounted on the front or rear of the Main Interface board.
2. Disconnect any end-lead coaxial connectors located on the front of the board, or those which pass across a portion of the board.
3. Loosen all of the board's securing screws.
4. Keeping the board parallel to the Main Interface board, gently pull out on the edge of the board until the feed-thru terminals are cleared.
5. To replace a plug-on circuit board, position the board parallel to the Main Interface board so that all feed-thru pins are properly aligned with their sockets.
6. Gently press the circuit board against the mounting surface. Be sure that all feed-thru pins and sockets mate properly.

7. Uniformly tighten the securing screws (recommended torque: four to six inch-pounds).

A2-MODE SWITCH CIRCUIT BOARD. Remove or replace the Mode Switch circuit board as follows:

1. Disassemble the Display Unit from the Acquisition Unit as previously described.
2. Remove the VERT TRACE SEPARATION (B) knob.
3. Disconnect the pin connectors and remove the 4 screws holding the board to the chassis.

NOTE

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

4. Slide the board toward the rear of the instrument until the front-panel pushbuttons clear the chassis.
5. Lift the board from the instrument.
6. Replace the board by reversing the order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct locations of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A3-MAIN INTERFACE CIRCUIT BOARD. Remove and replace the Main Interface circuit board as follows:

1. Remove the plug-in units and the power-supply unit (see Power-Supply Unit Removal).
2. Disconnect all connectors from the Main Interface board. Note the location of the connectors so they can be correctly replaced.
3. Remove the screws from inside each plug-in compartment which hold the plug-in interface connectors to the chassis (see Figure 4-11). Also remove the screws which hold the ground straps to the chassis.
4. Slide the Main Interface board assembly to the rear of the instrument and remove it.

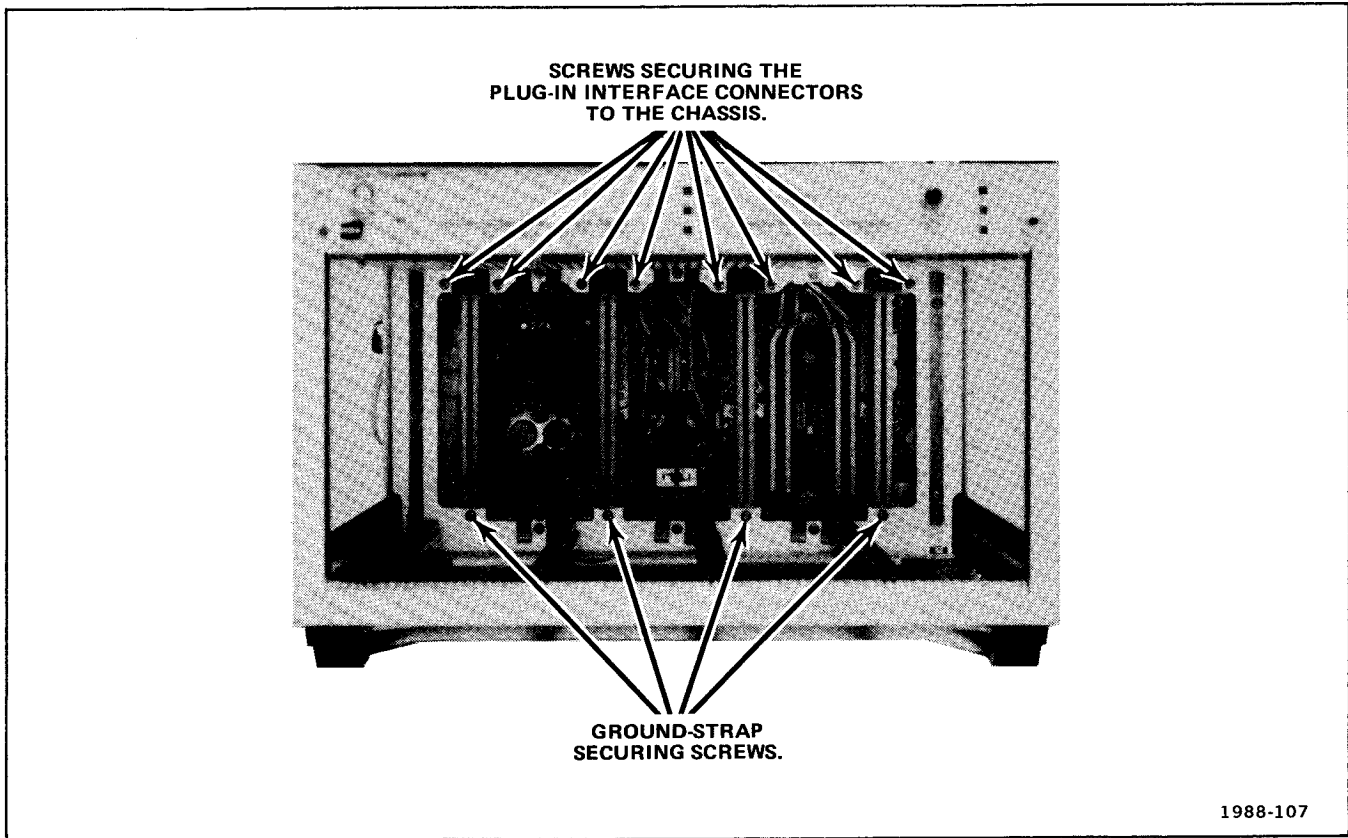


Figure 4-11. Location of securing screws for the Main Interface board.

5. Replace the Main Interface circuit board in the reverse order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown in the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A4/A5-FOLLOWER CIRCUIT BOARDS. A follower circuit board with six interface contacts is used in each vertical (two left plug-in compartments) plug-in interface connector to provide optimum signal and trigger connections between the plug-in unit and the 7834. Each Follower board is held in place by a spring so that the board can move back and forth within the interface connector to compensate for length differences between plug-in units. If a contact on a Follower board is damaged, the entire board with contacts and interconnecting cables is replaced as a unit.

Remove a Follower circuit board as follows:

1. Disconnect the instrument from the power source and remove any plug-in units.

2. Disconnect the coaxial leads of the Follower board from the Vertical Interface and the Trigger Amplifier circuit boards. Note the location of the connectors so they may be correctly replaced.

3. Using long-nose pliers, disengage the spring from the Follower board (a hole in the Main Interface board provides access to the spring from the rear of the board). Push the spring away from the Follower board toward the top of the interface connector.

4. Remove the Follower board with interconnecting cables from the rear of the interface connector, through the hole in the Main Interface board.

To replace a Follower circuit board, a folded length of thin shim stock as wide as the Follower board is required to compress the contacts while the board is inserted into the interface connector. Proceed as follows:

1. Hold the Follower board between the ends of the shim stock with the fold directly in front of the contacts. With

the shim stock held against the sides of the board, the contacts on the sides of the board should be pressed together.

2. Insert the folded end of the shim stock (with the Follower board) into the rear of the interface connector through the hole in the Main Interface board. When the Follower board contacts are fully inserted into the connector, hold the board in place and remove the shim stock through the front of the interface connector.

3. Secure the Follower board with the spring.

4. Reconnect the Follower board coaxial leads to the Vertical Interface and Trigger Amplifier boards.

A24-STORAGE MODE CIRCUIT BOARD. Remove and replace the Storage Mode circuit board as follows:

1. Disconnect all pin connectors from the board. Note the location of the connectors so they can be correctly replaced.

2. Remove the 2 screws securing the board to the chassis.

3. Slide the board toward the rear of the instrument until the attached front-panel pushbuttons clear the chassis.

4. Remove the board from the instrument.

5. Replace the Storage Mode board by reversing the order of removal. Match the index arrow on the connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the illustration in Section 8, Diagrams and Circuit Board Illustrations.

A12/A13-SIGNALS OUT AND READOUT CIRCUIT BOARD. Remove and replace the Signals Out and Readout boards as follows:

1. Disconnect the pin connectors and coaxial cables from the board. Note the location of the connectors so they may be correctly replaced.

2. Using a vacuum-type desoldering tool, remove the solder attaching the board to the BNC or probe power connectors.

3. Replace the boards in the reverse order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the

pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A19-VERTICAL AMPLIFIER CIRCUIT BOARD. Remove and replace the Vertical Amplifier board as follows:

1. Disconnect all pin connectors and coaxial cables from the front of the board. Also, remove the vertical output IC from the board (note the orientation of the tab on the IC case with the dot on the metal plate). Note the location of the pin connectors so they may be correctly replaced.

2. Remove the 7 securing screws holding the board to the chassis.

3. Remove the board from the instrument.

4. To replace the board, place the board in the instrument, but do not tighten the securing screws at this time.

5. Align the 2 holes in the Output IC socket pin pattern with the 2 pin sockets on the chassis located behind the Vertical Amplifier board. Then tighten the securing screws.

6. Apply silicone grease to the base of the vertical output IC. Insert the IC into its socket with the pin alignment tab properly oriented.

WARNING

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

7. Reconnect the coaxial cables and multi-pin connectors. Match the index arrow on the connectors to the corresponding arrow on the board.

Correct location of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A17-FAN CIRCUIT BOARD. The exhaust fan and Fan circuit board are removed as a unit. Remove and replace the Fan Assembly as follows:

1. Remove the hardware which mounts the fan housing assembly to the rail of the 7834 Acquisition Unit.

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2. Disconnect the pin connector from the board.
3. Remove the screw securing the Fan Assembly to the Storage board.
4. Remove the Fan Assembly from the instrument.
5. To replace the Fan Assembly, first place the screw through the fan housing and the hole in the rail of the 7834 Acquisition Unit; then, replace the screw holding the Fan board to the Storage board.
6. Tighten the fan housing screw to the locking nut on the rail of the 7834 Acquisition Unit.
7. Replace the pin connector matching the index arrow with the arrow on the circuit board.

A25-STORAGE CIRCUIT BOARD. Remove and replace the Storage circuit board as follows:

1. Remove the Fan circuit board assembly as previously described.
2. Remove the protective plastic shield from the Storage board by removing the plastic securing screw.
3. Disconnect all pin connectors from the Storage board.
4. Remove the 5 screws and the hexagonal standoff spacer which secure the board to the chassis.
5. Slide the board toward the rear of the instrument until the chassis is cleared by the attached front-panel push-button. Remove the board from the instrument.
6. To replace the board, reverse the order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A18-DELAY LINE TERMINATION CIRCUIT BOARD. Remove and replace the Delay Line Termination circuit board as follows:

1. Remove the Fan and Storage circuit boards, as previously described, to gain access to the Delay Line Termination board.
2. Unsolder the delay line leads and remove the coaxial cables from the Delay Line Termination board.
3. Remove the locking nut which secures the board to the delay line.
4. Lift the Delay Line Termination board from the instrument.
5. Reverse the order of removal to replace the Delay Line Termination circuit board.

A23-FOCUS CIRCUIT BOARD. The Focus circuit board is located in the high-voltage box on the right side of the instrument. Remove and replace the Focus board as follows:

1. Remove the 4 screws securing the high-voltage protective cover to the chassis.
2. Disconnect the pin connectors from the board. Note the location of the pin connectors so they can be correctly replaced.
3. Remove the four screws securing the Focus board to the chassis.
4. Lift the board from the instrument.
5. Replace the Focus board by reversing the order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in section 8, Diagrams and Circuit Board Illustrations.

A22-HIGH-VOLTAGE CIRCUIT BOARD. The High-Voltage circuit board is located in the high-voltage box on the right side of the instrument. Remove and replace the High-Voltage board as follows:

1. Remove the 4 screws securing the high-voltage protective cover to the chassis.

2. Remove the Focus board, as previously described, to gain access to the High-Voltage board.
3. Disconnect the pin connectors from the High-Voltage board. Note the location of the pin connectors so they may be correctly replaced.
4. Remove the 2 screws attaching the High-Voltage board to the chassis.
5. Lift the board from the instrument.
6. Disconnect the crt anode lead from the board and momentarily short the lead to ground to dissipate any charge left in the crt.

CAUTION

Do not touch any components with the crt anode lead until it is fully discharged.

7. To replace the High-Voltage board, reverse the order of removal. Match the index arrow on the pin connectors to the arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A16-LV REGULATOR CIRCUIT BOARD. Remove and replace the LV Regulator circuit board as follows:

1. Slide the power-supply unit out of the instrument (see Power-Supply Unit Removal).
2. Disconnect the multi-pin connectors from the board. Note the location of the pin connectors so they may be correctly replaced.

NOTE

If the LV Regulator board is to be removed to allow access to other parts of the power-supply unit, proceed with steps 3 and 4 only. If the board is to be removed from the instrument, proceed with the remaining steps of the procedure.

3. Remove the 2 screws located in the access holes under the LV Regulator board. These screws secure the board to the chassis.

4. Remove the 3 screws securing the LV Regulator board bracket to the rear heatsink. Remove the board with attached chassis.
5. Remove the mounting hardware securing the plastic-cased power transistors to the rear heatsink (see Fig. 4-12). Note the position of the lockwashers so they can be correctly replaced.
6. Remove the 5 securing screws and lift the board with attached power transistors from the chassis
7. To replace the LV Regulator board, first apply a thin coat of silicone grease to the back (mounting surface) of each power transistor.

WARNING

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

8. Place the LV Regulator board on the chassis. Replace, but do not tighten, the securing screws.
9. Check that the power transistors are aligned with their mounting screws and that the insulating washers are in place between the transistor cases and the chassis.
10. Secure the transistors with the mounting hardware. Do not over-tighten the nuts; recommended torque is four to six inch-pounds.
11. Tighten the screws holding the LV Regulator board to the chassis.
12. Install the chassis on the power-supply unit.
13. Connect the multi-pin connectors to the board. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown in the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.
14. Replace the power-supply unit in the instrument.

A14-CAP-RECTIFIER CIRCUIT BOARD. An exploded-view drawing of the power-supply unit is given in section 9, Replaceable Mechanical Parts, at the rear of this manual. To remove the Cap-Rectifier board, use the following procedure.

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1. Slide the power-supply unit out of the instrument (see Power-Supply Unit Removal).
2. Remove the protective cover from the power-supply unit (see Access to Components in the Power-Supply Unit).
3. Remove the LV Regulator board with attached chassis as described under A16-LV Regulator Circuit Board.
4. Remove the 4 screws securing the power transformer to the bracket.
5. Disconnect the multi-pin connectors from the Cap-Rectifier board. Note the location of the pin connectors so they can be correctly replaced.
6. Remove the 2 plastic screws which hold the circuit-board shield to A15-Power Supply Inverter Board.
7. Unsolder the 3 power-transformer leads from the Power-Supply Inverter board. Remove the excess solder from the board pads with a vacuum-type desoldering tool.
8. Remove the 5 securing screws from the Cap-Rectifier board.
9. Lift the circuit board and attached power transformer from the instrument.
10. To replace the Cap-Rectifier board, reverse the order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

A15-POWER-SUPPLY INVERTER CIRCUIT BOARD. An exploded view drawing of the power-supply unit is given in Section 9, Replaceable Mechanical Parts, at the rear of this manual. Remove and replace the Power-Supply Inverter board as follows:

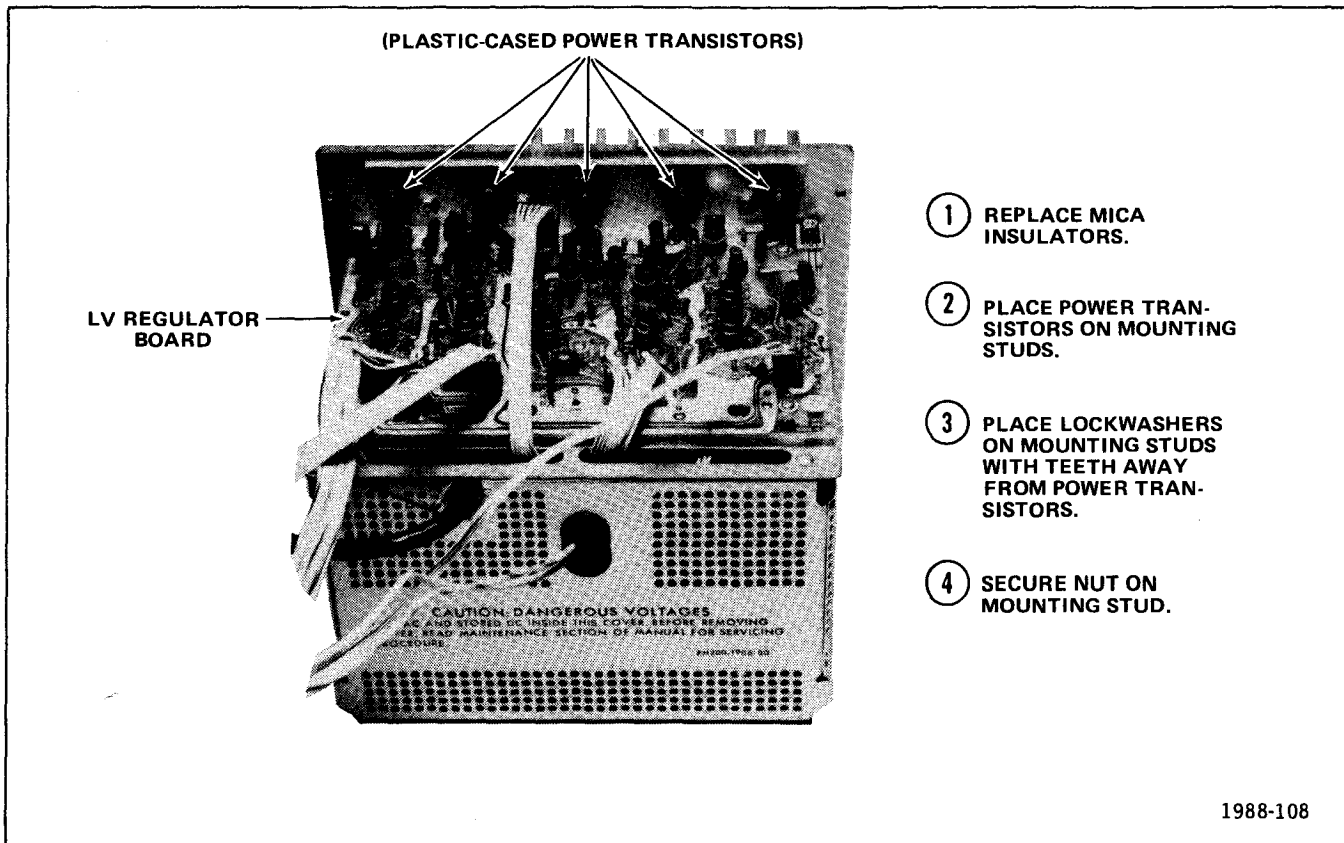


Figure 4-12. Correct placement of power transistor and mounting hardware on rear heatsink.

WARNING

The power-supply unit has been tested at the factory to ensure safe operation. Improper repair of this unit can result in hazardous potentials on the instrument chassis. Do not remove the plate insulator, block insulator, or transistor shield from the heat-sink. (See the exploded-view drawing of the power-supply unit for the location of these components.)

1. Slide the power-supply unit out of the instrument (see Power-Supply Unit Removal).
2. Remove the protective cover from the power-supply unit (see Access to Components in Power-Supply Unit).
3. Remove A14-Cap-Rectifier board using the previous procedure.
4. Remove the 3 securing screws from A15-Power-Supply Inverter board.
5. Unsolder the line-input leads from the circuit board. Remove the excess solder from these circuit board pads with a vacuum-type desoldering tool.
6. Remove the two metal-cased power transistors by removing the securing nuts and pulling the transistors from their sockets.
7. Move the Power-Supply Inverter board away from the heatsink shield until the transistor mounting studs clear the heatsink shield. Remove the board from the power-supply unit.
8. To replace the Power-Supply Inverter board, reverse the order of removal. Match the index arrow on the pin connectors to the corresponding arrow on the board. Correct location of the pin connectors is shown on the circuit board illustration in Section 8, Diagrams and Circuit Board Illustrations.

Plug-In Interface Connectors

The individual contacts of the plug-in interface connectors can be replaced. However, we recommend replacing the entire Main Interface board if a large number of the

contacts are damaged. An alternative solution is to refer the maintenance of the damaged Main Interface board to your local Tektronix Field Office. Use the following procedure to remove and replace an individual contact of the plug-in interface connectors:

NOTE

The plug-in interface contacts which are mounted on the Follower circuit boards cannot be replaced. A Follower board with contacts and interconnecting cables is replaced as a unit. See Circuit Boards earlier in this section.

1. Remove the Main Interface circuit board from the instrument as previously described.
2. Snap the white plastic connector cover off the side of the damaged plug-in interface connector.
3. Unsolder the remove the damaged contact.
4. Install the replacement contact. Carefully position it to fit against the connector body.
5. Snap the white plastic connector cover back onto the plug-in interface connector. Check that the replaced contact is aligned with the other contacts.
6. Replace the Main Interface board.

Delay Line Removal

Remove the delay line as follows:

1. Remove the Fan Assembly, Storage circuit board, and Delay Line Termination circuit board as described under Circuit Boards.
2. Remove the 4 screws securing the delay line to the chassis.
3. Lift the delay line from the instrument.
4. To replace the delay line, reverse the order of removal.

Semiconductors

Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine

maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the adjustment of the instrument. When semiconductors are replaced, check the operation of circuits which may be affected.

WARNING

To avoid electric shock hazard, always disconnect the 7834 from the power source before removing or replacing components.

Replacement semiconductors should be of the original type or a direct replacement. Lead configurations of the semiconductors used in this instrument are shown in Figure 4-13. Some plastic case transistors have lead configurations which do not agree with those shown. If a replacement transistor is made by a different manufacturer than the original, check the manufacturer's basing diagram for correct basing. All transistor sockets in this instrument are wired for standard basing as used for metal-cased transistors. When removing soldered-on transistors, use a solder-removing wick to remove the solder from the circuit board pads. Transistors which have heat radiators or are mounted on the chassis use silicone grease to increase heat transfer. Replace the silicone grease on both sides of the insulating washer when replacing these transistors.

WARNING

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

To replace one of the power transistors mounted on the heatsink at the rear of the power-supply unit, first remove the mounting hardware. Then, unsolder and remove the defective transistor. When replacing the transistor, be sure to install the insulating washer between the transistor and the heatsink (use silicone grease as previously described). Tighten the mounting nut just tight enough to hold the transistor in place. Then solder the replacement transistor to the LV Regulator board.

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

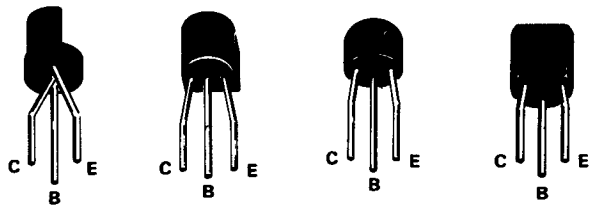
Interconnecting Pins

Two methods of interconnection are used in this instrument to electrically connect the circuit boards with other boards and components. When the interconnection is made with a coaxial cable, a special end-lead connector plugs into socket on the board. Other interconnections are made with a pin soldered into the board. Two types of mating connectors are used for these interconnecting pins. If the mating connector is mounted on a plug-on circuit board, a special socket is soldered into the board. If the mating connector is on the end of a lead, an end-lead pin connector is used which mates with the interconnecting pin. The following information provides the removal and replacement procedure for the various types of interconnecting methods.

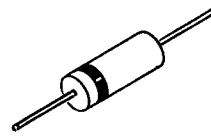
COAXIAL-TYPE END-LEAD CONNECTORS. Replacement of the coaxial-type end-lead connectors requires special tools and techniques; only experienced maintenance personnel should attempt to remove or replace these connectors. We recommend that the damaged cable or wiring harness be replaced as a unit. For cable or wiring harness part numbers, see section 9, Replaceable Mechanical Parts. An alternative solution is to refer the replacement of the defective connector to your local Tektronix Field Office or representative. Figure 4-14 gives an exploded view of a coaxial end-lead connector assembly.

CIRCUIT-BOARD PINS. A circuit-board pin replacement kit (including necessary tools, instructions, and replacement pins with attached ferrules) is available from Tektronix, Inc. Order Tektronix Part 040-0542-00. Replacing circuit-board pins on multi-layer boards is not recommended. (The multi-layer boards in this instrument are listed under Soldering Techniques in this section.)

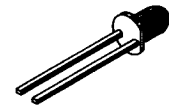
To replace a damaged pin, first disconnect any pin connectors. Then unsolder the damaged pin and pull it from the board with a pair of pliers, leaving the ferrule (see Figure 4-15) in the circuit board if possible. If the ferrule remains in the circuit board, remove the spare ferrule from the replacement 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 circuit board. Position the replacement pin in the same manner as the original pin had been. Solder the pin to the circuit board on each side of the 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.



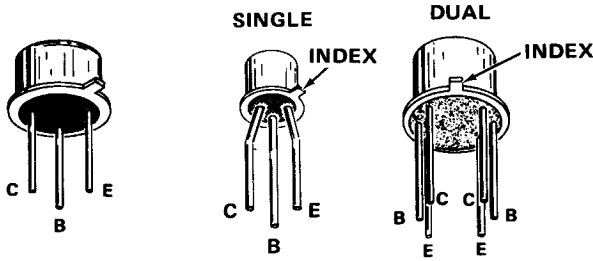
PLASTIC-CASED TRANSISTORS



SIGNAL DIODE



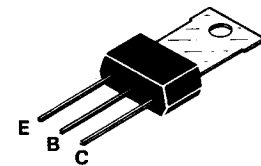
LIGHT EMITTING DIODE (L.E.D.)



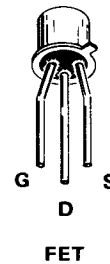
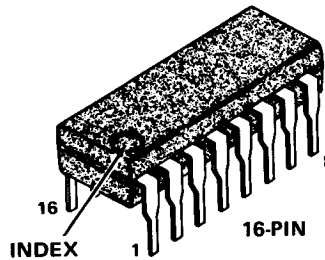
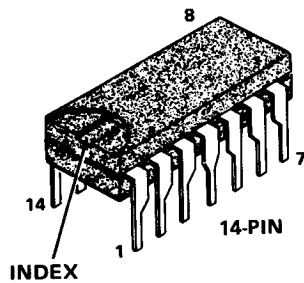
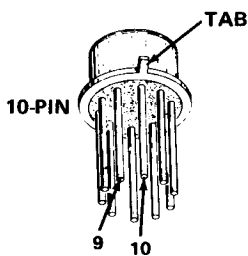
METAL-CASED TRANSISTORS



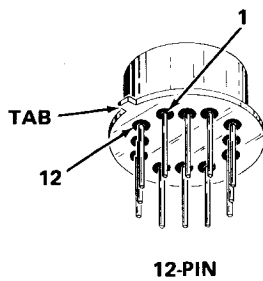
PLASTIC-POWER TRANSISTORS



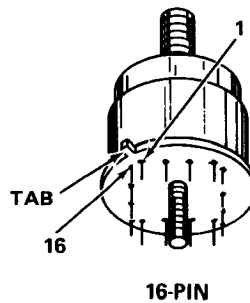
DARLINGTON TRANSISTOR



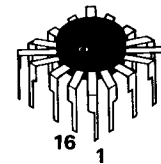
FET



12-PIN



16-PIN



16 1

INTEGRATED CIRCUITS

1988-26

Figure 4-13. Semiconductor lead configurations.

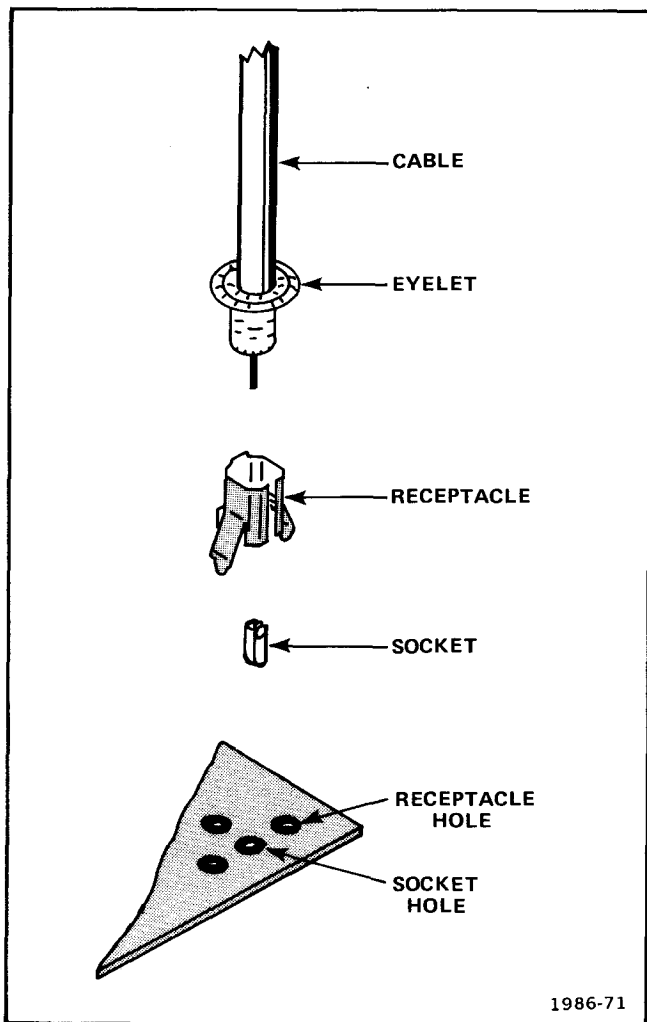


Figure 4-14. Coaxial end-lead connector assembly.

CIRCUIT-BOARD PIN SOCKETS. The pin sockets on the circuit boards are soldered to the back of the board. To remove or replace one of these sockets, first unsolder the pin (use a vacuum-type desoldering tool to remove excess solder). Then straighten the tabs on the socket and remove the socket from the board. Place the new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board; be careful not to get solder inside the socket.

CAUTION

The spring tension of the pin sockets ensures a good connection between the circuit board and the pin. This spring tension can be destroyed by using the pin sockets as a connecting point for spring-loaded probe tips, alligator clips, etc.

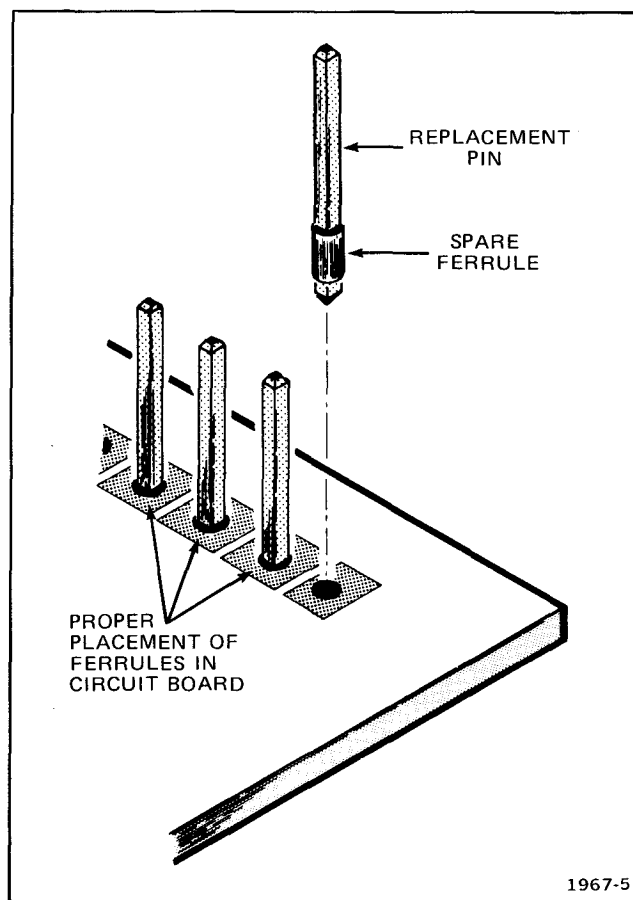


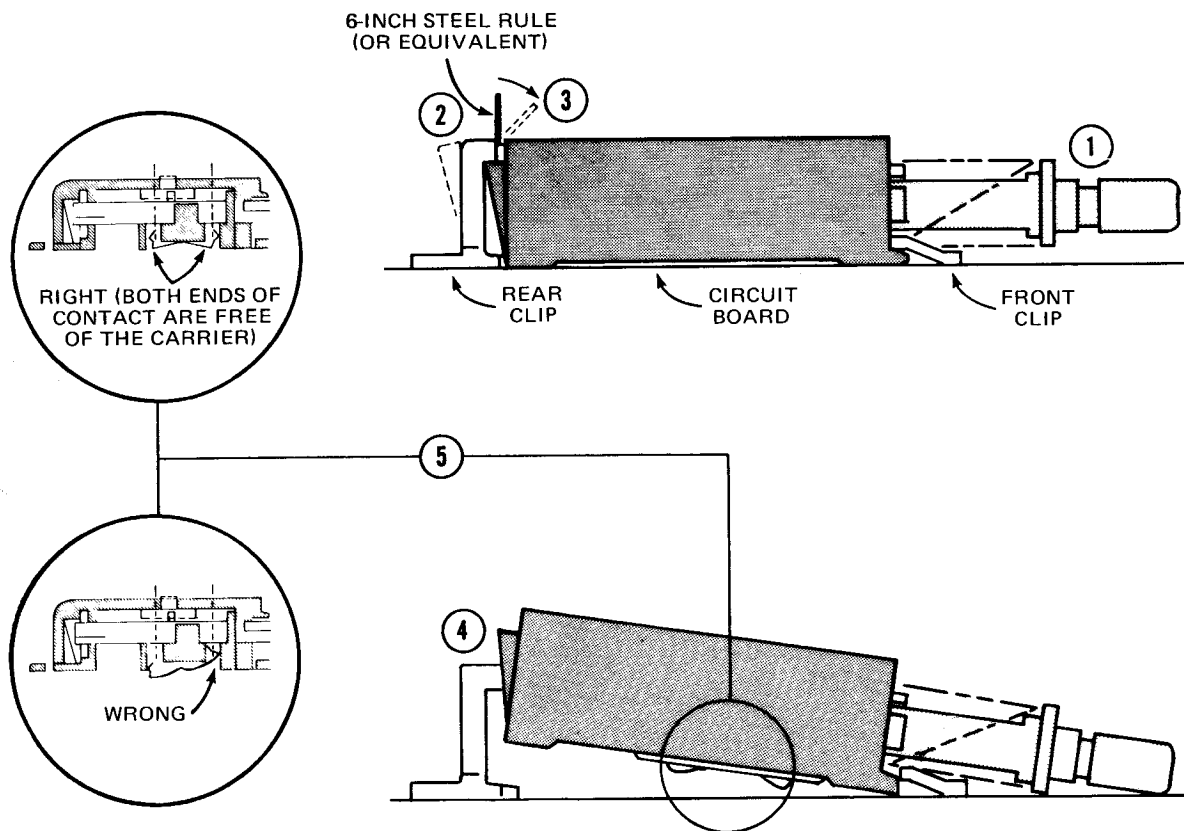
Figure 4-15. Exploded view of circuit-board pin and ferrule.

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

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

Pushbutton Switches

The pushbutton switches used on the 7834 Storage Oscilloscope are circuit board mounted. First remove the associated circuit board following the procedure given under Circuit Boards in this section. Figure 4-16 gives removal and replacement instructions for the pushbutton switches.



- ① Make sure that all switch shafts are in the OUT position to clear the rear clip.
- ② Place the long edge of a six-inch rule or similar thin straight edge between the top edge of the rear clip and the switch body.
- ③ Carefully pry the rear clip back just far enough to push the steel rule down between the clip and switch body.

CAUTION

When the switch is removed, the contacts may drop free and be damaged or lost. Body salts or acids can contaminate the switch contacts. Wear cotton gloves to prevent touching the contacts in the switch or on the board with bare hands.

- ④ Pull the rear of the switch up, remove the steel rule, and pull the switch out of the front clip.
- ⑤ To replace the switch, first check that the slide contacts are properly installed in the carrier. Then, place the front of the switch into the front clip and push the rear of the switch down until the rear clip catches and holds the switch in place.

1967-3

Figure 4-16. Removal procedure for pushbutton switches.

Graticule Light Bulbs

To remove or replace the graticule light bulbs, first remove the plastic crt mask, light filter and metal light shield. Pull on the white tabs to remove the graticule lamp assembly. Next, slide the retaining strip off to the side of the damaged bulb base. Pull the bulb out of the circuit board. Reverse the order of removal for replacement.

Power Transformer

Replace the power transformer only with a direct replacement Tektronix transformer. Remove and replace the power transformer as follows:

1. Remove the Cap-Rectifier board as described under Circuit Boards in this section.
2. Remove the bracket which holds the transformer to the rear heatsink.
3. Unsolder the transformer leads from the circuit boards. Remove the excess solder from the circuit-board pads (see Soldering Techniques). Note the position of the transformer leads so they may be correctly replaced.

4. Place the new transformer in position but do not yet solder the leads to the circuit-board pads.
5. Secure the bracket to the Cap-Rectifier board and attach the transformer to the bracket with the 4 securing screws.
6. Reposition the Cap-Rectifier board and secure with 3 screws. Attach the bracket securely to the rear heatsink.
7. Solder the transformer leads to the circuit-board pads.
8. Continue replacing the Cap-Rectifier board.

ADJUSTMENT AFTER REPAIR

After any electrical component has been replaced, the adjustment of that particular circuit should be checked, as well as the adjustment of any closely related circuits. Since the low-voltage supplies affect all circuits, adjustment of the entire instrument should be checked if component replacements have been made in these supplies or if the power transformer has been replaced. See Section 5 for a complete adjustment procedure.

PERFORMANCE CHECK AND ADJUSTMENT

This section contains information necessary to perform a complete instrument performance check and adjustment. Limits given in the procedure are adjustment guides and should not be interpreted as performance requirements unless preceded by a check mark (✓). Where possible, instrument performance is checked before an adjustment is made.

PRELIMINARY INFORMATION

Adjustment Interval

To maintain instrument accuracy, check the performance of the 7834 every 1000 hours of operation, or every 6 months if used infrequently. Before complete adjustment, thoroughly clean and inspect this instrument as outlined in Section 4, Maintenance.

Tektronix Field Service

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

Using This Procedure

This Performance Check and Adjustment procedure can be used for a complete adjustment procedure or as a check of the instrument's performance. Completion of each step in the procedure ensures that the instrument is correctly adjusted and operating within specified limits. Refer to the following discussion for instructions on a complete or partial check and adjustment.

INDEX. An index 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 part of the steps. A check mark (✓) preceding a CHECK indicates that the limit given is a performance requirement specified in Section 2, Specification.

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 when performing the complete adjustment

procedure, make each adjustment to the exact setting indicated.

PARTIAL PROCEDURES. The following procedure is written to completely check and adjust the instrument to the Performance Requirements listed in Section 2, Specification. If the applications for which the instrument is used do not require the full available performance, the procedures and the required equipment list can be shortened accordingly.

A partial performance check and adjustment may be desirable after replacing components, or to touch up the adjustment of a portion of the instrument. To check or adjust only part of the instrument, refer to the Equipment Required list which precedes that portion of the procedure to be performed. To avoid unnecessary adjustment of other parts, adjust only if the tolerance given in each CHECK is not met.

TEST EQUIPMENT REQUIRED

The test equipment listed in Table 5-1 is required for a complete performance check and adjustment of this instrument. The specifications given in Table 5-1 for test equipment are the minimum required to meet the Performance Requirements listed in Section 2, Specification. Detailed operating instructions for test equipment are omitted in this procedure. Refer to the test equipment instruction manual if more information is needed.

Special Fixtures

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

Test Equipment Alternatives

The test equipment listed in the Examples of Applicable Test Equipment column, Table 5-1, is required to check and adjust this instrument. The Performance Check and

Adjustment procedure is based on the first item of equipment given as an example. If other equipment is substituted, control settings or setups may need to be altered. If the exact item or equipment given as an example is not available, refer to the Minimum Specifications column to determine if other 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.

Signal Connections

Detailed signal-connection information is not provided except when critical for a particular test. Rear-panel output connectors should be connected to other equipment with 50-ohm BNC cables. When simultaneously connecting a signal to two inputs, use a BNC T connector. For test equipment signal-connection and termination information, refer to the test equipment instruction manuals.

TABLE 5-1
Test Equipment

Description	Minimum Specification	Purpose	Examples of Applicable Test Equipment
1. Precision DC Voltmeter	Range, -75 to +150 volts; accuracy, within 0.1%.	Check and adjustment of calibrator output accuracy, power supply voltages, Z-axis Display and Storage System voltages.	a. Tektronix DM 501 with power module, Digital Multi-Meter. b. Fluke Model 825A Differential DC Voltmeter.
2. DC Voltmeter (VOM)	Range, to 2000 volts; accuracy, checked to within 1% at -1955 volts.	High-voltage power supply adjustment.	a. Triplet Model 630-NA. b. Simpson Model 262. c. Item 1 used with a precision voltage divider.
3. Time-Mark Generator	Marker outputs, 2 nano-seconds to 0.1 second; marker accuracy, within 0.1%; trigger output, 1 millisecond.	Check and adjustment of crt geometry, horizontal timing, and calibrator frequency.	a. Tektronix TG 501 Time-Mark Generator with power module. b. Tektronix 2901 Time-Mark Generator. c. Tektronix Type 184 Time-Mark Generator.
4. Low-Frequency Sine-Wave Generator	Frequency, 250 kilohertz to 1 megahertz; output amplitude, variable from 50 millivolts to 3 volts into 50 ohms.	Check and adjust stored writing speed and horizontal bandwidth.	a. Tektronix FG 503 Function Generator with power module. b. General Radio 1310-B Oscillator.
5. Medium-Frequency Sine-Wave Generator	Frequency range from 2.5 megahertz to 100 megahertz; output amplitude, 1 volt p-p into 50 ohms; accuracy, within 2%.	Z-axis input check. Stored writing speed checks and adjustments.	a. Tektronix SG 503, Variable-Leveled Output. b. Tektronix 191 Constant-Amplitude Signal Generator. c. General Radio 1215-C with 1263-C Amplitude-Regulating Power Supply.

TABLE 5-1 (CONT.)
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
6. High-Frequency Sine-Wave Generator	Frequency, 245 megahertz to 500 megahertz; reference frequency, 10 megahertz or lower; output amplitude, variable from 0.5 to 4 volts into 50 ohms; amplitude accuracy, constant within 1% of reference as output frequency changes.	Check and adjustment of vertical bandwidth, vertical channel isolation and stored writing speed.	<p>a. Tektronix SG 504, Variable-Leveled Output.</p> <p>b. General Radio 1362 UHF Oscillator with 1263-C Amplitude-Regulating Power Supply.</p> <p>c. Wiltron Model 610C Swept Frequency Generator with Model 61083C, 10 to 1220 megahertz plug-in.</p>
7. Amplifier Unit	Tektronix 7A-series plug-in unit.	Used throughout procedure to provide vertical input to the instrument under adjustment.	a. Tektronix 7A19 Amplifier unit.
8. Amplifier Unit (Dual Trace)	Any 7A-series dual display amplifier unit.	Used to check position and operation of READOUT display.	a. Any 7A-series dual amplifier unit (may be shared with a 7000-series test oscilloscope).
9. Time-Base Unit (Two Required)	Tektronix 7B80 series; delaying unit needed for checking DLY'D gate out (7B85).	Used throughout procedure to provide sweep (delaying time base).	<p>a. Tektronix 7B85 Time Base.</p> <p>b. Tektronix 7B80 Time Base.</p>
10. Signal Standardizer (Calibration Fixture)	Produces gain-check and pulse-response waveforms.	Used throughout procedure to standardize instrument so plug-in units can be interchanged without complete readjustment.	<p>a. Tektronix Calibration Fixture 067-0587-01.</p> <p>b. 7000-series plug-in units with suitable signal sources may be substituted if lower performance is acceptable.</p>
11. 10X Passive Probe ¹	Compatible with test oscilloscope to be used.	Used to check power supply ripple, signals out, calibrator and Z-axis adjustment.	a. Tektronix P6053B or P6054A probe.

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

TABLE 5-1 (CONT.)

Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
12. Test Oscilloscope	Bandwidth, dc to 75 megahertz; minimum deflection factor 10 millivolt/division; accuracy, within 3%. Dual-channel with an inverting input and both added and alternate vertical modes.	Used for performance check and adjustment.	a. Tektronix 7603 Oscilloscope System with 7A18 Amplifier, 7B53A Time Base, and P6053B Probe. b. Tektronix 465 Oscilloscope with P6053B Probe. c. Refer to the Tektronix Products catalog for compatible oscilloscope system.
13. T Connector	BNC-to-BNC.	External Z-axis operation check.	a. Tektronix Part 103-0030-00.
14. Termination	Impedance, 50 ohms; accuracy, within 2%; connectors, BNC.	Output termination for signal generators, if amplifier unit is not 50-ohm input impedance.	a. Tektronix Part 011-0049-01.
15. Cable (Two of Each Length Required)	Impedance, 50 ohms; type, RG-58/U; length, 18 and 42 inches; connectors, BNC.	Signal interconnection.	a. Tektronix Part 012-0076-00 (18 inches). Tektronix Part 012-0057-01 (42 inches).
16. Screwdriver ¹	Three-inch shaft, 3/32-inch bit.	Used throughout adjustment procedure to adjust variable resistors.	a. Xcelite R-3323.
17. Low-Capacitance Screwdriver ¹	1-1/2 inch shaft.	Used throughout procedure to adjust variable capacitors.	a. Tektronix Part 003-0000-00.
18. Nylon Tuning Tool ¹	Fits 5/64-inch (ID) hex cores.	Vertical high-frequency compensation.	a. Handle and insert, Tektronix Parts 003-0307-00 and 003-0310-00.
19. Plug-in Extender ¹ (Rigid Calibration Fixture)	Provides access to power supply voltages.	Power Supply Voltage, Trigger System check and adjustment.	a. Tektronix Part 067-0589-00.

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

PERFORMANCE CHECK/ADJUSTMENT PROCEDURE

PAGE

7834 Serial No. _____

Calibration Date _____

Performance Check Date _____

Tested By _____

Introduction

The following procedure checks and adjusts the 7834 to meet the performance requirements given in the Specifications section.

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✓Performance Requirement check; see introductory information.

Setup 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. Remove the side and bottom covers from the 7834. (Refer to the Maintenance section in this manual for panel removal information.)
2. Connect the instrument to a power source which meets the voltage and frequency requirements marked on the instrument rear panel. (Refer to the General Information section in this manual for operating voltage information.) Press the POWER button in.

3. Allow at least 30 minutes warmup before proceeding.

NOTE

Titles for external controls of the 7834 are capitalized in this procedure (e.g., B TRIGGER SOURCE). Internal adjustments are initial capitalized (e.g., Horiz Gain).

CAUTION

To prevent instrument damage, plug-in units should not be installed or removed without first turning the instrument power off.

A. POWER SUPPLY

Equipment Required

1. Precision dc voltmeter
2. Screwdriver (three-inch)

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS 1** in the Diagrams section.

Control Settings

Set the 7834 controls as follows:

POWER switchOFF
 CALIBRATOR4 V (push button in)
 READOUT
 IntensityOFF (in detent)
 GRAT ILLUMCounterclockwise
 NON-STOREPush button in
 REDUCED SCAN . .Push button out
 All Other Controls. .No change

A1. ADJUST -50 VOLT POWER SUPPLY (R1513)

WARNING

Extreme caution must be used when operating the 7834 with the power unit removed due to the line voltage, high voltage, and high current potentials present.

NOTE

The Power Supply voltages can be checked without removing the power unit by using the 7000-Series plug-in (rigid) extender, part 067-0589-00.

a. Disconnect the line cord from the power source. Remove any plug-in units from the plug-in compartments. Expose the 7834 Power Supply adjustments and test points by removing the power unit from the rear of the 7834 (interconnecting cables remain connected). See the Maintenance section in this manual for power unit removal instructions.

b. Connect the line cord to the power source and press the POWER button in.

c. Connect the precision dc voltmeter between TP -50 Volt Sense and TP Gnd Sense on the Low-Voltage Regulator circuit board (see Figure 8-31).

d. Check the meter reading for -50 volts, within the limits of -49.8 to -50.2 volts.

e. ADJUST—The -50 V ADJ (adjustment) R1513 for a meter reading of -50 volts within 0.1 volts (see Figure 8-31).

f. INTERACTION—Any change in the setting of R1513 may affect the operation of all circuits in the instrument.

A2. ADJUST INVERTER CONTROL (R1293)

a. Connect the precision dc voltmeter between TP +108 and chassis ground (see Figure 8-31).

b. Check—Meter reading for +108 volts within the limits of +107.9 to +108.1 volts. If meter reading is within the given tolerance, proceed to step A-3.

c. ADJUST—The +108 V ADJ (adjustment) R1293 for a meter reading of +108 volts within 0.1 volt (see Figure 8-30). *LOW*

d. INTERACTION—Any change in the setting of R1293 may affect the adjustment of the -50 Volts Power Supply (R1513).

A3. CHECK POWER-SUPPLY VOLTAGES

a. Table 5-2 lists the low-voltage power supplies in this instrument. Check each supply with the precision dc voltmeter for output voltage within the given tolerance. Connect meter common lead to TP Gnd Sense (see Figure 8-31).

b. INTERACTION—If the power supplies are not within the tolerances given in Table 5-2, repeat steps A1 and A-2.

TABLE 5-2
Power Supply Tolerance

Power Supply (Refer to Fig. 8-31)	Output Voltage Limits
TP -50 V Sense	-49.8 to -50.2 Volts
TP -15 V Sense	-14.85 to -15.15 Volts
TP +5 V Sense	+4.9 to +5.1 Volts
TP +15 V Sense	+14.85 to +15.15 Volts
TP +50 V Sense	+49.5 to +50.5 Volts
+5 V Lights Control Illumination	+4 to +5.5 Volts

c. Disconnect the precision dc voltmeter.

NOTE

Regulation of the individual power supplies can be checked using the procedure given under Troubleshooting Techniques in the Maintenance section.

d. Disconnect the line cord from the power source.

NOTE

Access to Trigger System adjustments requires that the power unit be removed. If Adjustment of the Trigger System is anticipated, install the power unit after completing Trigger System adjustments.

e. Install the power unit and connect the line cord.

DELETE

~~**A4. Check Protection Circuit**~~

- ~~a. Connect the digital voltmeter between the emitter of Q1785 (pin 1 P1782) (vertical amplifier) and TP GND.~~
- ~~b. Check—Meter reading for approximately +49 volts.~~
- ~~c. With the voltmeter probe still attached to pin 2 of P1782, momentarily short across TP1786 and TP GND (vertical amplifier) while reading the voltage. The meter reading should be approximately +31 volts. (If meter reading is correct, the protection circuit will operate correctly.)~~
- ~~d. Disconnect the digital voltmeter.~~

B. Z-AXIS AND DISPLAY

Equipment Required

- | | |
|---|--------------------------------------|
| 1. DC voltmeter (VOM) | 7. Low-frequency sine-wave generator |
| 2. Precision dc voltmeter | 8. Screwdriver (three-inch) |
| 3. Signal Standardizer (Calibrator Fixture) | 9. Low-capacitance screwdriver |
| 4. Time-base unit | 10. T connector (BNC) |
| 5. Amplifier unit | |
| 6. Test oscilloscope with 10X passive probe | |

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS 2** in the diagrams section.

Control Settings

Set the 7834 controls as follows:

- POWER switchOFF
- VERTICAL MODE .RIGHT
- VERT TRACE SEPARATION (B) .Midrange
- A TRIGGER SOURCEVERT MODE
- A INTENSITYFully counterclockwise
- HORIZONTAL MODEA
- B INTENSITYFully counterclockwise
- B TRIGGER SOURCEVERT MODE
- FOCUSMidrange
- READOUT IntensityOFF (in detent)
- GRAT ILLUMMidrange
- NON-STOREPush button in
- REDUCED SCAN . .Push button out
- Horizontal Selector (rear of RIGHT compartment)Norm

measure at least 2000 volts, between the -1955 V test point, TP2298, and chassis ground (see Figure 8-32).

- b. Press the POWER button in.
- c. Check meter reading; -1955 volts within the limits of -1935.5 to -1974.5 volts.
- d. ADJUST—The -1955 V adjustment, R2285, (see Figure 8-32) for a meter reading of -1955 volts.
- e. Set the POWER button to OFF and disconnect the voltmeter. Return the POWER button to on.

B2. ADJUST CRT GRID BIAS (R2135, R4480)

- a. Connect the precision dc voltmeter to the DC Z test point TP2264 (see Figure 8-32).
- b. Set the Z-Axis Level adjustment R4480 (see Figure 8-33) for the lowest obtainable voltage on the voltmeter; then, set the Z-Axis level adjustment R4480 for 1 volt above the lowest obtainable voltage.
- c. Disconnect the voltmeter.

B1. ADJUST -1955 V SUPPLY (R2285)

- a. Remove the 8 screws that secure the top panel to the rear of the display unit. Remove the panel to expose the Z-Axis board. Connect the dc voltmeter (VOM), set to

HIGH

16.113
17.113

Performance Check and Adjustment—7834

d. Install the signal standardizer in the RIGHT VERT compartment and a time-base unit in the A HORIZ compartment.

e. Set the time-base unit for a free-running sweep at a sweep rate of 0.2 millisecond/division.

f. Connect the 10X passive probe to the input of the test oscilloscope (check the probe compensation).

g. Set the test oscilloscope for dc input coupling with a vertical deflection factor of 2 volts/division (20 volts/division at the probe tip) and a sweep rate of 1 millisecond/division.

h. Connect the probe tip to the DC Z test point, TP2264 (see Figure 8-32). Connect the probe ground to chassis ground with a short grounding strap.

i. Set the A INTENSITY control fully clockwise.

j. Note the pulse amplitude indicated on the test oscilloscope. If the pulse amplitude is 73 volts or less, no adjustment is necessary; if the pulse amplitude is greater than 73 volts, set the Z-Axis Level adjustment R4480 (see Figure 8-33) for a pulse amplitude of 73 volts by lowering the level at the top of the pulse without raising the bottom level of the pulse.

k. Set the A INTENSITY control for an 8 volt pulse displayed on the test oscilloscope.

l. Press the VAR PERSIST push button and set the PERSISTENCE control fully counterclockwise.

m. Set the AUTO ERASE control fully counterclockwise but not in the MAX/OFF detent position.

n. Set the STORAGE LEVEL control for a light green crt background.

o. Set the time-base unit for a sweep rate of 5 seconds/division.

OFF
p. ADJUST—CRT Grid Bias adjustment R2135 (see Figure 8-35) so that the trace on the crt screen is just extinguished.

q. Disconnect the 10X probe from TP2264.

✓ B3. CHECK/ADJUST TRACE ALIGNMENT (R2105, R2435, R1832, R2410)

a. Press the NON-STORE push button in.

b. Set the time-base unit for auto triggering with ac coupling from the internal source at a sweep rate of 1 millisecond/division.

c. Set the A INTENSITY control for a visible trace. Set the FOCUS control and ASTIG adjustment for a well-defined trace.

d. Position the trace to the center graticule line.

e. Measure the voltage between chassis ground and each of the vertical crt deflection plates with the precision dc voltmeter; then, determine the vertical plate average (add both measurements together and divide by 2).

37.3
40.7
f. Connect the precision dc voltmeter between chassis ground and the Vert Shield test point TP2105 (see Figure 8-35).

g. ADJUST—Vert Shield adjustment R2105 (see Figure 8-35) for a meter reading that is 5 volts less positive than the vertical plate average determined in part e.

✓ h. CHECK—That the trace aligns with the center graticule line within 0.1 division.

i. ADJUST—TRACE ROTATION adjustment to align the trace with the vertical center graticule line.

j. Remove the signal standardizer and the time-base unit from the 7834. Install the signal standardizer in the A HORIZ compartment and the time-base unit in the RIGHT VERT compartment.

✓ Performance Requirement check; see introductory information

- k. Position the trace to the center graticule line.
- l. Check—Trace aligns with the center graticule line within 0.1 division.
- m. ADJUST—FS (full scan) Y-Axis Align adjustment R2435 to align the trace with the center graticule line (see Figure 8-36).
 (R2475)
- n. Set the signal standardizer Test switch to Vert or Horiz Gain.
- o. Check—That the second and tenth vertical traces align with the second and tenth graticule lines within 0.08 division.
- p. ADJUST—The H. Gain (full scan) adjustment R1832 (see Figure 8-34) for 8 divisions of deflection.
- q. Press the REDUCED SCAN push button.
- r. Check—That the second and tenth vertical traces align with the second and tenth Reduced Scan graticule lines within 0.08 division.
- s. ADJUST—H. Gain (reduced scan) adjustment R2220 (see Figure 8-32) for 8 divisions of deflection on the Reduced Scan graticule.
- t. Remove the time-base unit and the signal standardizer. Install the time-base unit in the A HORIZ compartment and the signal standardizer in the RIGHT VERT compartment. Set the signal standardizer Test switch to Vert or Horiz Aux In.
- ✓ u. CHECK—That the trace aligns with the center vertical graticule line, within 0.1 reduced scan division.
- v. ADJUST—RS (reduced scan) Trace Rot (rotation) adjustment R2410 to align the trace with the center vertical graticule line (see Figure 8-36).
- w. Press and release the REDUCED SCAN push button.

B4. ADJUST STIGMATOR (R2110)

- a. Remove the time-base unit and install an amplifier unit in the A HORIZ compartment.
- b. Set the FOCUS and INTENSITY controls, and ASTIG adjustment, for a vertical line approximately 1.5 divisions in length on the crt.
- c. ADJUST—STIG (Stigmator) adjustment R2110 so the line is vertically aligned with the vertical graticule lines (see Figure 8-35).
- d. Set the FOCUS control and ASTIG adjustment for a small dot.
- e. Remove the amplifier unit from the A HORIZ compartment.

B5. ADJUST AUTO-FOCUS OPERATION (R2140, R2180, R2365, R2425, R2366, R2435, R2315).

- a. Install a time-base unit in the A HORIZ compartment.
- b. Connect the low-frequency sine-wave generator to the signal standardizer Aux In connector; set for a 6-kilohertz display, 3 divisions in amplitude.
- c. Set the time-base unit for auto internal triggering at a sweep rate of 20 microseconds/division.
- d. Set the signal standardizer amplitude for a 6 division display.
- e. Set the A INTENSITY control for a low-intensity display.
- f. Set the FOCUS control and ASTIG adjustment for a well-defined display.
- g. Press the REDUCED SCAN push button.
- h. ADJUST—Focus (reduced scan) adjustment R2140 and Astig (reduced scan) adjustment R2180 for a well-defined display (see Figure 8-35).

✓ Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

- i. Set the A INTENSITY control fully clockwise.
- j. ADJUST—Auto Focus (reduced scan) adjustment R2365 and Auto Astig (reduced scan) adjustment R2425 for the best well-defined display possible (see Figure 8-32).
- k. Press and release the REDUCED SCAN push button.
- l. ADJUST—Auto Focus (full scan) adjustment R2366 and Auto Astig (full scan) adjustment R2435 for the best well-defined display possible (see Figure 8-32).
- m. Disconnect the low-frequency sine-wave generator.
- n. Set the A INTENSITY control for a low intensity level.
- o. Set the READOUT control fully clockwise.
- p. ADJUST—RO Focus adjustment R2315 for a well-defined readout display (see Figure 8-32).
- q. Set the READOUT control fully counterclockwise to the OFF detent position.

B6. ADJUST Z-AXIS TRANSIENT RESPONSE (C2235, R2235, C2435, C2425)

- a. Set the test oscilloscope for a vertical deflection factor of 0.2 volt/division (2 volts/division at probe tip) at a sweep rate of 20 nanoseconds/division.
- b. Set the A INTENSITY control fully clockwise.
- c. Connect the 10X probe to Z test point TP2288 (see Figure 8-32).
- d. ADJUST—Z Comp 1 and Z Comp 2 adjustments C2235 and R2235 for an optimum square corner on the displayed pulse (see Figure 8-32).
- e. Move the 10X probe to the AUTO A test point TP2408 (see Figure 8-32).

- f. Set the test oscilloscope vertical deflection factor for 1 volt/division (10 volts/division at probe tip) and a sweep rate of 1 microsecond/division.
- g. Set the 7834 HORIZONTAL MODE switch to CHOP.
- h. Set the A INTENSITY control fully clockwise and the B INTENSITY control fully counterclockwise.
- i. ADJUST—Auto A (Astig) FS compensation adjustment C2435 for a flat top on the test oscilloscope displayed waveform (see Figure 8-32).
- j. Press the REDUCED SCAN push button.
- k. ADJUST—Auto A (Astig) RS compensation adjustment C2425 for a flat top on the test oscilloscope displayed waveform (see Figure 8-32).
- l. Press and release the REDUCED SCAN push button. Disconnect the 10X probe and set the HORIZONTAL MODE switch to A. Set the A INTENSITY control to midrange.

B7. CHECK/ADJUST GEOMETRY (R1897)

- a. Remove the signal standardizer and the time-base unit.
- b. Install the signal standardizer in the A HORIZ compartment and the time-base unit in the RIGHT VERT compartment.
- c. Set the signal standardizer Test switch to Vert or Horiz Gain and the Rep Rate switch to 100 kHz.
- d. Set the time-base unit sweep rate to 1 microsecond/division.
- e. CHECK—Vertical bowing and tilt of the display is less than 0.1 division.
- f. ADJUST—GEOM (geometry) adjustment R1897 for minimum bowing and tilt of the display (see Figure 8-34).

✓ **B8. CHECK EXTERNAL Z-AXIS OPERATION**

- a. Remove the signal standardizer and time-base unit.
- b. Install an amplifier unit in the RIGHT VERT compartment and the time-base unit in the A HORIZ compartment.
- c. Connect the output of the low-frequency sine-wave generator to the amplifier unit input (use a T connector, BNC, at the amplifier input).
- d. Set the amplifier unit for a calibrated deflection factor of 0.5 volt/division and the time-base unit sweep rate for 20 microseconds/division.
- e. Set the low-frequency sine-wave generator for a four-division display at 50 kilohertz (one volt above and below ground).
- f. Set the A INTENSITY control for a dim display.
- g. Connect the signal from the output of the T connector at the amplifier input to the Z-AXIS INPUT connector on the rear panel.
- ✓ h. CHECK—Positive portion of the displayed waveform is blanked out.
- i. Disconnect all test equipment and remove the plug-in units.

✓ Performance Requirement check; see introductory information.

C. CALIBRATOR AND OUTPUT SIGNALS

Equipment Required

- | | |
|--|---|
| 1. Precision dc voltmeter | 6. Cable (18-inch, 50-ohm BNC) |
| 2. Amplifier unit | 7. Cable (42-inch, 50-ohm BNC) two required |
| 3. Time-mark generator | 8. T connector (BNC) |
| 4. Time-base unit (with delaying mode) | 9. Screwdriver (three-inch) |
| 5. Test oscilloscope (dual-trace) | |

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS 3** in the Diagrams section.

✓ C1. CHECK/ADJUST CALIBRATOR OUTPUT VOLTAGE (R385)

a. Set both the 4 V and 0.4 V CALIBRATOR push buttons to the depressed position.

b. Connect the precision dc voltmeter to the CALIBRATOR output connector.

✓ c. CHECK—Meter reading for 0.4008 volt within the limits of 0.4004 to 0.4012 volt.

d. ADJUST—The 0.4 Volts DC adjustment R385 for a meter reading of exactly 0.4008 volt, see Figure 8-38. (Access to adjustment is through the chassis, inside vertical compartments.)

e. Disconnect the precision dc voltmeter.

✓ C2. CHECK/ADJUST CALIBRATOR 1 kHz REPETITION RATE (R375)

NOTE

A frequency counter with an accuracy of at least 0.1% may be used to adjust the calibrator repetition rate.

a. Connect 1-millisecond time-markers to the test oscilloscope external trigger input and to the non-inverting vertical channel of the test oscilloscope (use

a T connector, BNC). Connect the 7834 CALIBRATOR output to the other test oscilloscope vertical channel. Press the 4 V CALIBRATOR push button in.

b. Set the test oscilloscope triggering to auto mode with ac coupling from the external source, and adjust the triggering level for a stable display. Set the sweep rate for 1 millisecond/division and the vertical mode to alternate.

c. Set the test oscilloscope deflection factors to display 2 divisions of CALIBRATOR signal and 1 division of time-marker signal.

d. Set the test oscilloscope vertical mode to add, and the sweep rate for 0.2 second/division.

✓ e. CHECK—The time required for the 1-millisecond time marks to drift from the positive level of the CALIBRATOR signal to the negative level, and back to the positive level must be at least 0.4 seconds (2 divisions). This time can be measured directly from the display by observing the number of divisions that the markers move across the display area before it returns to the positive level.

f. ADJUST—1 kHz ADJ adjustment R375 for minimum drift (see Figure 8-38).

g. Disconnect all test equipment.

✓Performance Requirement check; see introductory information.

C3. CHECK CALIBRATOR RISE TIME, FALL TIME, AND DUTY CYCLE

- a. Set the CALIBRATOR to the 4 V position.
- b. Connect the CALIBRATOR output to the inverting vertical input of the test oscilloscope and set the vertical mode to display the inverting channel.
- c. Set the test oscilloscope vertical deflection to display 4 divisions of CALIBRATOR signal.
- d. Set the test oscilloscope for a stable display, internally triggered on the rising portion of the calibrator signal at a sweep rate of 0.1 microsecond/division.
- e. CHECK—Displayed waveform for not more than 2.5 divisions between the 10% to 90% points of the waveform (rise time, 0.25 microsecond or less).
- f. Set the test oscilloscope for a stable display triggered on the falling portion of the waveform.
- g. CHECK—Displayed waveform for not more than 2.5 divisions between the 90% and 10% points (fall time, 0.25 microsecond or less).
- h. Set the test oscilloscope triggering for auto mode with ac coupling from the internal source at a sweep rate of 0.1 millisecond/division. Set the triggering controls so that the display starts at the 50% point on the rising edge of the waveform.
- i. Set the test oscilloscope sweep magnifier to X10. Then, position the display horizontally so the falling edge of the waveform aligns with the center vertical graticule line.
- j. Set the test oscilloscope vertical to invert the display. (NOTE: The display is triggered on the opposite slope, even though the display appears the same.)

- ✓ k. CHECK—The 50% point on the falling edge of the waveform now displayed is within 0.4 divisions horizontally of the center line (indicates duty cycle of 50% within 0.1%).

- l. Disconnect all cables.

✓ C4. CHECK A AND B SAWTOOTH OUTPUT SIGNALS

- a. Install a time-base unit in the A HORIZ compartment and set the sweep rate for 0.1 millisecond/division.

- b. Set the test oscilloscope sweep rate for 0.2 milliseconds/division and the vertical deflection factor for 2 volts/division.

- c. Connect the + SAWTOOTH output connector to the test oscilloscope vertical input (1 megohm input).

- d. Set the Sweep Selector Switch S3320 to the A position (see Figure 8-37).

- ✓ e. CHECK—That the slope of the test oscilloscope display is 2 volts/division within 10% (10 volt sawtooth display for 10 division sweep).

- f. Move the time-base unit to the B HORIZ compartment.

- g. Set the Sweep Selector switch S3320 to the B position.

- ✓ h. CHECK—Test oscilloscope display for 1 volt/division of sweep within 10% (10 volt sawtooth display for 10 division sweep).

- i. Disconnect all test equipment.

✓ C5. CHECK A GATE, B GATE, AND DELAYED GATE OUTPUT SIGNALS

- a. Install a delaying time-base unit in the A HORIZ compartment. Set the time-base unit for non-delayed operation at a sweep rate of 0.5 millisecond/division. Set triggering for auto mode.

✓ Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

- b. Set the Gate Selector Switch S3340 to A (see Figure 8-37).
- c. Connect the rear panel + GATE OUT connector to the test oscilloscope vertical input. Set the test oscilloscope vertical deflection factor for 2 volts/division and sweep rate for 2 milliseconds/division.
- ✓ d. CHECK—Test oscilloscope display for a gate waveform 5 divisions in amplitude within 10%.
- e. Set the delaying time-base unit for delaying sweep operation.
- f. Set the Gate Selector Switch S3340 to Dly'd.
- ✓ g. CHECK—Test oscilloscope display for a gate waveform 5 divisions in amplitude within 10%.
- h. Move the delaying time-base unit into the B HORIZ compartment. Set the time-base unit for non-delayed operation at a sweep rate of 0.5 millisecond/division with auto mode triggering.
- i. Set the Gate Selector Switch S3340 to B.
- ✓ j. CHECK—Test oscilloscope display for a gate waveform 5 divisions in amplitude within 10%.
- k. Disconnect cables and remove plug-in units.

✓Performance Requirement check; see introductory information.

D. TRIGGER SYSTEM

Equipment Required

- | | |
|---|--|
| 1. Signal Standardizer (calibration fixture) | 6. Cable (42-inch, 50-ohm BNC, two required) |
| 2. Time-base unit (two required) | 7. Cable (18-inch, 50-ohm BNC) |
| 3. Amplifier unit | 8. Termination (50-ohm BNC, two required) |
| 4. Plug-in extender (rigid calibration fixture) | 9. Screwdriver (three-inch) |
| 5. Test oscilloscope (dual trace) | |

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS 3** in the Diagrams section.

Control Settings

Set the 7834 front-panel controls as follows:

POWER switchOFF
 VERTICAL
 MODE.RIGHT
 VERT TRACE
 SEPARATION (B). .Midrange
 A TRIGGER
 SOURCE.VERT MODE
 A INTENSITYMidrange
 HORIZONTAL
 MODE.A
 B INTENSITYMidrange
 B TRIGGER
 SOURCE.VERT MODE
 READOUT
 IntensityOFF (in detent)
 GRAT ILLUMMidrange
 NON-STOREPush button in
 REDUCED SCAN . .Push button out
 Horizontal Selector
 (rear of RIGHT
 VERT compart-
 ment)Norm

D1. CHECK/ADJUST A TRIGGER SELECTOR DC CENTERING AND GAIN (R586, R589)

WARNING

Extreme caution must be used when operating the 7834 with the power unit removed due to the line voltage, high voltage, and high current potentials present.

- Disconnect the line cord from the power source. Remove all plug-in units from the plug-in compartments. Expose the 7834 trigger system adjustments and test points by removing the power unit from the rear of the 7834 (interconnecting cables remain connected). See the Maintenance section in this manual for power unit removal instructions.
- Connect the line cord to the power source and press POWER button in.
- Within the plug-in extender (rigid calibration fixture), disconnect the top connector on the left and right sides (labeled A20 and B20). Connect each female connector to one of the test oscilloscope channels with the 42-inch 50-ohm BNC cable and 50-ohm BNC termination (omit 50-ohm BNC termination if the test oscilloscope has 50-ohm input impedance).

√Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

- d. Install the plug-in extender (rigid calibration fixture) in the A HORIZ compartment.
- e. Set both channels of the test oscilloscope for a deflection factor of 50 millivolts/division with the inputs grounded.
- f. Set the test oscilloscope for differential operation between the two channels (added display mode with one channel inverted) at a sweep rate of 0.1 milliseconds/division.
- g. Establish a ground reference level for the test oscilloscope by positioning the trace to the center horizontal line of the graticule. Do not change the test oscilloscope position controls after setting this ground reference.
- h. Set both channels of the test oscilloscope for dc input coupling.
- i. CHECK—Check the test oscilloscope display for a dc level within 0.5 division (25 millivolts) of the ground reference level in the LEFT, RIGHT, and ADD positions of the VERTICAL MODE switch.
- j. ADJUST—A DC Center adjustment R586 for a display dc level within 0.5 division (25 millivolts) of ground reference level in the LEFT, RIGHT, and ADD positions of the 7834 VERTICAL MODE switch (see Figure 8-39).
- k. Install the signal standardizer (calibration fixture) in the LEFT VERT compartment.
- l. Set the VERTICAL MODE switch to LEFT.
- m. Set the signal standardizer Test switch to Triggering Gain and the Rep Rate switch to 1 MHz.
- n. CHECK—Test oscilloscope display for nine traces with six divisions of vertical deflection between the center seven traces, within 0.9 division (300 millivolts within 45 millivolts).
- o. ADJUST—A Gain adjustment R589 for a test oscilloscope display of six divisions of deflection between

center seven traces, within 0.9 division (300 millivolts within 45 millivolts), see Figure 8-39.

- p. Remove the signal standardizer and plug-in extender calibration fixtures (leave cables connected for next step).

D2. CHECK/ADJUST B TRIGGER SELECTOR DC CENTERING AND GAIN (R686, R689)

- a. Install the plug-in extender in the B HORIZ compartment (see step 1 parts a, b, and c for test oscilloscope connection).
- b. Set both channels of the test oscilloscope for a deflection factor of 50 millivolts/division with the inputs grounded.
- c. Set the test oscilloscope for differential operation between the two channels (added display mode with one channel inverted) at a sweep rate of 20 microseconds/division.
- d. Establish a ground reference level for the test oscilloscope by positioning the trace to the center horizontal line of the graticule. Do not change the test oscilloscope position controls after setting this ground reference.
- e. Set both channels of the test oscilloscope for dc input coupling.
- f. CHECK—Test oscilloscope display for a dc level within 0.5 division (25 millivolts) of the ground reference level in the LEFT, RIGHT, and ADD positions of the 7834 VERTICAL MODE switch.
- g. ADJUST—B DC Center adjustment R686 (see Figure 8-39) for a dc level within 0.5 division (25 millivolts) of ground reference level in the LEFT, RIGHT, and ADD positions of the 7834 VERTICAL MODE switch.
- h. Install the signal standardizer in the LEFT VERT compartment.
- i. Set the VERTICAL MODE switch to LEFT.
- j. Set the signal standardizer Test switch to Triggering Gain and Rep Rate switch to 1 MHz.

✓Performance Requirement check; see introductory information.

k. CHECK—Test oscilloscope display for nine traces with the deflection between the second and eighth traces to be six divisions within 0.9 division (300 millivolts within 45 millivolts).

l. ADJUST—B Gain adjustment R689 for a test oscilloscope display of nine traces with the deflection between the second and eighth traces to be six divisions within 0.9 division, see Figure 8-39.

m. Remove the plug-in extender and disconnect all test equipment.

✓ D3. CHECK/ADJUST VERTICAL SIGNAL OUT DC CENTERING (R547)

a. Set the test oscilloscope vertical deflection factor to 1 volt/division and establish a ground reference at the graticule center line.

b. Connect the VERT SIG OUT connector to the vertical input of the test oscilloscope with the 42-inch, 50-ohm BNC cable.

✓ c. CHECK—Test oscilloscope display for a dc level within 1 division of the ground reference established in step a.

d. ADJUST—S.O. DC ADJ adjustment R547 (see Figure 8-39) for a dc level within 1 division of the ground reference level.

e. Disconnect all cables.

✓ D4. CHECK TRIGGER SELECTOR OPERATION

a. Install the signal standardizer in the RIGHT VERT compartment, an amplifier unit in the LEFT VERT compartment, and time-base units in both horizontal compartments.

b. Set both time-base units for auto, internal triggering at a 0.2 millisecond/division sweep rate.

c. Connect the CALIBRATOR 0.4 V output to the amplifier unit (use 18-inch BNC cable). Set the amplifier for a two-division display in the upper half of the graticule area.

✓ Performance Requirement check; see introductory information.

d. Set the VERTICAL MODE switch to RIGHT.

e. Set the signal standardizer Test switch to Vert or Horiz + Step Resp, the Rep Rate switch to 10 kHz, and the Amplitude control for a two-division display in the lower half of the graticule area.

f. Set the VERTICAL MODE switch to ALT.

✓ g. CHECK—The crt display for 1 kHz and 10 kHz triggered waveforms (adjust the time-base unit trigger level control as necessary).

h. Set the A TRIGGER SOURCE switch to LEFT VERT.

✓ i. CHECK—Sequentially select all positions of the VERTICAL MODE switch and check for a stable display of only the 1kHz waveform.

j. Set the A TRIGGER SOURCE switch to RIGHT VERT.

✓ k. CHECK—Sequentially select all positions of the VERTICAL MODE switch and check for a stable display of only the 10kHz waveform.

l. Set the VERTICAL MODE switch to ALT and the HORIZONTAL MODE switch to B.

✓ m. CHECK—Crt display for 1 kHz and 10 kHz triggered waveforms.

n. Set the B TRIGGER SOURCE switch to LEFT VERT.

✓ o. CHECK—Sequentially select all positions of the VERTICAL MODE switch and check for a stable display of only the 1 kHz waveform.

p. Set the B TRIGGER SOURCE switch to RIGHT VERT.

✓ q. CHECK—Sequentially select all positions of the VERTICAL MODE switch and check for a stable display of only the 10 kHz waveform.

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- r. Set the VERTICAL MODE switch to ALT, the HORIZONTAL MODE switch to ALT, and the B TRIGGER SOURCE switch to VERT MODE.

- ✓ s. CHECK—The crt display for the B HORIZ time-base unit should be triggered on the 1 kHz waveform; the A HORIZ time-base unit should be triggered on the 10 kHz waveform.

- t. Disconnect all test equipment and remove the plug-in units.

✓Performance Requirement check; see introductory information.

E. HORIZONTAL SYSTEM

Equipment Required

- | | |
|--|----------------------------------|
| 1. Precision dc voltmeter | 7. Screwdriver (three-inch) |
| 2. Signal Standardizer (calibration fixture) | 8. Low-capacitance screwdriver |
| 3. Time-base unit | 9. Cable (42-inch, 50-ohm, BNC) |
| 4. Amplifier unit (two required) | 10. Cable (18-inch, 50-ohm, BNC) |
| 5. Time-mark generator | 11. T connector (BNC) |
| 6. Low-frequency sine-wave generator | |

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS 4** in the Diagrams section.

Control Settings

Preset the 7834 controls as follows:

POWER switch Push button in
 VERTICAL
 MODE. RIGHT
 VERT TRACE
 SEPARATION (B). .Midrange
 A TRIGGER
 SOURCE VERT MODE
 A INTENSITYMidrange
 HORIZONTAL
 MODE. A
 B INTENSITYMidrange
 B TRIGGER
 SOURCE VERT MODE
 FOCUS Midrange
 READOUT
 Intensity OFF (in detent)
 GRAT ILLUMAs desired
 NON-STOREPush button in
 REDUCED SCAN . .Push button out
 Horizontal Selector
 (rear of RIGHT
 VERT compart-
 ment) Norm

E1. ADJUST HORIZONTAL AMPLIFIER PLATE AVERAGE (R1935)

- a. Install a time-base unit in the RIGHT VERT compartment and the signal standardizer (calibration fixture) in the A HORIZ compartment.
- b. Set the signal standardizer Test Switch to Vert or Horiz Aux In and the time-base unit for a free-running sweep at 1 millisecond/division.
- c. Connect the precision dc voltmeter between TP1894 and TP1994 (see Figure 8-42). Then, set the signal standardizer position control to obtain a meter reading of zero volts.
- d. Disconnect the negative meter lead and connect it to ground.
- e. ADJUST—Plate Avg. adjustment R1935 for a meter reading of 39 volts (see Figure 8-42).
- f. Disconnect the meter.

✓ E2. CHECK/ADJUST HORIZONTAL AMPLIFIER GAIN (R1836, R1832)

- a. Set the signal standardizer Test Switch to Vert or Horiz Com Mode.

✓Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

- b. Check that the vertical trace is within 0.5 division of the center vertical graticule line.
- c. ADJUST—The H. CTR adjustment R1836 to align the displayed trace with the center vertical graticule line (see Figure 8-42).
- d. Set the signal standardizer Test Switch to Vert or Horiz Gain with the Rep Rate switch set to 1 MHz. Align the bright vertical trace with the center vertical graticule line using the signal standardizer Position control.
- ✓ e. CHECK—That the second and tenth vertical traces align with the second and tenth graticule lines within 0.08 division. Note the exact error for comparison in part m.
- f. ADJUST—The H. Gain adjustment R1832 (see Figure 8-42) for 8 divisions between the second and tenth traces.
- ✓ g. CHECK—That the other vertical traces align with their respective graticule lines within 0.05 division. (The H. Gain adjustment R1832 should be set for optimum for valid check.)
- h. Move the signal standardizer to the B HORIZ compartment.
- i. Set the HORIZONTAL MODE switch to B.
- j. Set the signal standardizer Test switch to Com Mode and the B INTENSITY control for a usable display.
- k. Check that horizontal centering of the trace is within 0.5 division of the center graticule line.
- l. ADJUST—If necessary, compromise the setting of R1836 for optimum centering for both horizontal compartments. If readjustment is necessary, recheck parts a through k.
- m. Set the signal standardizer Test switch to Vert or Horiz Gain.
- ✓ n. CHECK—That the second and tenth vertical traces align within 0.08 division of the error noted in part e. And, that the other vertical traces align with their respective graticule lines within 0.05 divisions. (Specified at the center graticule line.)
- o. ADJUST—If necessary, compromise the setting of R1832 for optimum gain for both horizontal compartments. If readjustment is necessary, recheck parts a through n.

E3. CHECK/ADJUST HIGH-FREQUENCY TIMING (C1863, C1963, R1875, C1975)

- a. Remove the signal standardizer from the B HORIZ compartment.
- b. Move the time-base unit to the B HORIZ compartment.
- c. Install an amplifier unit in the LEFT VERT compartment and set the VERTICAL MODE switch to LEFT.
- d. Set the time-base unit triggering for auto mode with ac coupling from the internal source at a sweep rate of 1 millisecond/division.
- e. Connect 1-millisecond markers from the time-mark generator to the amplifier unit input and adjust the amplifier unit deflection factor for about 2 divisions of display.
- f. Set the time-base unit triggering controls for a stable display.
- g. Position the first marker to the extreme left line on the graticule.
- h. Set the time-base unit sweep-calibration adjustment for 1 marker at each major graticule division between the second and tenth graticule lines (center 8 divisions).
- i. CHECK—Refer to the time-base unit instruction manual for performance check or calibration procedures for checking high-frequency timing and linearity. Use the procedures and limits given for the three fastest sweep rates that do not exceed 1 nanosecond/division. If the given limits are met, omit the remainder of this step.

✓Performance Requirement check; see introductory information.

j. Set the time-base unit for a 10 nanoseconds/division sweep rate with X1 sweep magnification.

k. Apply 10 nanosecond time markers and set the amplifier unit vertical deflection for about 2 divisions of display.

l. ADJUST—Both 10 ns adjustments C1863 and C1963 for one time marker for each division over the center 8 graticule full-scan divisions (see Figure 8-42).

m. Set the time-base unit sweep rate to 20 nanoseconds/division with the X10 sweep magnification (2 nanoseconds/division).

n. Press the REDUCED SCAN push button in.

o. Apply 2-nanosecond time markers and set the amplifier unit vertical deflection for about 2 divisions of display.

p. ADJUST—2 ns Lin adjustment R1875 for optimum linearity over the center 10 divisions of the REDUCED SCAN graticule area.

q. Set the time-base unit sweep rate to 10 nanoseconds/division and magnification to X10.

r. Press and release the REDUCED SCAN push button.

s. ADJUST—1 ns adjustment C1975 for one time marker every 2 divisions on the Full-Scan graticule area (see Figure 8-42).

t. INTERACTION—Repeat part i.

E4. CHECK/ADJUST X-Y COMPENSATION (C832)

a. Install amplifier units in the LEFT VERT and A HORIZ compartments.

b. Set the HORIZONTAL MODE switch to A.

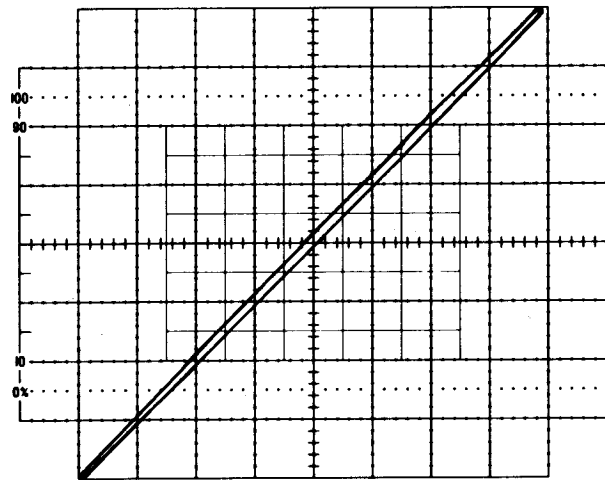
c. Set both amplifier units for a deflection factor of 50 millivolts/division with dc input coupling.

✓Performance Requirement check; see introductory information.

d. Connect the low-frequency sine-wave generator to the input of either amplifier with the 42-inch 50-ohm BNC cable, and a T connector (BNC). Connect the output of the T connector to the input of the other amplifier with the 18-inch 50-ohm cable.

e. Set the low-frequency sine-wave generator output for eight divisions of vertical and horizontal deflection at a frequency of 35 kilohertz.

f. CHECK—Crt lissajous display for a separation of 0.28 division or less (indicates 2 degrees or less phase shift; see Figure 5-1).



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Fig. 5-1. Typical display when checking X-Y compensation.

g. Remove the amplifier from the A HORIZ compartment and install it in the B HORIZ compartment (leave signals connected).

h. Set the HORIZONTAL MODE switch to B.

i. Repeat parts e and f.

NOTE

If the instrument under test does not contain Option 2, omit the remainder of this step.

j. Set the low-frequency sine-wave generator for eight divisions of vertical and horizontal deflection at one megahertz.

Performance Check and Adjustment—7834

- ✓ k. CHECK—Crt lissajous display for a separation of 0.28 division or less (indicates 2 degrees or less phase shift).

- l. ADJUST—X-Y Comp adjustment C832 for minimum separation of the display (see Figure 8-40). It may be necessary to remove the left side cover of the plug-in unit installed in the B HORIZ compartment to provide access to C832.

- m. Disconnect all cables and remove plug-in units.

- ✓ E5. CHECK HORIZONTAL BANDWIDTH
 - a. Install a time-base unit in the RIGHT VERT compartment.

 - b. Set the VERTICAL MODE switch to RIGHT.

 - c. Set the time-base unit for auto triggering at a sweep rate of 1 millisecond/division.

 - d. Connect the low-frequency sine-wave generator to the input of the amplifier unit installed in the B HORIZ compartment.

 - e. Set the low-frequency sine-wave generator for 10 divisions of horizontal deflection at a reference frequency of 10 kilohertz.

 - f. Without changing the output amplitude, increase the output frequency of the generator to one megahertz.

 - ✓ g. CHECK—Crt display for 7.1 divisions or more horizontal deflection.

 - h. Remove the amplifier from the B HORIZ compartment and install it in the A HORIZ compartment (leave signal connected). Set the HORIZONTAL MODE switch to A.

 - i. Repeat parts e through g.

 - j. Disconnect all test equipment and remove the plug-in units.

✓ Performance Requirement check; see introductory information.

F. VERTICAL SYSTEM

Equipment Required

- | | |
|--|--------------------------------|
| 1. Signal Standardizer (calibration fixture) | 4. Screwdriver (three-inch) |
| 2. Time-base unit (two required) | 5. Low-capacitance screwdriver |
| 3. High-frequency sine-wave generator (constant-amplitude) | 6. Nylon tuning tool |

BEFORE YOU BEGIN, see  in the Diagrams section.

Control Settings

Preset the 7834 controls as follows:

POWER switchPush button in
 VERTICAL
 MODE.ALT
 VERT TRACE
 SEPARATION (B). .Midrange
 A TRIGGER
 SOURCE.VERT MODE
 A INTENSITYMidrange
 HORIZONTAL
 MODE.A
 B INTENSITYMidrange
 B TRIGGER
 SOURCE.VERT MODE
 FOCUSMidrange
 READOUT
 IntensityOFF (in detent)
 GRAT ILLUMAs desired
 NON-STOREPush button in
 REDUCED SCAN . .Push button out
 Horizontal
 Selector (in
 RIGHT VERT
 compartment). . . .Norm

F1. CHECK/ADJUST VERTICAL AMPLIFIER CENTERING (~~R1714~~) R1695

- Install the time-base unit in the A HORIZ compartment.
- Set the time-base unit for a free-running sweep at a rate of 1 millisecond/division.
- CHECK—That the vertical position of the alternating traces (might appear as a single trace) is within 0.5 division of the graticule center line with less than 0.5 division separation between traces.

- ADJUST—Vert Ctr adjustment ~~R1714~~ ^{R1695} (see Figure 8-43) for equal spacing of the traces from the graticule center line. (If the traces appear as a single trace, adjust ~~R1714~~ to position the trace to the graticule center line). ^{R1695}
- Press the REDUCED SCAN push button.
- CHECK—That the vertical position of the alternating traces is within 0.5 Reduced Scan divisions of the graticule center line with less than 0.5 division separation between traces.
- ADJUST—Reduced Scan Vertical Center adjustment R1629 (see Fig. 8-43) for equal spacing of the traces from the graticule center line.
- Press and release the REDUCED SCAN push button.

✓ F2. CHECK/ADJUST VERTICAL AMPLIFIER GAIN (R1730)

- Set the VERTICAL MODE switch to RIGHT.
- Install the signal standardizer (calibration fixture) in the RIGHT VERT compartment.
- Set the signal standardizer Test switch to Vert or Horiz Gain and Rep Rate switch to 1 MHz. Position the display to align the bright center trace with the graticule center line.
- CHECK—For one trace per graticule division within 0.06 division over the center 6 graticule divisions; note the exact error for comparison in part h.

✓ Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

OUT

- e. ADJUST—Vert Gain adjustment R1730 for one division between each of the center 7 displayed traces within 0.01 division (see Figure 8-43).
- f. Remove the signal standardizer from the RIGHT VERT compartment and install it in the LEFT VERT compartment.
- g. Set the VERTICAL MODE switch to LEFT.
- ✓ h. CHECK—For one trace per graticule division within 0.06 division of the error noted in part d, over the center 6 graticule divisions.
- i. ADJUST—Vertical interface Gain adjustment R4619 (see Figure 8-41) for one division between each of the center 7 displayed traces within 0.01 division. (Remove the right side cover from the signal standardizer for access to R4619.)
- j. Press the REDUCED SCAN push button in.
- ✓ k. CHECK—For one trace per Reduced-Scan graticule division within 0.01 division.
- l. ADJUST—Reduced Scan Vert Gain adjustment R2175 (see Figure 8-35) for one division between each of the center 7 displayed traces within 0.01 division.
- m. Press and release the REDUCED SCAN push button.

OUT

F4. CHECK/ADJUST VERTICAL HIGH-FREQUENCY COMPENSATION (R1749, R1764, R1743, R1758, L1667, C1658, L1730, L1731)

- a. Set the signal standardizer Test switch to Vert or Horiz + Step Resp with the Rep Rate switch set to 100 Hz and adjust the Amplitude control for a 6-division display.
- b. Set the time-base unit sweep rate for 2 milliseconds/division and triggering for auto mode with ac coupling from the internal source; set triggering and position controls for a stable centered display.
- c. CHECK—Displayed pulse for optimum flat top within 0.06 division as given in Table 5-3.

TABLE 5-3

**Low-Frequency Compensation
(Signal Rep Rate vs: Sweep Speed)**

Signal Standardizer Rep Rate	Sweep Speed
100 Hz	2.0 ms
1 kHz	0.2 ms
10 kHz	20 μs
100 kHz	2 μs

- d. ADJUST—LF Comp #1 adjustment R1749 and LF Comp #2 adjustment R1764 for flat top within 0.06 division (see Figure 8-43).
- e. Set the signal standardizer Rep Rate switch to 1 MHz. Set the Amplitude and Position controls for a six-division display, centered on the graticule area.
- f. Set the time-base unit for a sweep rate of 100 nanoseconds/division. Set the triggering controls for a stable display triggered on the rising portion of the pulse.
- g. Check for optimum square corner and flat top on the displayed pulse. Aberrations in the first 50 nanoseconds after the step should not exceed 0.3 division peak-to-peak. Aberrations from 50 to 150 nanoseconds after the step should not exceed 0.06 division peak-to-peak; except allow 0.12 division of aberrations for delay-line termination at about 125 nanoseconds from step.

✓ F3. CHECK LOW-FREQUENCY LINEARITY

- a. Set the signal standardizer Test switch to Vert or Horiz + Step Resp with the Rep Rate switch set to 1 kHz.
- b. Set the signal standardizer Amplitude control so the display is exactly two divisions in amplitude in the center of the graticule area.
- ✓ c. CHECK—Position the two-division display vertically and check for not more than 0.1 division of compression or expansion anywhere within the graticule area.

✓Performance Requirement check; see introductory information.

h. ADJUST—High-frequency compensation as given in Table 5-4 for optimum square leading corner and flat top with minimum aberrations within limits given in part g. Location of the adjustments is shown in Figure 8-43. Use the low-capacitance screwdriver to adjust variable capacitors. Repeat the complete adjustment procedure as necessary to obtain optimum response.

TABLE 5-4
High-Frequency Compensation

Adjustment (See Fig. 8-43)	Primary Area of Pulse Affected	Best Time-Base Sweep Rate
HF COMP, R1743 HF COMP #5, R1758	First 100 ns	100 ns/div
HF COMP #3, L1667 HF COMP #1, C1658	First 10 ns	5 ns/div
HF COMP #2, R1658	First 3 ns	5 ns/div
Position crt termination leads to reduce aberrations. (The termination leads connect to crt pins directly in front of the Vertical Amplifier board.)	Single aberration 5 ns from leading edge of step.	5 ns/div
L1730 L1731 (Longer leads will increase the front corner spike.)	First 1 ns	5 ns/div

i. Move the signal standardizer to the RIGHT VERT compartment and set the VERTICAL MODE switch to RIGHT.

j. Check for optimum square corner and flat top on the displayed pulse with aberrations within limits given in part g.

NOTE

If U4625 or U4685 were replaced, high-frequency mismatching may exist between the LEFT and RIGHT VERT compartments; adjust the length of the wire Loop inductors L4621 and L4681 (located on the rear of the interface board) to provide matching.

k. ADJUST—If necessary, compromise the high-frequency compensation adjustments for optimum pulse response for both vertical compartments. If readjustment is necessary, recheck parts a through g of this step.

F5. CHECK VERTICAL AMPLIFIER 400 MHz GAIN

- a. Insert the signal standardizer in the RIGHT VERT compartment and set the Test switch to Vert or Horiz Freq Resp with the Amplitude control fully clockwise.
- b. Set the VERTICAL MODE switch to RIGHT.
- c. Connect the high-frequency sine-wave generator to the signal standardizer Aux In CW In (Freq Resp) input, and rotate the Amplitude control fully clockwise.
- d. Set the time-base unit sweep rate for 0.1 millisecond/division and the triggering for a free-running sweep.
- e. Set the high-frequency sine-wave generator for a 10-division display at reference frequency (between 3 and 20 megahertz) centered on the graticule. (To obtain a 10-division display first set for 8 divisions, then, vertically position the display 1 division down and set the sine-wave generator to return the top of the display to the top of the graticule.)
- f. Set the signal standardizer Amplitude control for a 6-division display, centered on the graticule. (The CW Leveled indicator should be lit.)

g. Without changing the output amplitude, increase the generator frequency until the displayed amplitude is reduced to 4.5 divisions. If the CW Leveled indicator goes off, increase the amplitude of the sine-wave generator until the light just turns on.

NOTE

The signal standardizer CW Leveled light must be on and the sine-wave generator must be properly connected for a valid check. Refer to the signal standardizer and high-frequency sine-wave generator manuals.

h. CHECK—Generator frequency is 400 megahertz or higher (verifies 400 MHz Gain).

√Performance Requirement check; see introductory information.

Performance Check and Adjustment—7834

- i. Move the signal standardizer to the LEFT VERT compartment (leave signal connected) and set the VERTICAL MODE switch to LEFT.
- ✓ j. CHECK—Repeat parts e through g for the left vertical compartment.
- ✓ **F6. CHECK VERTICAL CHANNEL ISOLATION**
 - a. Set the high-frequency sine-wave generator and the signal standardizer for 8 divisions of deflection at 400 megahertz.
 - b. Set the VERTICAL MODE switch to RIGHT.
 - ✓ c. CHECK—Crt display amplitude for 0.26 division or less of the 400 megahertz signal (verifies isolation at least 30:1 at 400 megahertz).
 - d. Move the amplifier unit to the RIGHT VERT compartment without disturbing set-up.
 - e. Set the VERTICAL MODE switch to LEFT.
 - ✓ f. CHECK—Crt display amplitude for 0.26 division or less of the 400 megahertz signal (verifies isolation at least 30:1 at 400 megahertz).
 - g. Set the VERTICAL MODE switch to RIGHT.
 - h. Set the high-frequency sine-wave generator for 8 divisions of deflection at 150 megahertz.
 - i. Set the VERTICAL MODE switch to LEFT.
 - ✓ j. CHECK—Crt display amplitude for 0.08 division or less of 150 megahertz signal (verifies 150 megahertz isolation at least 100:1).
 - k. Move the amplifier unit to the LEFT VERT compartment without disturbing set-up.
 - l. Set the VERTICAL MODE switch to RIGHT.
 - ✓ m. CHECK—Crt display amplitude for 0.08 division or less of 150 megahertz signal (verifies isolation at least 100:1 from dc to 150 megahertz).

✓ **Performance Requirement check; see introductory information.**

- n. Remove signal connection.

✓ **F7. CHECK VERTICAL DISPLAY MODES**

- a. Install an amplifier unit or the signal standardizer in the RIGHT VERT compartment.
- b. Position the trace to the upper half of the graticule area with the right-vertical unit position control.
- c. Set the VERTICAL MODE switch to LEFT and position the trace to the lower half of the graticule area with the left-vertical unit position control.
- ✓ d. CHECK—Crt display for two traces in the ALT and CHOP positions of the VERTICAL MODE switch.
- e. Set the VERTICAL MODE switch to ADD.
- ✓ f. CHECK—Crt display for a single trace that can be positioned vertically with either vertical-unit position control.

✓ **F8. CHECK VERTICAL TRACE SEPARATION OPERATION**

- a. Set the VERTICAL MODE switch to LEFT.
- b. Center the trace vertically with the left-vertical unit position control.
- c. Install a time-base unit in the B HORIZ compartment.
- d. Set both time-base units for a free-running sweep at a rate of 0.2 millisecond/division.
- e. Set the HORIZONTAL MODE switch to CHOP.
- ✓ f. CHECK—Rotate the VERT TRACE SEPARATION (B) control throughout its range and check that the trace produced by the B time-base unit can be positioned above and below the trace produced by the A time-base unit at least 3.5 divisions. Also, check with the HORIZONTAL MODE switch set to ALT.
- g. Remove all plug-in units.

G. READOUT SYSTEM

NOTE

Option 1 deletes the Readout System from the instrument. If the instrument under test is an Option 1 instrument, omit this section of the procedure.

Equipment Required	
1. Amplifier unit (dual trace)	3. Screwdriver (three-inch)
2. Time-base unit	

BEFORE YOU BEGIN, see  in the Diagrams section.

Control Settings

Set the 7834 controls as follows:

- POWER switchOFF
- VERTICAL MODERIGHT
- VERT TRACE SEPARATION (B). .Midrange
- A TRIGGER SOURCEVERT MODE
- A INTENSITYMidrange
- HORIZONTAL MODEA
- B INTENSITYMidrange
- B TRIGGER SOURCEVERT MODE
- B INTENSITYMidrange
- READOUTFREE RUN
- READOUT IntensityOFF (in detent)
- GRAT ILLUMMidrange
- Horizontal Selector (in RIGHT VERT compartment).Norm
- NON-STOREPush button in

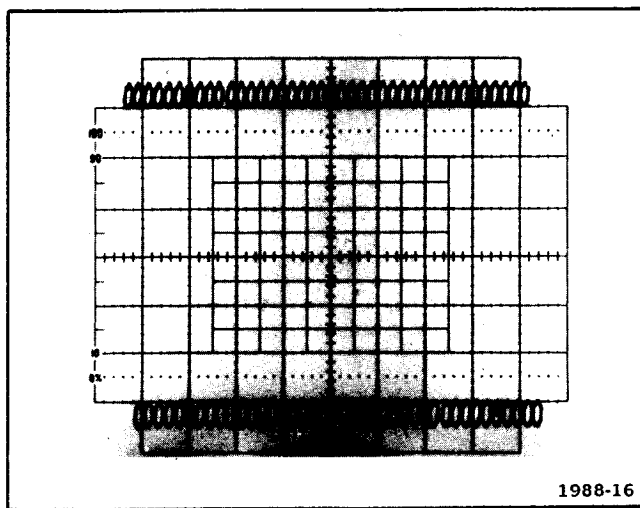
b. Set the POWER switch to on.

c. Set the READOUT control for visible characters (all zeros).

NOTE

The following tolerances are provided as guides to correct instrument operation and are not instrument specifications.

d. Check the crt display for two rows of zeros, 40 zeros to a row with no overlap. The two rows of zeros should be located vertically between 0.5 and 1 division of the top and bottom graticule line (see Figure 5-2).



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G1. CHECK/ADJUST READOUT VERTICAL SEPARATION AND CENTERING (R3490, R1700, R1815)

a. Remove Q3416 from its socket on the Readout Board A13 (see Figure 8-44).

Figure 5-2. Readout display with Q3416 removed.

NOTE

The Vertical Amplifier Centering Adjustment must be correct before making the next adjustment. Refer to E. Vertical System adjustment.

- e. ADJUST—Vertical Separation adjustment R3490 (see Figure 8-44) and RO Ctr adjustment R1700 (see Figure 8-47) to position the two rows of readout characters between 0.5 and 1 division from the top and bottom graticule lines.
- f. CHECK—That all zeros are within 4.5 divisions of the center horizontal graticule line.
- g. ADJUST—RO Pos adjustment R1815 (see Figure 8-46) to horizontally center the zeros display.
- h. Set the POWER switch to OFF and replace Q3416 in its socket.

G2. CHECK/ADJUST FULL CHARACTER SCAN (R3437)

- a. Install the dual-trace amplifier unit in the RIGHT VERT compartment. Press the POWER switch in.
- b. Set the amplifier unit for a deflection factor of 50 millivolts/division.
- c. Check the displayed characters for completeness without overscanning (overscanning causes a bright dot where traces overlap).
- d. ADJUST—Full Character Scan adjustment R3437 (see Figure 8-44) for fully scanned characters without overscanning. The m and the 5 will show the most change.

G3. CHECK/ADJUST COLUMN AND ROW MATCH (R3407, R3422)

- a. Set the amplifier unit for a dual-trace display mode.

- b. Press and hold the amplifier unit trace-identify buttons.

- c. Check the readout display for correct indication of "IDENTIFY". If the readout display blinks or is incorrect, adjustment is required.

- d. ADJUST—Column Match adjustment R3407 and Row Match adjustment R3422 (see Figure 8-44) for correct readout of "IDENTIFY". Set these adjustments to the center of the adjustment range which provides correct readout indication. Release the amplifier unit trace-identify buttons.

G4. CHECK READOUT MODES

- a. Install a time-base unit in the A HORIZ compartment.
- b. Set the time-base unit for a free-running sweep.
- c. Set the READOUT mode switch to FREE RUN.
- d. Set the time-base unit on several sweep rates throughout the time/division switch range. Check that the readout characters are presented on a free-run basis and are displayed independently of the sweep rate.
- e. Set the READOUT mode switch to GATED and READOUT INTENSITY for a usable display.
- f. Set the time-base unit for a free-running sweep at a rate of 0.5 second/division.
- g. Check that the readout characters are blanked out while the sweep is running, and are displayed immediately after the end of the sweep; each character encoded by the plug-in units is displayed only once for each sweep.

H. STORAGE SYSTEM

Equipment Required

- | | |
|---|---------------------------------------|
| 1. Precision dc voltmeter | 7. Cables (50-ohm, BNC, two required) |
| 2. Test oscilloscope | 8. Amplifier unit |
| 3. Low-frequency sine-wave generator | 9. Time-base unit |
| 4. Medium-frequency sine-wave generator | 10. Screwdriver (three-inch) |
| 5. High-frequency sine-wave generator | |
| 6. 10X passive probe | |

BEFORE YOU BEGIN, see **ADJUSTMENT LOCATIONS** in the Diagrams section.

Control Settings

Preset the 7834 controls as follows:

VERTICAL
MODE LEFT

HORIZONTAL
MODE B

A TRIGGER
SOURCE VERT MODE

B TRIGGER
SOURCE VERT MODE

A INTENSITY Counterclockwise

B INTENSITY Midrange

READOUT
Intensity OFF (in detent)

REDUCED SCAN Push button out

NON-STORE Push button in

AUTO ERASE MAX/OFF (in detent)

PERSISTENCE MAX (counterclockwise)

SAVE Push button out

SAVE
INTENSITY Fully clockwise

STORAGE
LEVEL Fully clockwise

MULTI TRACE
DLY MAX/ ∞ (in detent)

Horizontal
Selector (in
RIGHT VERT
compartment) Norm

NOTE

External and internal focus and astigmatism adjustments affect stored writing speed. If the stored writing speed specifications in the following procedure cannot be met, refer to the Z-Axis and Display procedure in this section. Also, optimum stored writing speed can only be obtained when actual operating voltages and waveforms are within the limits specified in the voltage and waveform conditions. The voltage and waveform conditions are located preceding the Storage Display schematic in the Diagrams section of this manual.

✓ H1. CHECK/ADJUST BISTABLE OPERATION (R2745)

- Install an amplifier unit in the LEFT VERT compartment and a time-base unit in the B HORIZ compartment.
- Set the amplifier unit for a deflection factor of 0.5 volt/division.
- Set the time-base unit for auto mode triggering with ac coupling from the internal source and a 0.5-millisecond/division sweep rate.
- Connect the low-frequency sine-wave generator to the amplifier unit and set for a 6.4-division, 1.5-kilohertz display.

✓ Performance Requirement check; see introductory information.

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- e. Set the time-base unit for single-sweep operation.
 - f. Set the B INTENSITY control fully clockwise.
 - g. Press the BISTABLE push button.
 - ✓ h. CHECK—Press the ERASE push button and check that the waveform will store anywhere within the center 6 x 8 divisions of the graticule area without trace fade out or background fade up, within 1 minute. This checks the bistable writing speed at 0.03 division/microsecond. If the conditions given in this check are met, proceed to part p of this step.
 - i. Connect the precision dc voltmeter to the Front Mesh TP2839 (see Figure 8-45).
 - j. Press the ERASE push button and note the meter reading after the erase cycle.
 - k. Press the ERASE push button and adjust the BS Op Level adjustment R2745 (see Figure 8-45) for a lower meter reading (after the erase cycle) until the stored waveform starts to fade out within about 15 seconds. Note the meter reading (this is the lower writing threshold). It may be necessary to repeat several times to obtain the proper level. (If fade out does not occur in 15 seconds, use the lowest attainable voltage.)
 - l. Press the ERASE push button and adjust BS Op Level adjustment R2745 for a higher meter reading (after the erase cycle), until the nonstored background begins to fade up (display loses contrast) within about 15 seconds. Note the meter reading (this is the upper writing limit). (If background fade up does not occur in 15 seconds, use the highest obtainable voltage on the meter.)
 - m. ADJUST—BS Op Level adjustment R2745 (see Figure 8-45) for a meter reading midway between the upper writing limit and lower writing threshold (optimum bistable operation will normally occur at midrange, however some crt's may require a slightly higher or lower setting to achieve optimum view time; adjust R2745 as necessary).
 - n. Set the B INTENSITY control to midrange and disconnect the voltmeter.
 - o. INTERACTION—Return to part c of this step to recheck.
 - p. Set the B INTENSITY control to midrange.
 - q. Set the time-base unit for auto mode triggering.
 - r. Press the REDUCED SCAN and NON-STORE push buttons.
 - s. Set the time-base unit sweep magnifier to X10 and triggering level control for a stable display.
 - t. Set the low-frequency sine-wave generator output for a 6.4-division, 10-kilohertz display on the Reduced Scan graticule area.
 - u. Press the BISTABLE push button and set the time-base unit for single-sweep operation.
 - v. Set the B INTENSITY control fully clockwise.
 - ✓ w. CHECK—Press the ERASE push button and check that the signal will store anywhere within the Reduced Scan graticule area without trace fade out or background fade up within 1 minute. (This checks the reduced scan bistable writing speed at 0.2 division/microsecond.) If the conditions in this part cannot be met, return to part i of this step.
- ✓ **H2. CHECK SAVE MODE AND SAVE INTENSITY CONTROL**
- a. Press the ERASE push button.
 - b. Press the SAVE push button.
 - ✓ c. CHECK—That the display will not erase when the ERASE push button is pressed.
 - ✓ d. CHECK—That the screen goes dark as the SAVE INTENSITY control is turned counterclockwise.
 - e. Press and release the SAVE push button.

✓ Performance Requirement check; see introductory information.

f. Disconnect all cables.

g. Press and release the REDUCED SCAN push button.

✓ **H3. CHECK/ADJUST BISTABLE FAST OPERATION (R2845, R2855)**

a. Press the NON-STORE push button.

b. Set the B INTENSITY control to midrange.

c. Set the time-base unit for auto mode triggering with ac coupling from the internal source at a sweep rate of 0.2 microsecond/division with X1 sweep magnification.

d. Connect the medium-frequency sine-wave generator to the amplifier unit.

e. Set the generator and amplifier controls for a 6.4-division, 2.5-megahertz display.

f. Set the time-base unit for single-sweep operation.

g. Set the B INTENSITY control fully clockwise.

h. Press the BISTABLE FAST push button.

i. Turn the STORAGE LEVEL control to the 3 o'clock position.

✓ j. CHECK—Press the ERASE push button and check that the sine wave will store anywhere within the center 6 x 8 divisions of the graticule area with little or no background spattering (indicated by mottling and uneven texture of the crt background lighting); use the STORAGE LEVEL control as necessary. (This checks the fast bistable writing speed at 50 divisions/microsecond.) If the conditions given in this check are met, proceed to part p of this step.

k. ADJUST—Repetitively press the ERASE push button and set the BS TSFR Level adjustment R2845 (see Figure 8-45) to the point where the lighted crt background begins to spatter.

✓ **Performance Requirement check; see introductory information.**

l. Set the time-base unit triggering source switch to external.

✓ m. CHECK—Press the ERASE push button and wait 1 full minute. Then, set the triggering source switch to internal. If the stored waveform and crt background spatter are nearly the same as obtained in part k, proceed to part o of this step.

n. ADJUST—Connect the precision dc voltmeter to the Fast Mesh, TP2876 (see Figure 8-45). Set the time-base unit triggering source switch to external. If the display observed in part m indicated additional spatter, press the ERASE push button and set the BS Fast Prep adjustment R2855 (see Figure 8-45) for a more-positive meter reading (about 0.5 volt). If the display observed in part m indicated less spatter or portions of the waveform dropped out, set R2855 for a less-positive meter reading (about 0.5 volt). Disconnect the precision dc voltmeter. Set the time-base unit triggering source switch to internal and repeat k, l, and m of this step.

o. ADJUST—Repetitively press the ERASE push button and set the BS TSFR Level adjustment R2845 to the point where spatter is just eliminated, and return to part a of this step.

p. Press the NON-STORE push button.

q. Set the B INTENSITY control to midrange.

r. Set the time-base unit for auto mode triggering and 0.2 microsecond/division sweep rate with X10 sweep magnification.

s. Press the REDUCED SCAN push button.

t. Set the medium-frequency sine-wave generator for a 6.4-division, 39-megahertz display on the Reduced Scan graticule area.

u. Set the time-base unit for single-sweep operation.

v. Set the B INTENSITY control fully clockwise.

w. Press the FAST BISTABLE push button.

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- ✓ x. CHECK—Press the ERASE push button and check that the sine wave will store anywhere within the Reduced Scan graticule area (this checks the reduced scan fast bistable writing speed at 780 divisions/microsecond); use the STORAGE LEVEL control as necessary. If the conditions given in this part cannot be met, return to part k of this step.
- y. Press and release the REDUCED SCAN push button.
- ✓ H4. CHECK VARIABLE PERSISTENCE FAST FULL SCAN WRITING SPEED
- Press the NON-STORE push button.
 - Set the B INTENSITY control to midrange.
 - Set the time-base unit for auto mode triggering and sweep rate for 0.5 microsecond/division with X10 sweep magnification.
 - Connect the medium-frequency sine-wave generator to the amplifier unit and set for a 6.4-division, 15-megahertz display.
 - Set the time-base unit trigger level control for a stable display.
 - Set the time-base unit for single-sweep operation.
 - Set the B INTENSITY control fully clockwise.
 - Set the STORAGE LEVEL control to the 3 o'clock position and the PERSISTENCE control fully counterclockwise.
 - Press the VAR PERSIST FAST push button.
- ✓ j. CHECK—Press the ERASE push button and check that the sine wave will store, and can be viewed for at least 30 seconds, over the center 6 x 8 divisions of the Full Scan graticule area (this checks the Variable Persistence Fast writing speed at 300 divisions/microsecond; use the STORAGE LEVEL control as necessary). If the conditions given in this check are met, omit steps 5, 6, and 7 and proceed to step 8.

✓Performance Requirement check; see introductory information.

H5. ADJUST VARIABLE PERSISTENCE OP LEVEL AND PREP LEVEL (R2725, R2735)

- Press the VAR PERSIST push button.
- Set B INTENSITY control fully counterclockwise and the STORAGE LEVEL control fully clockwise.
- Set the time-base unit for auto mode triggering.
- Connect a 10X probe from the test oscilloscope to the Front Mesh test point TP2839 (see Figure 8-45).
- Set the test oscilloscope sweep rate for 1 millisecond/division and the vertical deflection factor to 0.5 volt/division (5 volts/division at probe tip) with dc input coupling.
- Preset the VP OP Level adjustment R2725 (see Figure 8-45) for the lowest possible voltage level on the Front Mesh TP2839 (approximately 0 volts, disregard the 10-kilohertz signal).
- Set the AUTO ERASE control fully clockwise and preset the VP Prep adjustment R2735 (see Figure 8-45), during the erase cycle, for the lowest possible voltage level on the Front Mesh TP2839 (approximately 0 volts). Disregard the pulse at the beginning of the erase cycle.
- ADJUST—Set the AUTO ERASE control fully counterclockwise (in detent), press the ERASE push button and observe the crt screen. If the crt screen is dark, or shaded areas are noticeable, set the VP OP Level adjustment R2725 for a more-positive voltage level (by 3-volt steps) on the Front Mesh TP2839; press the ERASE push button and observe the crt screen. Repeat until a voltage level is reached where further increases in voltage on TP2839 cause no noticeable change in crt screen luminance (target saturated). If saturation cannot be achieved, set the Front Mesh TP2839 to the highest attainable voltage.
- Set the STORAGE LEVEL control to the 3 o'clock position.
- Repetitively press the ERASE push button and preset VP Prep adjustment R2735 (see Figure 8-45) to the point where the crt screen is just completely dark, after an erase cycle.

k. Press the FAST VAR PERSIST push button.

l. Move the jumper on P2531 to the test point connection P2849 (see Figure 8-45). Press the ERASE push button and note that the crt screen is dark. (If the crt screen is not dark, midrange the VP FAST Prep adjustment R2850.)

m. ADJUST—VP Prep adjustment R2735 (see Figure 8-45) to the point where approximately 60% of the crt screen has a light-green background immediately after an erase cycle (should be viewed in dim ambient lighting).

H6. ADJUST VARIABLE PERSISTENCE FAST FRONT MESH STABILITY (R2705)

a. Set the test oscilloscope sweep rate to 2 microseconds/division and the vertical deflection factor to 1 volt/division (10 volts/division at probe tip).

b. Press the ERASE push button and observe the crt background luminance.

c. Set the time-base unit triggering for single-sweep operation and the source switch to external.

d. Check—Press the ERASE push button and note the amplitude of the 2-microsecond-wide pump pulse on the Front Mesh TP2839 (as viewed on test oscilloscope); wait 1 minute and set the time-base unit triggering source switch to internal. The background luminance should remain the same as observed in part b. If the conditions of this check are met proceed to step 7.

e. ADJUST—If the background is brighter after a 1 minute waiting period, increase the pump pulse amplitude a small amount with the VP Fast Stability adjustment R2705 (see Figure 8-45); if the background is darker after the 1 minute waiting period, decrease the pump pulse amplitude a small amount with the VP Fast Stability adjustment R2705. Repeat parts b through d to recheck.

f. Disconnect the 10X probe.

H7. ADJUST VARIABLE PERSISTENCE FAST MESH STABILITY AND TRANSFER LEVEL (R2846, R2850)

a. Set the time-base unit triggering for auto mode with ac coupling from the internal source.

b. Move the jumper on test point connection P2849 to test point connection P2848 (see Figure 8-45).

c. ADJUST—Repetitively press the ERASE push button and adjust the VP TSFR Level adjustment R2846 until approximately 35% of the crt screen is illuminated after an erase cycle.

d. Turn the B INTENSITY control fully clockwise; press the ERASE push button and notice the display.

e. Set the time-base unit for single-sweep operation and triggering source switch to external.

f. Press the ERASE push button and wait 1 minute; then, set the triggering source switch to internal and notice the display.

g. Compare the crt display observed in part f with the display observed in part d; if there was little or no noticeable change in the crt display (background and trace), proceed to part k of this step.

h. Connect the precision dc voltmeter to the Fast Mesh TP2876 (see Figure 8-45).

i. Set the time-base unit triggering to external. Press the ERASE push button and note the voltage level on the Fast Mesh TP2876.

j. ADJUST—If the crt display in part f faded up from that in part d, adjust VP Fast Prep adjustment R2850 to lower the Fast Mesh TP2876 voltage by approximately 0.5 volt. If the crt display observed in part f faded down from the crt display observed in part d, adjust VP Fast Prep adjustment R2850 to increase the voltage level on the Fast Mesh TP2876 by approximately 0.5 volt. Disconnect the dc voltmeter, set the time-base unit triggering source switch to internal, turn the B INTENSITY control fully counterclockwise and return to part c of this step.

k. Move the jumper on test point connection P2848 to P2531 (see Figure 8-48).

l. Return to step 4 to recheck.

✓ **H8. CHECK VARIABLE PERSISTENCE FAST REDUCED SCAN WRITING SPEED**

- a. Press the NON-STORE push button.
- b. Connect the high-frequency sine-wave generator to the amplifier unit.
- c. Set the B INTENSITY control to midrange.
- d. Press the REDUCED SCAN push button.
- e. Set the time-base unit triggering for auto mode.
- f. Set the time-base unit sweep rate to 20 nanoseconds/division with X10 sweep magnification (2 nanoseconds/division).
- g. Set the generator and amplifier controls for a 6.4-division, 275-megahertz display on the Reduced Scan graticule area.
- h. Set the time-base unit triggering level control for a stable display.
- i. Set the time-base unit for single-sweep operation.
- j. Set the B INTENSITY control fully clockwise.
- k. Press the VAR PERSIST FAST push button.
- ✓ l. CHECK—Press the ERASE push button; check that the waveform will store, and can be viewed for at least 30 seconds, anywhere within the Reduced Scan graticule area. (Use the STORAGE LEVEL control if necessary.) This checks variable persistence fast writing speed at 5,500 divisions/microsecond. If the conditions given in this check are not met return to step 5.
- m. Disconnect all cables.

✓ **H9. CHECK VARIABLE PERSISTENCE OPERATION**

- a. Set the B INTENSITY control to midrange.
- b. Press the NON-STORE push button.

✓ **Performance Requirement check; see introductory information.**

- c. Set the time-base unit for auto triggering at a sweep rate of 10 microseconds/division with X1 sweep magnification.
- d. Press and release the REDUCED SCAN push button.
- e. Connect the low-frequency sine-wave generator to the amplifier unit and set the generator for a 6.4-division, 100-kilohertz display.
- f. Set the time-base unit for single-sweep operation.
- g. Set the B INTENSITY control fully clockwise.
- h. Press the VAR PERSIST push button.
- i. Set the PERSISTENCE control fully counterclockwise.
- ✓ j. CHECK—Press the ERASE push button and check that the waveform will store, and can be viewed for at least 30 seconds, in the center 6 x 8 divisions of the Full Scan graticule area; use the STORAGE LEVEL control if necessary. This checks the variable persistence writing speed at 2 divisions/microsecond. If the conditions given in this check are not met, return to step 5.
- k. Set the B INTENSITY control to midrange.
- l. Press the NON-STORE push button.
- m. Set time-base unit triggering for auto mode and sweep rate for 10 microseconds/division with X10 sweep magnification.
- n. Press the REDUCED SCAN push button.
- o. Set the low-frequency signal generator for a 6.4-division, 600-kilohertz display on the Reduced Scan graticule area.
- p. Set the time-base unit triggering level control for a stable display.
- q. Set the time-base unit for single-sweep operation.

- r. Set the B INTENSITY control fully clockwise.
- s. Press the VAR PERSIST push button.
- ✓ t. CHECK—Press ERASE and check that the waveform will store, and can be viewed for 30 seconds, anywhere in the Reduced Scan graticule area. Use the STORAGE LEVEL control as necessary. This checks the reduced scan variable persistence writing speed at 12 divisions/microsecond. If the conditions in this step cannot be met return to step 5.
- u. CHECK—Turn the PERSISTENCE control fully clockwise. Press the ERASE push button and check that the background has a uniform light green glow and that the stored waveform fades out in approximately 2 seconds. Slowly turn the PERSISTENCE control counterclockwise and check that the background darkens. Leave the PERSISTENCE control fully counterclockwise.
- v. Press and release the REDUCED SCAN push button.
- w. Disconnect all cables.

H10. CHECK AUTO ERASE

- a. Place jumper plug P2531 in the Periodic Erase position as shown in Figure 8-45.
- b. Turn the AUTO ERASE control fully clockwise (minimum view time).
- c. Set the time-base unit triggering for auto mode and sweep rate for 0.2 second/division with X1 sweep magnification. Position the starting point of the trace to the first graticule line.
- d. Set the B INTENSITY and STORAGE LEVEL controls for a usable display.
- e. CHECK—That the erase period is less than 1 second by observing the trace length to be less than 5 divisions.
- f. Set the time-base unit sweep rate to 2 seconds/division.
- g. Turn the AUTO ERASE control fully counterclockwise (but not in detent).

✓Performance Requirement check; see introductory information.

- h. CHECK—That the erase period is 10 seconds or greater, by observing the trace length to be at least 5 divisions.
- i. Place jumper plug P2531 in the Erase After Sweep position as shown in Figure 8-45. Set the time-base unit sweep rate to single sweep.

- j. Turn the AUTO ERASE control fully clockwise.

- ✓ k. CHECK—That erasure occurs only after the completion of a sweep.

- l. Set the AUTO ERASE control to the MAX/OFF detent position.

- ✓ m. CHECK—That the crt screen no longer erases automatically.

- n. Set the B INTENSITY control to midrange.

H11. CHECK READOUT STORAGE FUNCTIONS AND MULTI TRACE DELAY

- a. Set the time-base unit for auto triggering and a 1 millisecond/division sweep rate.
- b. Press the VAR PERSIST FAST push button.
- c. Set the MULTI TRACE DLY control fully clockwise and check that the crt screen flashes approximately once every second.
- d. Set the MULTI TRACE DLY control fully counterclockwise (but not in the detent position) and check that the crt screen flashes at an interval of approximately 4 or more seconds.
- e. Set the READOUT Intensity control fully clockwise.
- f. Press the BISTABLE FAST push button.
- g. Press the ERASE push button and note that readout is not displayed.
- h. Set the READOUT, GATED/FREE RUN switch to the GATED position and the MULTI TRACE DLY control fully counterclockwise to the detent position.

- i. CHECK—For a readout display.

Performance Check and Adjustment—7834

j. Set the READOUT Intensity control fully counter-clockwise to the OFF detent position and press the ERASE push button.

k. Turn the READOUT Intensity control fully clockwise and notice that the readout is displayed.

l. Turn the READOUT Intensity control fully counter-clockwise and press the VAR PERSIST FAST push button.

m. Press ERASE and turn the READOUT Intensity control fully clockwise. Notice that no readout is displayed.

n. Set the READOUT, GATED/FREE RUN switch to FREE RUN and the READOUT Intensity control to OFF.

o. Press the BISTABLE push button and set the B INTENSITY control for a visible trace.

p. Press the ERASE push button and notice that the displayed trace is blanked during the ERASE cycle.

q. Press the NON-STORE push button.

r. This completes the Performance Check and Adjustment procedure. Disconnect all test equipment and replace the side panels.

INSTRUMENT OPTIONS

Your instrument may be equipped with one or more instrument options. A brief description of each available option is given in the following discussion. Option information is incorporated into the appropriate sections of the manual. Refer to Table 6-1 and the Table of Contents for location of option information. For further information on instrument options, see your Tektronix Products catalog or contact your Tektronix Field Office.

WARNING

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

OPTION 1

This option eliminates the Readout System and the PROBE POWER connectors. Operation of the instrument is unchanged except that there is no alpha-numeric display on the crt and the READOUT control is nonfunctional. The Readout System can be added at any time by ordering the Readout Conversion Kit. Refer to the Tektronix Products catalog for the part number.

OPTION 2

The X-Y Delay Compensation network equalizes the signal delay between either vertical compartment and the B HORIZ compartment. When this network is installed and activated, the phase shift between the vertical and B horizontal channels is adjustable to less than 2° from dc to 1 megahertz. This option can be added at any time. Refer to the Tektronix Products catalog for the part number.

OPTION 3

With Option 3 installed, the instrument will meet EMC (electromagnetic compatibility) specifications given in Section 1. This option can be added at any time. Refer to the Tektronix Products catalog for the part number.

TABLE 6-1
Option Information Locator



Instrument Option	Manual Section	Location of Information
Option 1 (Deletes Readout and PROBE POWER connectors)	2 Operating Instructions	Readout Display Includes Option 1 description.
	5 Performance Check and Adjustment	G. Readout System Deletes non-option 1 information.
	6 Instrument Options	Introductory Page Includes a brief description of Option 1.
	7 Replaceable Electrical Parts	Replaceable Electrical Parts Replaceable parts unique to Option 1 contain the footnote "Option 1 only".
	8 Diagrams and Circuit Board Illustrations	Readout System  A13 Readout Board circuitry, on diagram 10, is removed from Option 1 instruments.
	9 Replaceable Mechanical Parts	Instrument Options (pull-out page) Provides a mechanical parts list and an exploded-view drawing unique to Option 1.
Option 2 (Provides X-Y Delay Compensation)	1 General Information	Specification Table 1-4 contains the electrical characteristics for Option 2.
	5 Performance Check and Adjustment	Horizontal System E4. Check/Adjust X-Y compensation.
	6 Instrument Options	Introductory Page Includes a brief description of Option 2.
	7 Replaceable Electrical Parts	Replaceable Electrical Parts Replaceable parts unique to Option 2 are footnoted "Option 2 only".
	8 Diagrams and Circuit Board Illustrations	Horizontal Interface  Diagram 8, shows circuitry unique to Option 2.
	9 Replaceable Mechanical Parts	Instrument Options (pull-out page) Provides a mechanical parts list and an exploded-view drawing unique to Option 2.

TABLE 6-1 (CONT.)
Option Information Locator

Instrument Option	Manual Section	Location of Information
Option 3 (Provides EMC)	1 General Information	Specification Table 1-5 contains the electrical characteristics for Option 3.
	2 Operating Instructions	Detailed Operating Information Light Filter; includes basic description. Installation of Plug-In Units Refers to EMC shielded blank plug-in panel.
	6 Instrument Options	Introductory Page Includes a brief description of Option 3.
	7 Replaceable Electrical Parts	Replaceable Electrical Parts Replaceable parts unique to Option 3 contain the footnote "Option 3 only".
	9 Replaceable Mechanical Parts	Instrument Options (pull-out page) Provides a mechanical parts list and an exploded-view drawing unique to Option 3.

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
0000L	MATSUSHITA ELECTRIC	200 PARK AVENUE, 54TH FLOOR	NEW YORK, NY 10017
0000W	UNITED CHEMICON, INC.	731 JAMES STREET	SYRACUSE, NY 13203
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
02777	HOPKINS ENGINEERING COMPANY	12900 FOOTHILL BLVD.	SAN FERNANDO, CA 91342
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
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
12617	HAMLIN, INC.	GROVE & LAKE STS.	LAKE MILLS, WI 53551
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
14099	SEMTECH CORP.	652 MITCHELL RD.	NEWBURY PARK, CA 91320
14298	AMERICAN COMPONENTS, INC., AN INSILCO COMPANY	8TH AVE. AT HARRY STREET	CONSHOHOCKEN, PA 19428
14604	ELMWOOD SENSORS, INC.	1655 ELMWOOD AVENUE	CRANSTON, RI 02907
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
14936	GENERAL INSTRUMENT CORP., SEMICONDUCTOR PRODUCTS GROUP	P.O. BOX 600, 600 W. JOHN ST.	HICKSVILLE, NY 11802
15454	RODAN INDUSTRIES, INC.	2905 BLUE STAR ST.	ANAHEIM, CA 92806
25088	SIEMENS CORP.	186 WOOD AVE. S	ISELIN, NJ 08830
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
32159	WEST-CAP ARIZONA	2201 E. ELVIRA ROAD	TUCSON, AZ 85706
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
50157	MIDWEST COMPONENTS INC.	P. O. BOX 787	
50434	HEWLETT-PACKARD COMPANY	1981 PORT CITY BLVD.	MUSKEGON, MI 49443
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	640 PAGE MILL ROAD	PALO ALTO, CA 94304
51642	CENTRE ENGINEERING INC.	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
53944	ELT INC., GLOW LITE DIVISION	2820 E COLLEGE AVENUE	STATE COLLEGE, PA 16801
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	BOX 698	PAULS VALLEY, OK 73075
56289	SPRAGUE ELECTRIC CO.	1 PANASONIC WAY	SECAUCUS, NJ 07094
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.		NORTH ADAMS, MA 01247
71707	COTO COIL CO., INC.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
72136	ELECTRO MOTIVE CORPORATION, SUB OF INTERNATIONAL ELECTRONICS CORPORATION	65 PAVILION AVE.	PROVIDENCE, RI 02905
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	SOUTH PARK AND JOHN STREETS	WILLIMANTIC, CT 06226
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	644 W. 12TH ST.	ERIE, PA 16512
74970	JOHNSON, E. F., CO.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	299 10TH AVE. S. W.	WASECA, MN 56093
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	401 N. BROAD ST.	PHILADELPHIA, PA 19108
77342	AMF INC., POTTER AND BRUMFIELD DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
78488	STACKPOLE CARBON CO.	200 RICHLAND CREEK DRIVE	PRINCETON, IN 47671
79727	C-W INDUSTRIES		ST. MARYS, PA 15857
80009	TEKTRONIX, INC.	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	P O BOX 500	BEAVERTON, OR 97077
80294	BOURNS, INC., INSTRUMENT DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
80740	BECKMAN INSTRUMENTS, INC.	6135 MAGNOLIA AVE.	RIVERSIDE, CA 92506
81483	INTERNATIONAL RECTIFIER CORP.	2500 HARBOR BLVD.	FULLERTON, CA 92634
82389	SWITCHCRAFT, INC.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
		5555 N. ELSTON AVE.	CHICAGO, IL 60630

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
84411	TRW ELECTRONIC COMPONENTS, TRW CAPACITORS	112 W. FIRST ST.	OGALLALA, NE 69153
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E WASHINGTON STREET P O BOX 372	INDIANAPOLIS, IN 46206
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O BOX 609	COLUMBUS, NE 68601

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-0702-03			CKT BOARD ASSY:GRATICULE LIGHTS	80009	670-0702-03
A2	670-3962-00			CKT BOARD ASSY:MODE SWITCH	80009	670-3962-00
A3	670-3956-00			CKT BOARD ASSY:MAIN INTERFACE	80009	670-3956-00
A4	670-1698-04			CKT BOARD ASSY:50 OHM FOLLOWER	80009	670-1698-04
A5	670-1698-04			CKT BOARD ASSY:50 OHM FOLLOWER	80009	670-1698-04
A6	670-3961-00			CKT BOARD ASSY:LOGIC	80009	670-3961-00
A7	670-3957-00	B010100	B020949	CKT BOARD ASSY:TRIGGER AMPLIFIER	80009	670-3957-00
A7	670-3957-01	B020950		CKT BOARD ASSY:TRIGGER AMPLIFIER	80009	670-3957-01
A8	670-1625-04			CKT BOARD ASSY:VERTICAL INTERFACE	80009	670-1625-04
A9	670-3959-00			CKT BOARD ASSY:X-Y COMPENSATION	80009	670-3959-00
A10	670-3960-00			CKT BOARD ASSY:HORIZONTAL INTERCONNECT	80009	670-3960-00
A11	670-3958-00			CKT BOARD ASSY:HORIZONTAL INTERFACE	80009	670-3958-00
A12	670-3963-00			CKT BOARD ASSY:SIGNALS OUT	80009	670-3963-00
A13	670-1885-03			CKT BOARD ASSY:READOUT	80009	670-1885-03
A14	670-3964-00			CKT BOARD ASSY:CAPACITOR REFLECTOR	80009	670-3964-00
A15	670-1610-06			CKT BOARD ASSY:POWER SUPPLY INVERTER	80009	670-1610-06
A16	670-3965-00	B010100	B020597	CKT BOARD ASSY:LOW VOLTAGE REGULATOR	80009	670-3965-00
A16	670-3965-01	B020598		CKT BOARD ASSY:LOW VOLTAGE REGULATOR	80009	670-3965-01
A17	670-4641-00			CKT BOARD ASSY:FAN	80009	670-4641-00
A18	-----			CKT BOARD ASSY:DELAY LINE TERMINATION		
A18	-----			* REPLACEABLE UNDER 119-0757-00 ONLY		
A19	670-3966-00			CKT BOARD ASSY:VERTICAL AMPLIFIER	80009	670-3966-00
A20	670-3969-00			CKT BOARD ASSY:HORIZONTAL AMPLIFIER	80009	670-3969-00
A21	670-3970-00			CKT BOARD ASSY:Z AXIS	80009	670-3970-00
A22	670-3971-00			CKT BOARD ASSY:HIGH VOLTAGE	80009	670-3971-00
A23	670-4095-00			CKT BOARD ASSY:FOCUS	80009	670-4095-00
A24	670-3967-00			CKT BOARD ASSY:STORAGE MODE SWITCH	80009	670-3967-00
A25	670-3968-00			CKT BOARD ASSY:STORAGE	80009	670-3968-00
B1610	147-0035-00			MOTOR,DC:BRUSHLESS,10-15VDC,145MA	25088	1AD3001-0A
C29	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C117	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C135	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C142	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C145	290-0747-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	500D148
C146	290-0769-00			CAP.,FXD,ELCTLT:10UF,+50-10%,100V	0000W	100T10
C147	290-0769-00			CAP.,FXD,ELCTLT:10UF,+50-10%,100V	0000W	100T10
C148	290-0747-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	500D148
C149	290-0747-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	500D148
C172	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C173	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C178	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C332	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C336	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	04222	7001-1364
C351	281-0116-00			CAP.,VAR,AIR DI:1.6-9.1PF,425V	74970	189-0354-075
C356	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C357	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C359	283-0081-00			CAP.,FXD,CER DI:0.1UF,+80-20%,25V	56289	36C600
C376	285-1006-00			CAP.,FXD,PLSTC:0.22UF,2%,50V	80009	285-1006-00
C384	283-0115-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	805-519-COG0470J
C386	283-0115-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	805-519-COG0470J
C509	283-0176-00			CAP.,FXD,CER DI:0.0022UF,20%,50V	72982	8121B058X7R0222M
C513	283-0176-00			CAP.,FXD,CER DI:0.0022UF,20%,50V	72982	8121B058X7R0222M
C569	283-0176-00			CAP.,FXD,CER DI:0.0022UF,20%,50V	72982	8121B058X7R0222M

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C573	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C588	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C593	283-0157-00			CAP., FXD, CER DI:7PF, 5%, 500V	72982	8111B064C0H0709J
C596	283-0181-00	B010100	B020911	CAP., FXD, CER DI:1.8PF, (NOM VALUE), SEL	72982	8101B121COK0189B
C596	281-0611-00	B020912		CAP., FXD, CER DI:2.7PF, (NOM VALUE), SEL	72982	374-001C0J0279C
C598	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C609	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C613	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C648	283-0051-00			CAP., FXD, CER DI:0.0033UF, 5%, 100V	72982	8131N145C0G033AJ
C669	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C671	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C673	283-0176-00			CAP., FXD, CER DI:0.0022UF, 20%, 50V	72982	8121B058X7R0222M
C688	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C693	283-0157-00			CAP., FXD, CER DI:7PF, 5%, 500V	72982	8111B064C0H0709J
C696	281-0611-00	B010100	B020911	CAP., FXD, CER DI:2.7PF, (NOM VALUE), SEL	72982	374-001C0J0S79C
C696	281-0618-00	B020912		CAP., FXD, CER DI:4.7PF, (NOM VALUE), SEL	72982	374-001C0H0479D
C698	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C822	283-0603-00			CAP., FXD, MICA D:113PF, 2%, 300V	00853	D153F1130G0
C825	283-0668-00			CAP., FXD, MICA D:184PF, 1%, 500V	00853	D155F1840F0
C827	283-0677-00			CAP., FXD, MICA D:82PF, 1%, 500V	00853	D155E820F0
C832	281-0118-00			CAP., VAR, MICA D:8-90PF, 750V	72136	T50417-6
C835	283-0668-00			CAP., FXD, MICA D:184PF, 1%, 500V	00853	D155F1840F0
C837	283-0677-00			CAP., FXD, MICA D:82PF, 1%, 500V	00853	D155E820F0
C853	281-0508-00			CAP., FXD, CER DI:12PF, +/-0.6PF, 500V	72982	301-000C0G0120J
C863	281-0508-00			CAP., FXD, CER DI:12PF, +/-0.6PF, 500V	72982	301-000C0G0120J
C920	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C1205	283-0022-00			CAP., FXD, CER DI:0.02UF, 1400VDCAC	80009	283-0022-00
C1206	283-0022-00			CAP., FXD, CER DI:0.02UF, 1400VDCAC	80009	283-0022-00
C1216	290-0628-00			CAP., FXD, ELCTLT:950UF, +50-10%, 200V	56289	36D7560
C1217	290-0628-00			CAP., FXD, ELCTLT:950UF, +50-10%, 200V	56289	36D7560
C1219	283-0057-00			CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C1227	283-0280-00			CAP., FXD, CER DI:2200PF, 10%, 2000V	56289	29C558
C1228	283-0280-00			CAP., FXD, CER DI:2200PF, 10%, 2000V	56289	29C558
C1229	285-0939-00			CAP., FXD, PLSTC:3UF, 5%, 400V	84411	TEK111-30594
C1231	290-0395-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	150D475X0050B2
C1235	283-0078-00			CAP., FXD, CER DI:0.001UF, 20%, 500V	56289	20C114A8
C1236	283-0280-00			CAP., FXD, CER DI:2200PF, 10%, 2000V	56289	29C558
C1237	285-0938-00			CAP., FXD, PLSTC:0.03UF, 5%, 600V	56289	AF8B1G303J004
C1238	283-0279-00			CAP., FXD, CER DI:0.001UF, 20%, 3000V	56289	55C153
C1239	290-0395-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	150D475X0050B2
C1242	283-0001-00			CAP., FXD, CER DI:0.005UF, +100-0%, 500V	72982	831-559E502P
C1243	290-0159-00			CAP., FXD, ELCTLT:2UF, +50-10%, 150V	56289	30D205F150BB9
C1245	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C1249	290-0164-00			CAP., FXD, ELCTLT:1UF, +50-10%, 150V	56289	30D105F150BA2
C1253	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C1254	283-0065-00			CAP., FXD, CER DI:0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C1259	290-0573-00			CAP., FXD, ELCTLT:2.7UF, 20%, 50V	56289	196D275X0050JA1
C1263	290-0512-00			CAP., FXD, ELCTLT:22UF, 20%, 15V	56289	196D226X0015KA1
C1264	290-0523-00			CAP., FXD, ELCTLT:2.2UF, 20%, 20V	56289	196D225X0020HA1
C1267	290-0523-00			CAP., FXD, ELCTLT:2.2UF, 20%, 20V	56289	196D225X0020HA1
C1276	283-0060-00			CAP., FXD, CER DI:100PF, 5%, 200V	72982	855-535U2J101J

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Discont	Name & Description	Mfr Code	Mfr Part Number
C1277	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075 E474M
C1278	283-0023-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C1280	283-0060-00			CAP., FXD, CER DI: 100PF, 5%, 200V	72982	855-535U2J101J
C1285	283-0080-00			CAP., FXD, CER DI: 0.022UF, +80-20%, 25V	56289	19C611
C1290	285-0629-00			CAP., FXD, PLSTC: 0.047UF, 20%, 100V	56289	410P47301
C1298	290-0580-00			CAP., FXD, ELCTLT: 0.27UF, 20%, 50V	56289	196D274X0050HA1
C1300	283-0065-00			CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C1301	290-0778-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C1302	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C1313	290-0773-00			CAP., FXD, ELCTLT: 1000UF, +50-10%, 10V	0000L	ECE-B10Z1000
C1314	290-0771-00			CAP., FXD, ELCTLT: 220UF, +50-10%, 10VDC	0000L	ECE-A10V220L
C1316	290-0773-00			CAP., FXD, ELCTLT: 1000UF, +50-10%, 10V	0000L	ECE-B10Z1000
C1317	290-0771-00			CAP., FXD, ELCTLT: 220UF, +50-10%, 10VDC	0000L	ECE-A10V220L
C1324	290-0766-00			CAP., FXD, ELCTLT: 2.2UF, +50-10%, 160V	56289	502D232
C1325	290-0766-00			CAP., FXD, ELCTLT: 2.2UF, +50-10%, 160V	56289	502D232
C1326	290-0480-00	B010100	B010207	CAP., FXD, ELCTLT: 0.5UF, +50-10%, 200V	80009	290-0480-00
C1326	285-0892-00	B010208		CAP., FXD, PLSTC: 0.22UF, 10%, 200V	56289	LP66A1C224K002
C1327	285-0566-00			CAP., FXD, PLSTC: 0.022UF, 10%, 200V	56289	410P22392
C1350	290-0772-00			CAP., FXD, ELCTLT: 330UF, +50-10%, 25V	0000L	ECE-B25Z330
C1351	290-0772-00			CAP., FXD, ELCTLT: 330UF, +50-10%, 25V	0000L	ECE-B25Z330
C1353	290-0770-00			CAP., FXD, ELCTLT: 100UF, +50-10%, 25V	56289	502D230
C1354	290-0770-00			CAP., FXD, ELCTLT: 100UF, +50-10%, 25V	56289	502D230
C1358	290-0768-00			CAP., FXD, ELCTLT: 10UF, +50-10%, 100V	54473	ECE-A100V10L
C1360	290-0768-00			CAP., FXD, ELCTLT: 10UF, +50-10%, 100V	54473	ECE-A100V10L
C1362	290-0768-00			CAP., FXD, ELCTLT: 10UF, +50-10%, 100V	54473	ECE-A100V10L
C1364	290-0768-00			CAP., FXD, ELCTLT: 10UF, +50-10%, 100V	54473	ECE-A100V10L
C1413	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1416	283-0084-00			CAP., FXD, CER DI: 270PF, 5%, 1000V	72982	838-533B271J
C1436	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1481	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1495	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1506	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C1511	283-0004-00			CAP., FXD, CER DI: 0.02UF, +80-20%, 150V	72982	855-558-Z5V0203Z
C1518	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1533	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1571	283-0128-00			CAP., FXD, CER DI: 100PF, 5%, 500V	72982	871-536T2H101J
C1575	290-0771-00			CAP., FXD, ELCTLT: 220UF, +50-10%, 10VDC	0000L	ECE-A10V220L
C1591	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C1603	290-0768-00			CAP., FXD, ELCTLT: 10UF, +50-10%, 100V	54473	ECE-A100V10L
C1604	290-0778-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C1631	283-0065-00			CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C1657	283-0185-00			CAP., FXD, CER DI: 2.5PF, 5%, 50V	72982	8101B057C0K0295B
C1658	281-0151-00	B010100	B020489	CAP., VAR, CER DI: 1-3PF, 100V	72982	518-600A1-3
C1658	281-0218-00	B020490		CAP., VAR, CER DI: 1-5PF, +2-2.5%, 100V	72982	513-001 1-5
C1659	283-0185-00			CAP., FXD, CER DI: 2.5PF, 5%, 50V	72982	8101B057C0K0295B
C1662	281-0603-00			CAP., FXD, CER DI: 39PF, 5%, 500V	72982	308-000C0G0390J
C1663	281-0603-00			CAP., FXD, CER DI: 39PF, 5%, 500V	72982	308-000C0G0390J
C1670	281-0543-00			CAP., FXD, CER DI: 270PF, 10%, 500V	72982	301055X5P271K
C1672	281-0543-00			CAP., FXD, CER DI: 270PF, 10%, 500V	72982	301055X5P271K
C1675	283-0160-00			CAP., FXD, CER DI: 1.5PF, 10%, 50V	72982	8101A058C0K159B
C1680	283-0181-00			CAP., FXD, CER DI: 1.8PF, 10%, 100V	72982	8101B121C0K0189B
C1681	283-0160-00			CAP., FXD, CER DI: 1.5PF, 10%, 50V	72982	8101A058C0K159B
C1685	281-0543-00			CAP., FXD, CER DI: 270PF, 10%, 500V	72982	301055X5P271K

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C1689	281-0543-00			CAP., FXD, CER DI: 270PF, 10%, 500V	72982	301055X5P271K
C1692	283-0065-00			CAP., FXD, CER DI: 0.001UF, 5%, 100V	72982	805-518-Z5D0102J
C1734	283-0181-00			CAP., FXD, CER DI: 1.8PF, 10%, 100V	72982	8101B121C0K0189B
C1738	283-0181-00			CAP., FXD, CER DI: 1.8PF, 10%, 100V	72982	8101B121C0K0189B
C1739	283-0160-00			CAP., FXD, CER DI: 1.5PF, 10%, 50V	72982	8101A058C0K159B
C1743	283-0128-00			CAP., FXD, CER DI: 100PF, 5%, 500V	72982	871-536T2H101J
C1745	283-0114-00			CAP., FXD, CER DI: 0.0015UF, 5%, 200V	72982	805-509B152J
C1747	283-0239-00			CAP., FXD, CER DI: 0.022UF, 10%, 50V	72982	8131N075C223K
C1749	283-0203-00			CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075 E474M
C1751	281-0214-00	XB020490		CAP., VAR, CER DI: 0.5-3PF, 400V	80031	2502A0R503VP02F0
C1753	283-0160-00			CAP., FXD, CER DI: 1.5PF, 10%, 50V	72982	8101A058C0K159B
C1754	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1758	283-0108-00			CAP., FXD, CER DI: 220PF, 10%, 200V	56289	272C13
C1760	283-0180-00			CAP., FXD, CER DI: 5600PF, 20%, 200V	72982	8121N204 E 562M
C1762	283-0211-00			CAP., FXD, CER DI: 0.1UF, 10%, 200V	72982	8141N210X7R0104K
C1764	283-0212-00			CAP., FXD, CER DI: 2UF, 20%, 50V	72982	8141N064Z5U205M
C1767	283-0181-00			CAP., FXD, CER DI: 1.8PF, 10%, 100V	72982	8101B121C0K0189B
C1783	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1786	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1787	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1789	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1791	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1794	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1796	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1798	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C1844	283-0598-00			CAP., FXD, MICA D: 253PF, 5%, 300V	00853	D153E2530J0
C1854	283-0348-00			CAP., FXD, CER DI: 0.5PF, +/-0.1PF, 100V	51642	100-100-NP0-508B
C1855	281-0544-00			CAP., FXD, CER DI: 5.6PF, 10%, 500V	72982	301-000C0H0569D
C1862	281-0544-00			CAP., FXD, CER DI: 5.6PF, 10%, 500V	72982	301-000C0H0569D
C1863	281-0077-00			CAP., VAR, AIR DI: 1.3-5.4PF, 800V	74970	189-2-5
C1864	283-0028-00			CAP., FXD, CER DI: 0.0022UF, 20%, 50V	56289	19C606
C1865	281-0661-00			CAP., FXD, CER DI: 0.8PF, +/-0.1PF, 500V	72982	301-000C0K0808B
C1878	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1883	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1884	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1892	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1897	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1902	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145 E 104Z
C1903	290-0745-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 25V	56289	502D225
C1904	290-0745-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 25V	56289	502D225
C1905	290-0745-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 25V	56289	502D225
C1906	283-0178-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 100V	72982	8131N145 E 104Z
C1917	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C1944	283-0598-00			CAP., FXD, MICA D: 253PF, 5%, 300V	00853	D153E2530J0
C1954	283-0348-00			CAP., FXD, CER DI: 0.5PF, +/-0.1PF, 100V	51642	100-100-NP0-508B
C1955	281-0504-00			CAP., FXD, CER DI: 10PF, +/-1PF, 500V	72982	301-055C0G0100F
C1962	281-0544-00			CAP., FXD, CER DI: 5.6PF, 10%, 500V	72982	301-000C0H0569D
C1963	281-0077-00			CAP., VAR, AIR DI: 1.3-5.4PF, 800V	74970	189-2-5
C1964	283-0028-00			CAP., FXD, CER DI: 0.0022UF, 20%, 50V	56289	19C606
C1965	281-0661-00			CAP., FXD, CER DI: 0.8PF, +/-0.1PF, 500V	72982	301-000C0K0808B
C1968	283-0002-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 500V	72982	811-546E103Z
C1974	283-0647-00			CAP., FXD, MICA D: 70PF, 1%, 100V	00853	D151E700F0
C1975	281-0187-00			CAP., VAR, PLSTC: 4-40PF, 250V	80031	2810D00440QN02F0

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C1978	283-0002-00			CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E103Z
C1983	283-0002-00			CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E103Z
C1984	283-0002-00			CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E103Z
C1992	283-0002-00			CAP., FXD, CER DI:0.01UF, +80-20%, 500V	72982	811-546E103Z
C2014	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	575C1A1
C2016	283-0188-00			CAP., FXD, CER DI:0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2021	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	575C1A1
C2031	283-0162-00			CAP., FXD, CER DI:0.01UF, +80-30%, 5000V	56289	112C403
C2033	283-0261-00			CAP., FXD, CER DI:0.01UF, 20%, 4000V	56289	575C1A1
C2034	283-0162-00			CAP., FXD, CER DI:0.01UF, +80-30%, 5000V	56289	112C403
C2041	281-0512-00			CAP., FXD, CER DI:27PF, +/-2.7PF, 500V	72982	308-000C0G0270K
C2045	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2052	283-0188-00			CAP., FXD, CER DI:0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2055	283-0188-00			CAP., FXD, CER DI:0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2056	283-0279-00			CAP., FXD, CER DI:0.001UF, 20%, 3000V	56289	55C153
C2066	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2101	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2112	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2113	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2116	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2117	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2119	290-0767-00			CAP., FXD, ELCLTLT:4.7UF, +75-10%, 160V	56289	502D228
C2121	290-0767-00			CAP., FXD, ELCLTLT:4.7UF, +75-10%, 160V	56289	502D228
C2132	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C2134	290-0778-00			CAP., FXD, ELCLTLT:1UF, +50-10%, 50V	0000L	ECE-A50N1
C2139	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C2150	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2151	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2152	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2155	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2156	283-0084-00			CAP., FXD, CER DI:270PF, 5%, 1000V	72982	838-533B271J
C2193	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2197	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C2205	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2211	290-0745-00			CAP., FXD, ELCLTLT:22UF, +50-10%, 25V	56289	502D225
C2212	290-0745-00			CAP., FXD, ELCLTLT:22UF, +50-10%, 25V	56289	502D225
C2215	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2217	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2218	290-0778-00			CAP., FXD, ELCLTLT:1UF, +50-10%, 50V	0000L	ECE-A50N1
C2224	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C2232	281-0592-00			CAP., FXD, CER DI:4.7PF, +/-0.5PF, 500V	72982	301-023C0H0479D
C2235	281-0166-00			CAP., VAR, AIR DI:1.9-15.7PF, 250V	74970	187-0109-005
C2236	283-0081-00			CAP., FXD, CER DI:0.1UF, +80-20%, 25V	56289	36C600
C2237	283-0180-00			CAP., FXD, CER DI:5600PF, 20%, 200V	72982	8121N204 E 562M
C2242	283-0057-00			CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C2244	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039 E 105Z
C2248	281-0661-00			CAP., FXD, CER DI:0.8PF, +/-0.1PF, 500V	72982	301-000C0K0808B
C2249	283-0084-00			CAP., FXD, CER DI:270PF, 5%, 1000V	72982	838-533B271J
C2253	283-0057-00			CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C2263	283-0023-00			CAP., FXD, CER DI:0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2271	283-0003-00			CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2282	283-0188-00			CAP., FXD, CER DI:0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2283	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C2288	281-0627-00		CAP., FXD, CER DI: 1PF, +/-0.25PF, 500V	72982	301-000COK0109C
C2289	283-0188-00		CAP., FXD, CER DI: 0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2297	283-0188-00		CAP., FXD, CER DI: 0.001UF, 20%, 6000V	72982	8486KVX5T0102M
C2323	283-0054-00		CAP., FXD, CER DI: 150PF, 5%, 200V	72982	855-535U2J151J
C2326	281-0592-00		CAP., FXD, CER DI: 4.7PF, +/-0.5PF, 500V	72982	301-023C0H0479D
C2327	283-0023-00		CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2346	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2356	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2364	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2371	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2379	281-0661-00		CAP., FXD, CER DI: 0.8PF, +/-0.1PF, 500V	72982	301-000COK0808B
C2384	283-0023-00		CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2385	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C2393	283-0023-00		CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2405	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2406	283-0023-00		CAP., FXD, CER DI: 0.1UF, +80-20%, 12V	91418	MX0104Z1205R5
C2425	281-0204-00		CAP., VAR, PLSTC: 2-22PF, 100V	80031	287C00222MJ02
C2432	281-0577-00		CAP., FXD, CER DI: 14PF, 5%, 500V	72982	301-050C0G0140J
C2435	281-0204-00		CAP., VAR, PLSTC: 2-22PF, 100V	80031	287C00222MJ02
C2436	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2507	290-0282-00		CAP., FXD, ELCTLT: 0.047UF, 10%, 35V	56289	162D473X9035BC2
C2521	290-0778-00		CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C2523	290-0778-00		CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C2528	290-0778-00		CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C2534	290-0114-00		CAP., FXD, ELCTLT: 47UF, 20%, 6V	56289	150D476X0006B2
C2542	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C2562	290-0297-00		CAP., FXD, ELCTLT: 39UF, 10%, 10V	56289	150D396X9010B2
C2565	283-0116-00		CAP., FXD, CER DI: 820PF, 5%, 500V	72982	801-547B821J
C2577	290-0282-00		CAP., FXD, ELCTLT: 0.047UF, 10%, 35V	56289	162D473X9035BC2
C2592	283-0028-00		CAP., FXD, CER DI: 0.0022UF, 20%, 50V	56289	19C606
C2594	290-0297-00		CAP., FXD, ELCTLT: 39UF, 10%, 10V	56289	150D396X9010B2
C2608	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2626	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2662	283-0203-00		CAP., FXD, CER DI: 0.47UF, 20%, 50V	72982	8131N075 E474M
C2663	290-0778-00		CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C2668	283-0059-00		CAP., FXD, CER DI: 1UF, +80-20%, 25V	72982	8141N037Z5U0105Z
C2671	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2676	290-0535-00		CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C2683	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2684	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2685	290-0114-00		CAP., FXD, ELCTLT: 47UF, 20%, 6V	56289	150D476X0006B2
C2686	290-0530-00		CAP., FXD, ELCTLT: 68UF, 20%, 6V	90201	TDC686M006NLF
C2696	290-0297-00		CAP., FXD, ELCTLT: 39UF, 10%, 10V	56289	150D396X9010B2
C2718	281-0589-00		CAP., FXD, CER DI: 170PF, 5%, 500V	72982	301000Z5D0171J
C2753	290-0340-00		CAP., FXD, ELCTLT: 10UF, 10%, 50V	56289	109D106X9050C2
C2767	290-0535-00		CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C2770	290-0244-00		CAP., FXD, ELCTLT: 0.47UF, 5%, 35V	56289	162D474X5035BC2
C2774	283-0150-00		CAP., FXD, CER DI: 650PF, 5%, 200V	72982	835-515B651J
C2804	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2809	290-0778-00		CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C2813	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2814	283-0003-00		CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2815	281-0627-00		CAP., FXD, CER DI: 1PF, +/-0.25PF, 500V	72982	301-000COK0109C

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C2827	281-0523-00			CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C2833	290-0164-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 150V	56289	30D105F150BA2
C2835	281-0523-00			CAP., FXD, CER DI: 100PF, +/-20PF, 500V	72982	301-000U2M0101M
C2839	283-0092-00			CAP., FXD, CER DI: 0.03UF, +80-20%, 200V	72982	845-534E303Z
C2843	281-0540-00			CAP., FXD, CER DI: 51PF, 5%, 500V	72982	301-000U2J0510J
C2864	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C2867	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C2869	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C2874	283-0057-00	B010100	B010207	CAP., FXD, CER DI: 0.1UF, +80-20%, 200V	56289	274C10
C2874	283-0211-00	B010208		CAP., FXD, CER DI: 0.1UF, 10%, 200V	72982	8141N210X7R0104K
C2912	281-0512-00			CAP., FXD, CER DI: 27PF, +/-2.7PF, 500V	72982	308-000C0G0270K
C2915	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C2927	283-0092-00			CAP., FXD, CER DI: 0.03UF, +80-20%, 200V	72982	845-534E303Z
C3053	290-0530-00			CAP., FXD, ELCTLT: 68UF, 20%, 6V	90201	TDC686M006NLF
C3072	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C3074	290-0771-00			CAP., FXD, ELCTLT: 220UF, +50-10%, 10VDC	0000L	ECE-A10V220L
C3076	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C3077	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C3078	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C3079	285-1077-00			CAP., FXD, PLSTC: 0.10UF, 20%, 600V	14752	230B1F104
C3320	281-0510-00			CAP., FXD, CER DI: 22PF, +/-4.4PF, 500V	72982	301-000C0G0220M
C3326	283-0081-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 25V	56289	36C600
C3364	281-0603-00			CAP., FXD, CER DI: 39PF, 5%, 500V	72982	308-000C0G0390J
C3395	290-0745-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 25V	56289	502D225
C3396	290-0745-00			CAP., FXD, ELCTLT: 22UF, +50-10%, 25V	56289	502D225
C3401	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C3407	283-0597-00			CAP., FXD, MICA D: 470PF, 10%, 300V	00853	D153E471K0
C3418	283-0004-00			CAP., FXD, CER DI: 0.02UF, +80-20%, 150V	72982	855-558-Z5V0203Z
C3420	283-0597-00			CAP., FXD, MICA D: 470PF, 10%, 300V	00853	D153E471K0
C3429	283-0004-00			CAP., FXD, CER DI: 0.02UF, +80-20%, 150V	72982	855-558-Z5V0203Z
C3434	285-0698-00			CAP., FXD, PLSTC: 0.0082UF, 5%, 100V	56289	410P82251
C3438	281-0612-00			CAP., FXD, CER DI: 5.6PF, +/-0.5PF, 500V	72982	374-001C0H0569D
C3443	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C3445	283-0103-00			CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638
C3449	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C3470	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C3471	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C3472	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C3475	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C3495	283-0054-00	XB020450		CAP., FXD, CER DI: 150PF, 5%, 200V	72982	855-535U2J151J
C4301	290-0778-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C4302	290-0755-00			CAP., FXD, ELCTLT: 100UF, +50-10%, 10V	56289	502D223
C4303	290-0778-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C4304	290-0778-00			CAP., FXD, ELCTLT: 1UF, +50-10%, 50V	0000L	ECE-A50N1
C4305	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	72982	8131N039 E 105Z
C4314	283-0672-00			CAP., FXD, MICA D: 200PF, 1%, 500V	00853	D155F201F0
C4315	281-0603-00			CAP., FXD, CER DI: 39PF, 5%, 500V	72982	308-000C0G0390J
C4316	283-0003-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 150V	72982	855-558Z5U-103Z
C4336	281-0603-00			CAP., FXD, CER DI: 39PF, 5%, 500V	72982	308-000C0G0390J
C4343	281-0629-00			CAP., FXD, CER DI: 33PF, 5%, 600V	72982	308-000C0G0330J
C4345	281-0629-00			CAP., FXD, CER DI: 33PF, 5%, 600V	72982	308-000C0G0330J
C4346	281-0525-00			CAP., FXD, CER DI: 470PF, +/-94PF, 500V	04222	7001-1364
C4347	283-0638-00			CAP., FXD, MICA D: 130PF, 1%, 100V	00853	D151F131F0

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C4348	281-0525-00			CAP., FXD, CER DI:470PF, +/-94PF, 500V	04222	7001-1364
C4420	281-0603-00			CAP., FXD, CER DI:39PF, 5%, 500V	72982	308-000C0G0390J
C4423	281-0603-00			CAP., FXD, CER DI:39PF, 5%, 500V	72982	308-000C0G0390J
C4441	281-0603-00			CAP., FXD, CER DI:39PF, 5%, 500V	72982	308-000C0G0390J
C4449	281-0523-00	B010100	B020379	CAP., FXD, CER DI:100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4449	283-0003-00	B020380		CAP., FXD, CER DI:0.01UF, +80-20%, 150V	72982	855-55825U-103Z
C4461	283-0604-00			CAP., FXD, MICA D:304PF, 2%, 300V	00853	D153F3040G0
C4467	283-0604-00			CAP., FXD, MICA D:304PF, 2%, 300V	00853	D153F3040G0
C4471	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039 E 105Z
C4482	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C4483	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C4491	281-0523-00			CAP., FXD, CER DI:100PF, +/-20PF, 500V	72982	301-000U2M0101M
C4492	283-0177-00			CAP., FXD, CER DI:1UF, +80-20%, 25V	72982	8131N039 E 105Z
C4497	283-0000-00			CAP., FXD, CER DI:0.001UF, +100-0%, 500V	72982	831-516E102P
C4605	281-0788-00			CAP., FXD, CER DI:470PF, 10%, 100V	72982	8005H9AADW5R471K
C4610	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C4611	283-0268-00			CAP., FXD, CER DI:0.015UF, 10%, 50V	72982	8131N075W5R153K
C4613	281-0788-00			CAP., FXD, CER DI:470PF, 10%, 100V	72982	8005H9AADW5R471K
C4665	281-0788-00			CAP., FXD, CER DI:470PF, 10%, 100V	72982	8005H9AADW5R471K
C4673	281-0788-00			CAP., FXD, CER DI:470PF, 10%, 100V	72982	8005H9AADW5R471K
C4677	283-0114-00			CAP., FXD, CER DI:0.0015UF, 5%, 200V	72982	805-509B152J
C4678	283-0268-00			CAP., FXD, CER DI:0.015UF, 10%, 50V	72982	8131N075W5R153K
C4688	283-0268-00			SELECTED		
CR18	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR21	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR22	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR23	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR24	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR25	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR26	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR27	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR28	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR31	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR32	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR33	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR34	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR35	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR36	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR37	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR38	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR41	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR42	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR43	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR44	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR45	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR46	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR47	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR48	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR51	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR52	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR53	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR54	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR55	152-0141-02			SEMICONV DEVICE:SILICON, 30V, 150MA	80009	152-0141-02

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR56	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR57	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR58	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR114	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR124	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR128	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR136	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR138	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR142	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR152	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR156	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR162	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR164	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR172	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR180	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR181	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR184	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR303	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR307	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR319	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR321	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR322	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR323	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR325	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR326	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR327	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR328	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR329	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR330	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR341	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR342	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR346	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR347	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR348	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR349	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR386	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR521	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR522	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR526	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR548	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR549	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR621	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR622	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR626	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR820	152-0141-02			SEMICON D DEVICE:SILICON, 30V, 150MA	80009	152-0141-02
CR1215	152-0396-01			SEMICON D DEVICE:SILICON, 400V, 3A	12969	652-821
CR1232	152-0107-00			SEMICON D DEVICE:SILICON, 400V, 400MA	80009	152-0107-00
CR1234	152-0400-00			SEMICON D DEVICE:SILICON, 400V, 1A	80009	152-0400-00
CR1238	152-0401-00			SEMICON D DEVICE:SILICON, 3-LAYER, TRIGGER	04713	1N5761
CR1240	152-0107-00			SEMICON D DEVICE:SILICON, 400V, 400MA	80009	152-0107-00
CR1241	152-0400-00			SEMICON D DEVICE:SILICON, 400V, 1A	80009	152-0400-00
CR1242	152-0107-00			SEMICON D DEVICE:SILICON, 400V, 400MA	80009	152-0107-00
CR1244	152-0107-00			SEMICON D DEVICE:SILICON, 400V, 400MA	80009	152-0107-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CR1249	152-0061-00		SEMICON D DEVICE: SILICON, 175V, 100MA	80009	152-0061-00
CR1251	152-0061-00		SEMICON D DEVICE: SILICON, 175V, 100MA	80009	152-0061-00
CR1252	152-0061-00		SEMICON D DEVICE: SILICON, 175V, 100MA	80009	152-0061-00
CR1253	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1259	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1260	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1261	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1265	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1266	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1280	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1281	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1282	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1283	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1288	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1289	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1290	152-0333-00		SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR1294	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1301	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1302	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1310	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1311	152-0502-00		SEMICON D DEVICE: SILICON, 20V, 5A	04713	1N5823
CR1312	152-0502-00		SEMICON D DEVICE: SILICON, 20V, 5A	04713	1N5823
CR1313	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1314	152-0423-00		SEMICON D DEVICE: SILICON, 400V, 3A	04713	1N5000
CR1315	152-0423-00		SEMICON D DEVICE: SILICON, 400V, 3A	04713	1N5000
CR1320	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1321	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1322	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1323	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1324	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1325	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1327	152-0242-00		SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR1340	152-0413-00		SEMICON D DEVICE: SILICON, 400V, 750MA	80009	152-0413-00
CR1341	152-0413-00		SEMICON D DEVICE: SILICON, 400V, 750MA	80009	152-0413-00
CR1342	152-0413-00		SEMICON D DEVICE: SILICON, 400V, 750MA	80009	152-0413-00
CR1343	152-0413-00		SEMICON D DEVICE: SILICON, 400V, 750MA	80009	152-0413-00
CR1345	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1346	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1347	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1348	152-0397-00		SEMICON D DEVICE: SILICON, 50V, 12A	80009	152-0397-00
CR1375	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1402	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1410	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1429	152-0066-01		SEMICON D DEVICE: SILICON, 400V, 1A	80009	152-0066-01
CR1431	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1439	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1445	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1459	152-0066-01		SEMICON D DEVICE: SILICON, 400V, 1A	80009	152-0066-01
CR1468	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1469	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1482	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1483	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1489	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR1499	152-0066-01			SEMICON D DEVICE: SILICON, 400V, 1A	80009	152-0066-01
CR1502	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1503	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1506	152-0233-00			SEMICON D DEVICE: SILICON, 85V, 100MA	80009	152-0233-00
CR1510	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1521	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1522	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1523	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1539	152-0066-01			SEMICON D DEVICE: SILICON, 400V, 1A	80009	152-0066-01
CR1543	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	80009	152-0075-00
CR1549	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1576	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1589	152-0066-01			SEMICON D DEVICE: SILICON, 400V, 1A	80009	152-0066-01
CR1603	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1607	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1611	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1612	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1613	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1614	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1690	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1692	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1696	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1697	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1702	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1704	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1823	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1843	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1844	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1845	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1851	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1852	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1858	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1863	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1874	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1943	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1951	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1952	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1958	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR1963	152-0322-00			SEMICON D DEVICE: SILICON, 15V, HOT CARRIER	28480	5082-2672
CR1974	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2012	152-0409-00			SEMICON D DEVICE: SILICON, 12, 000V, 5MA	80009	152-0409-00
CR2014	152-0409-00			SEMICON D DEVICE: SILICON, 12, 000V, 5MA	80009	152-0409-00
CR2016	152-0409-00			SEMICON D DEVICE: SILICON, 12, 000V, 5MA	80009	152-0409-00
CR2021	152-0331-00			SEMICON D DEVICE: SILICON, 800V, 25MA	80009	152-0331-00
CR2022	152-0331-00			SEMICON D DEVICE: SILICON, 800V, 25MA	80009	152-0331-00
CR2023	152-0409-00			SEMICON D DEVICE: SILICON, 12, 000V, 5MA	80009	152-0409-00
CR2045	152-0242-00			SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR2052	152-0242-00			SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR2054	152-0242-00			SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR2055	152-0242-00			SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR2064	152-0242-00			SEMICON D DEVICE: SILICON, 225V, 200MA	80009	152-0242-00
CR2115	152-0331-00			SEMICON D DEVICE: SILICON, 800V, 25MA	80009	152-0331-00
CR2118	152-0586-00			SEMICON D DEVICE: SILICON, 600V, 500MA	14936	RGP10J

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR2119	152-0586-00			SEMICON D DEVICE : SILICON , 600V , 500MA	14936	RGP10J
CR2123	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2125	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2133	152-0242-00			SEMICON D DEVICE : SILICON , 225V , 200MA	80009	152-0242-00
CR2134	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2144	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2145	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2152	152-0331-00			SEMICON D DEVICE : SILICON , 800V , 25MA	80009	152-0331-00
CR2153	152-0331-00			SEMICON D DEVICE : SILICON , 800V , 25MA	80009	152-0331-00
CR2155	152-0331-00			SEMICON D DEVICE : SILICON , 800V , 25MA	80009	152-0331-00
CR2162	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2174	152-0242-00			SEMICON D DEVICE : SILICON , 225V , 200MA	80009	152-0242-00
CR2175	152-0242-00			SEMICON D DEVICE : SILICON , 225V , 200MA	80009	152-0242-00
CR2176	152-0242-00			SEMICON D DEVICE : SILICON , 225V , 200MA	80009	152-0242-00
CR2181	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2195	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2218	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2222	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2223	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2227	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2242	152-0242-00			SEMICON D DEVICE : SILICON , 225V , 200MA	80009	152-0242-00
CR2253	152-0333-00			SEMICON D DEVICE : SILICON , 55V , 200MA	80009	152-0333-00
CR2264	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2281	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2282	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2302	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2304	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2306	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2315	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2316	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2317	152-0322-00			SEMICON D DEVICE : SILICON , 15V , HOT CARRIER	28480	5082-2672
CR2333	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2335	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2396	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2397	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2408	152-0574-00			SEMICON D DEVICE : SILICON , 120V , 0.15A	80009	152-0574-00
CR2438	152-0574-00			SEMICON D DEVICE : SILICON , 120V , 0.15A	80009	152-0574-00
CR2454	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2455	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2471	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2472	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2514	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2515	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2526	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2528	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2535	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2542	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2552	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2553	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2554	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2555	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2561	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02
CR2564	152-0141-02			SEMICON D DEVICE : SILICON , 30V , 150MA	80009	152-0141-02

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR2565	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2582	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2610	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2611	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2612	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2613	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2614	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2615	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2626	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2643	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2644	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2646	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2663	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	80009	152-0075-00
CR2664	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2686	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2687	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2704	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2705	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2706	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2707	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2708	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2709	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2710	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2721	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2722	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2723	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2724	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2725	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2726	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2737	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2743	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2774	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2813	150-1036-00			LAMP, LED: RED, 3.0V, 40MA	50522	MV5074B
CR2814	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2825	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2826	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2828	152-0040-00			SEMICON D DEVICE: SILICON, 600V, 1A	80009	152-0040-00
CR2831	150-1036-00			LAMP, LED: RED, 3.0V, 40MA	50522	MV5074B
CR2833	152-0040-00			SEMICON D DEVICE: SILICON, 600V, 1A	80009	152-0040-00
CR2834	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2839	152-0040-00			SEMICON D DEVICE: SILICON, 600V, 1A	80009	152-0040-00
CR2848	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2849	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2874	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2876	152-0040-00			SEMICON D DEVICE: SILICON, 600V, 1A	80009	152-0040-00
CR2902	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2904	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2905	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2924	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2951	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2953	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2954	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2955	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR2962	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2966	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2980	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR2981	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3015	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3017	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3049	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3052	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3053	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3056	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3061	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3062	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3066	152-0061-00			SEMICON D DEVICE: SILICON, 175V, 100MA	80009	152-0061-00
CR3077	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3212	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3213	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3214	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3215	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3216	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3217	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3218	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3219	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3233	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3241	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3243	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3245	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3247	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3326	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3333	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3361	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3363	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3364	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3416	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3431	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3432	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3433	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3438	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3439	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3441	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3442	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3443	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3445	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR3447	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4322	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4354	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4355	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4368	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4369	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4420	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4423	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4433	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4434	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4448	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR4449	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4461	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4467	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4472	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4473	152-0333-00			SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR4474	152-0333-00			SEMICON D DEVICE: SILICON, 55V, 200MA	80009	152-0333-00
CR4484	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4486	152-0141-02			SEMICON D DEVICE: SILICON, 30V, 150MA	80009	152-0141-02
CR4487	152-0153-00			SEMICON D DEVICE: SILICON, 15V, 50MA	80009	152-0153-00
CR4488	152-0153-00			SEMICON D DEVICE: SILICON, 15V, 50MA	80009	152-0153-00
CR4645	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	80009	152-0075-00
CR4653	152-0075-00			SEMICON D DEVICE: GE, 25V, 40MA	80009	152-0075-00
DL650	119-0757-00			DELAY LINE, ELEC: 65NS, 100 OHMS	80009	119-0757-00
DS352	150-0048-01			LAMP, INCAND: 5V, 0.06A, SEL	08806	683AS15
DS353	150-0048-01			LAMP, INCAND: 5V, 0.06A, SEL	08806	683AS15
DS365	150-0121-02			LAMP, CARTRIDGE: GREEN, 5V, 60MA	80009	150-0121-02
DS901	150-0048-01			LAMP, INCAND: 5V, 0.06A, SEL	08806	683AS15
DS902	150-0048-01			LAMP, INCAND: 5V, 0.06A, SEL	08806	683AS15
DS941	150-0029-00			LAMP, INCAND: 6.3V, 0.20A	08806	349
DS942	150-0029-00			LAMP, INCAND: 6.3V, 0.20A	08806	349
DS943	150-0029-00			LAMP, INCAND: 6.3V, 0.20A	08806	349
DS1219	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2074	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2292	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2294	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2295	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2296	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2298	150-0035-00			LAMP, GLOW: 90V, 0.3MA	53944	A1B-3
DS2558	150-1033-00			LAMP, LED: YELLOW, 2.2V	50434	5082-4584
DS2624	150-1033-00			LAMP, LED: YELLOW, 2.2V	50434	5082-4584
E1208	119-0181-00			SURGE VOLTAGE P: 230VAC, +/-15%	80009	119-0181-00
E1213	119-0181-00			SURGE VOLTAGE P: 230VAC, +/-15%	80009	119-0181-00
F1200	159-0017-00			FUSE, CARTRIDGE: 3AG, 4A, 250V, FAST BLOW	71400	MTH4
FL1200	119-0420-00			FILTER, RFI: 6A, 250VAC, 400HZ	02777	F-11935-6
K822	148-0034-00			RELAY, ARMATURE: DPDT, 15VDC, 600 OHM	80009	148-0034-00
K838	148-0034-00			RELAY, ARMATURE: DPDT, 15VDC, 600 OHM	80009	148-0034-00
K2014	108-0663-00			COIL, REED SW: 12V, 20MA	71707	SP-12-P
K2014S1	260-1726-00			SWITCH, REED: 3A, 5W, V=3.5KV, 50W	12617	DRVT-5
K2155	108-0405-00			COIL, RF: 12V	80009	108-0405-00
K2155S1	260-0722-00			SWITCH, REED: 0.5A, 500V, 10W	12617	MRR-5
L822	108-0719-00			COIL, RF: 805NH	80009	108-0719-00
L825	108-0719-00			COIL, RF: 805NH	80009	108-0719-00
L827	108-0718-00			COIL, RF: 1.75UH	80009	108-0718-00
L832	108-0719-00			COIL, RF: 805NH	80009	108-0719-00
L835	108-0719-00			COIL, RF: 805NH	80009	108-0719-00
L837	108-0718-00			COIL, RF: 1.75UH	80009	108-0718-00
L1229	108-0681-00			COIL, RF: 140UH	80009	108-0681-00
L1237	108-0761-00			COIL, RF: 1MH	80009	108-0761-00
L1313	108-0680-00			COIL, RF: 27UH	80009	108-0680-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
L1316	108-0680-00			COIL, RF: 27UH	80009	108-0680-00
L1352	108-0680-00			COIL, RF: 27UH	80009	108-0680-00
L1355	108-0680-00			COIL, RF: 27UH	80009	108-0680-00
L1359	108-0646-00			COIL, RF: 80UH	80009	108-0646-00
L1363	108-0646-00			COIL, RF: 80UH	80009	108-0646-00
L1657	195-0048-00	XB020490		LEAD, ELECTRICAL: 0.018 DIA X 0.75" MIN L	80009	195-0048-00
L1659	195-0048-00	XB020490		LEAD, ELECTRICAL: 0.018 DIA X 0.75" MIN L	80009	195-0048-00
L1660	108-0369-00			COIL, RF: 0.12UH	80009	108-0369-00
L1661	108-0369-00			COIL, RF: 0.12UH	80009	108-0369-00
L1667	114-0220-00	B010100	B020489	COIL, RF: 1-3UH, CORE 276-0568-00	80009	114-0220-00
L1667	114-0222-00	B020490		COIL, RF: 2-6UH, CORE 276-0568-00	80009	114-0222-00
L1730	195-0048-00			LEAD, ELECTRICAL: 0.018 DIA X 0.75" MIN L	80009	195-0048-00
L1731	195-0048-00			LEAD, ELECTRICAL: 0.018 DIA X 0.75" MIN L	80009	195-0048-00
L1903	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
L1904	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
L1905	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
L2018	108-0553-00			COIL, RF: 47MH	32159	647,000M
L2200	108-0851-00			COIL, TUBE DEFLE: TRACE ROTATOR	80009	108-0851-00
L2204	276-0507-00			SHIELDING BEAD, : 0.6UH	78488	57-0180-7D 500B
L2215	276-0507-00			SHIELDING BEAD, : 0.6UH	78488	57-0180-7D 500B
L3072	108-0538-00			COIL, RF: 2.7UH	76493	70F276A1
L3074	108-0538-00			COIL, RF: 2.7UH	76493	70F276A1
L3076	108-0538-00			COIL, RF: 2.7UH	76493	70F276A1
L3482	108-0331-00			COIL, RF: 0.75UH	80009	108-0331-00
L4387	108-0440-00			COIL, RF: 8UH, TOROIDAL INDUCTOR	80009	108-0440-00
LR531	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR534	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR536	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR539	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR631	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR634	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR636	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR639	108-0729-00			COIL, RF: 195NH	80009	108-0729-00
LR1780	108-0685-00			COIL, RF: 80NH	80009	108-0685-00
LR1784	108-0685-00			COIL, RF: 80NH	80009	108-0685-00
LR1787	108-0330-00			COIL, RF: 0.4UH	80009	108-0330-00
LR1789	108-0325-00			COIL, RF: 0.5UH	80009	108-0325-00
LR1791	108-0325-00			COIL, RF: 0.5UH	80009	108-0325-00
LR1794	108-0325-00			COIL, RF: 0.5UH	80009	108-0325-00
LR1796	108-0325-00			COIL, RF: 0.5UH	80009	108-0325-00
LR1798	108-0325-00			COIL, RF: 0.5UH	80009	108-0325-00
LR4301	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4302	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4303	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4304	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4317	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4338	108-0543-00			COIL, RF: FIXED, 1.1UH	80009	108-0543-00
LR4342	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4344	108-0245-00			COIL, RF: 3.9UH	80009	108-0245-00
LR4359	108-0543-00			COIL, RF: FIXED, 1.1UH	80009	108-0543-00
LR4368	108-0543-00			COIL, RF: FIXED, 1.1UH	80009	108-0543-00
LR4412	108-0543-00			COIL, RF: FIXED, 1.1UH	80009	108-0543-00

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q182	151-0341-00			TRANSISTOR: SILICON, NPN	80009	151-0341-00
Q304	151-0341-00			TRANSISTOR: SILICON, NPN	80009	151-0341-00
Q308	151-0341-00			TRANSISTOR: SILICON, NPN	80009	151-0341-00
Q321	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q325	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q328	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q332	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q336	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q376	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q382	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q384	151-0342-00			TRANSISTOR: SILICON, PNP	80009	151-0342-00
Q524	151-0341-00			TRANSISTOR: SILICON, NPN	80009	151-0341-00
Q548	151-0434-00			TRANSISTOR: SILICON, PNP	80009	151-0434-00
Q558	151-0434-00			TRANSISTOR: SILICON, PNP	80009	151-0434-00
Q588	151-0294-00			TRANSISTOR: SILICON, PNP	80009	151-0294-00
Q598	151-0294-00			TRANSISTOR: SILICON, PNP	80009	151-0294-00
Q624	151-0341-00			TRANSISTOR: SILICON, NPN	80009	151-0341-00
Q688	151-0294-00			TRANSISTOR: SILICON, PNP	80009	151-0294-00
Q698	151-0294-00			TRANSISTOR: SILICON, PNP	80009	151-0294-00
Q1234	151-0368-01			TRANSISTOR: SILICON, NPN	80009	151-0368-01
Q1241	151-0368-01			TRANSISTOR: SILICON, NPN	80009	151-0368-01
Q1246	151-0260-00			TRANSISTOR: SILICON, NPN	80009	151-0260-00
Q1248	151-0519-00	B010100	B010129	TRANSISTOR: SILICON, SCR	80009	151-0519-00
Q1248	151-0529-00	B010130		TRANSISTOR: SCR, 200V, 0.5A	04713	MCR206
Q1252	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q1254	151-0273-00			TRANSISTOR: SILICON, NPN	80009	151-0273-00
Q1406A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1409A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1415	151-0126-00			TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q1418	151-0228-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4888	80009	151-0228-00
Q1425	151-0136-00			TRANSISTOR: SILICON, NPN	02735	35495
Q1428	151-0349-00			TRANSISTOR: SILICON, NPN, SEL FROM MJE2801	80009	151-0349-00
Q1436A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1445A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1451	151-0126-00			TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q1455	151-0260-02			TRANSISTOR: SILICON, NPN	80009	151-0260-02
Q1458	151-0349-00			TRANSISTOR: SILICON, NPN, SEL FROM MJE2801	80009	151-0349-00
Q1485	151-0219-00			TRANSISTOR: SILICON, PNP	80009	151-0219-00
Q1489A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1496	151-0260-02			TRANSISTOR: SILICON, NPN	80009	151-0260-02
Q1498	151-0349-00			TRANSISTOR: SILICON, NPN, SEL FROM MJE2801	80009	151-0349-00
Q1508A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1522	151-0228-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4888	80009	151-0228-00
Q1526	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q1534	151-0136-00			TRANSISTOR: SILICON, NPN	02735	35495
Q1538	151-0349-00			TRANSISTOR: SILICON, NPN, SEL FROM MJE2801	80009	151-0349-00
Q1546	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q1555	151-0324-00			TRANSISTOR: SILICON, PNP	80009	151-0324-00
Q1560A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1576A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q1582	151-0126-00			TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q1585	151-0260-02			TRANSISTOR: SILICON, NPN	80009	151-0260-02
Q1588	151-0349-00			TRANSISTOR: SILICON, NPN, SEL FROM MJE2801	80009	151-0349-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q1603	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q1624	151-0309-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0309-00
Q1634	151-1021-00			TRANSISTOR: SILICON, JFE	80009	151-1021-00
Q1694	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q1700	151-0342-00			TRANSISTOR: SILICON, PNP	80009	151-0342-00
Q1710	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q1720	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q1785	151-0390-00			TRANSISTOR: SILICON, NPN	80009	151-0390-00
Q1786	151-0126-00			TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q1814	151-0190-00			TRANSISTOR: SILICON, NPN	80009	151-0190-00
Q1824	151-0325-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4258	80009	151-0325-00
Q1854	151-0438-00			TRANSISTOR: SILICON, PNP, SEL FROM SPS6927	80009	151-0438-00
Q1858	151-0441-00			TRANSISTOR: SILICON, NPN	80009	151-0441-00
Q1864	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1868	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q1874	151-0472-00			TRANSISTOR: SILICON, NPN	80009	151-0472-00
Q1878	151-0410-00			TRANSISTOR: SILICON, PNP	80009	151-0410-00
Q1884	151-0274-00			TRANSISTOR: SILICON, NPN	80009	151-0274-00
Q1894	151-0270-00			TRANSISTOR: SILICON, PNP	80009	151-0270-00
Q1914	151-1021-00			TRANSISTOR: SILICON, JFE	80009	151-1021-00
Q1924	151-0325-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4258	80009	151-0325-00
Q1932	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1938	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1954	151-0441-00			TRANSISTOR: SILICON, NPN	80009	151-0441-00
Q1958	151-0438-00			TRANSISTOR: SILICON, PNP, SEL FROM SPS6927	80009	151-0438-00
Q1964	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q1968	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1974	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1978	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q1984	151-0274-00			TRANSISTOR: SILICON, NPN	80009	151-0274-00
Q1994	151-0270-00			TRANSISTOR: SILICON, PNP	80009	151-0270-00
Q2108	151-0126-00			TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2132	151-0169-00			TRANSISTOR: SILICON, NPN	80009	151-0169-00
Q2140	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2152	151-0350-00			TRANSISTOR: SILICON, PNP	80009	151-0350-00
Q2156	151-0385-00			TRANSISTOR: SILICON, PNP	02735	2N5416
Q2160	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2162	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2172	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2178	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2182	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2188	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2195	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2202	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2206	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q2216	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q2236	151-0325-00			TRANSISTOR: SILICON, PNP, SEL FROM 2N4258	80009	151-0325-00
Q2242	151-0411-00			TRANSISTOR: SILICON, NPN	80009	151-0411-00
Q2254	151-0270-00			TRANSISTOR: SILICON, PNP	80009	151-0270-00
Q2264	151-0274-00			TRANSISTOR: SILICON, NPN	80009	151-0274-00
Q2274	151-0417-00	B010100	B020911	TRANSISTOR: SILICON, PNP	07263	S21766
Q2274	151-0220-00	B020912		TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q2302	151-0333-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q2306	151-0333-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q2316	151-0333-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0333-00
Q2322	151-0302-00		TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2328	151-0302-00		TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2332	151-0219-00		TRANSISTOR: SILICON, PNP	80009	151-0219-00
Q2336	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2344	151-0302-00		TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2354	151-0302-00		TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2362	151-0453-00		TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2364	151-0302-00		TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q2368	151-0453-00		TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2372	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2374	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2378	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2384	151-0350-00		TRANSISTOR: SILICON, PNP	80009	151-0350-00
Q2394	151-0347-00		TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2406	151-0347-00		TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2422	151-0453-00		TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2432	151-0453-00		TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2436	151-0432-00		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q2468	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2469	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2478	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2479	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2502	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2506	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2508	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2514	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2526	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2528	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2532	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2536	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2538	151-0508-00		TRANSISTOR: SILICON, NPN, PROGRAMMABLE	03508	2N6027
Q2542	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2572	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2576	151-0126-00		TRANSISTOR: SILICON, NPN	80009	151-0126-00
Q2578	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2584	151-0223-00		TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q2586	151-0223-00		TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q2588	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2612	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2626	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2632	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2642	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2644	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2654	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2658	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2664	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2668	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2674	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2678	151-0192-00		TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2686	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2688	151-0301-00		TRANSISTOR: SILICON, PNP	04713	2N2907A

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q2694	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2704	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2714	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2730	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2734	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2745	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2752	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2755	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2772	151-0508-00			TRANSISTOR: SILICON, NPN, PROGRAMMABLE	03508	2N6027
Q2774	151-0508-00			TRANSISTOR: SILICON, NPN, PROGRAMMABLE	03508	2N6027
Q2784	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2788	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2802	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2804	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2808	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2814	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2818	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2822	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2826	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2828	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2834	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2838	151-0444-00			TRANSISTOR: SILICON, NPN	80009	151-0444-00
Q2842	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2852	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2862	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2864	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2868	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2873	151-0443-00			TRANSISTOR: SILICON, PNP	80009	151-0443-00
Q2874	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2904	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2914	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2918	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2924	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2942	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2946	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2966	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2972	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q2976	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q2988	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q2992	151-0301-00			TRANSISTOR: SILICON, PNP	04713	2N2907A
Q2996	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q3012	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3016	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3022	151-0453-00			TRANSISTOR: SILICON, PNP	80009	151-0453-00
Q3026	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q3048	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q3054	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3064	151-0347-00			TRANSISTOR: SILICON, NPN	80009	151-0347-00
Q3234	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3264	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3321	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3323	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3330	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q3351	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3353	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3361	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3406A, B	151-0232-00			TRANSISTOR: SILICON, NPN, DUAL	80009	151-0232-00
Q3411	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3414	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3416	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3419	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3427	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q3442	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3445	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q3486	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3489	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3493	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q3499	151-0220-00			TRANSISTOR: SILICON, PNP	80009	151-0220-00
Q4336	151-0198-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0198-00
Q4364	151-0198-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0198-00
Q4374	151-0188-00			TRANSISTOR: SILICON, PNP	80009	151-0188-00
Q4392	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q4424	151-0198-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS918	80009	151-0198-00
Q4432	151-0223-00			TRANSISTOR: SILICON, NPN	80009	151-0223-00
Q4438	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q4442	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q4448	151-0216-00			TRANSISTOR: SILICON, PNP	80009	151-0216-00
Q4456	151-1022-00			TRANSISTOR: SILICON, JFE, SEL FROM 2N4392	80009	151-1022-00
Q4462	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q4468	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q4474	151-0192-00			TRANSISTOR: SILICON, NPN, SEL FROM MPS6521	80009	151-0192-00
Q4488	151-0188-00			TRANSISTOR: SILICON, PNP	80009	151-0188-00
Q4633	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
Q4652	151-0302-00			TRANSISTOR: SILICON, NPN	80009	151-0302-00
R18	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R22	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R24	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R26	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R28	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R29	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R32	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R34	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R36	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R38	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R42	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R44	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R46	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R48	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R52	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R54	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R56	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R58	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R65	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R66	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R67	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R68	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R87	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R88	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R102	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R112	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R117	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R121	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R122	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R123	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R126	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R127	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R128	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R131	315-0150-00			RES., FXD, CMPSN: 15 OHM, 5%, 0.25W	01121	CB1505
R132	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R133	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R135	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R136	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R138	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R142	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R144	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R152	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R153	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R156	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R157	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R162	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R164	315-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 0.25W	01121	CB1825
R172	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R173	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R174	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R178	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R180	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R181	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R182	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R183	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R184	301-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.50W	01121	EB1025
R186	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R187	315-0391-00			RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R192	321-0231-00			RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R193	321-0231-00			RES., FXD, FILM: 2.49K OHM, 1%, 0.125W	91637	MFF1816G24900F
R194	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R195	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R196	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R303	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R304	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R307	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R308	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R319	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R320	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R321	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R322	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R323	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R324	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R325	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R326	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R327	315-0471-00		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R328	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R329	315-0912-00		RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R331	315-0123-00		RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R332	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R334	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R335	315-0123-00		RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R336	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R342	315-0912-00		RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R345	311-1373-00		RES., VAR, NONWIR: 5K OHM, 20%, 1W	01121	16M188
R352	315-0153-00		RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R356	315-0100-00		RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R372	315-0823-00		RES., FXD, CMPSN: 82K OHM, 5%, 0.25W	01121	CB8235
R373	321-0258-00		RES., FXD, FILM: 4.75K OHM, 1%, 0.125W	91637	MFF1816G47500F
R374	321-0822-06		RES., FXD, FILM: 1.76K OHM, 0.25%, 0.125W	91637	MFF1816C17600C
R375	311-1566-00		RES., VAR, NONWIR: 200 OHM, 20%, 0.50W	73138	91-88-0
R376	321-0321-07		RES., FXD, FILM: 21.5K OHM, 0.1%, 0.125W	91637	MFF1816C21501B
R380	315-0362-00		RES., FXD, CMPSN: 3.6K OHM, 5%, 0.25W	01121	CB3625
R381	321-0321-07		RES., FXD, FILM: 21.5K OHM, 0.1%, 0.125W	91637	MFF1816C21501B
R382	315-0223-00		RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R383	321-0166-00		RES., FXD, FILM: 523 OHM, 1%, 0.125W	91637	MFF1816G523R0F
R384	308-0307-00		RES., FXD, WW: 5K OHM, 1%, 3W	91637	RS2B-B50000F
R385	311-1225-00		RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R386	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R387	321-1611-07		RES., FXD, FILM: 550 OHM, 0.1%, 0.125W	91637	MFF1816C550R0B
R392	321-1612-07		RES., FXD, FILM: 4.455K OHM, 0.1%, 0.125W	91637	MFF1816C44550B
R393	321-1611-07		RES., FXD, FILM: 550 OHM, 0.1%, 0.125W	91637	MFF1816C550R0B
R394	321-1612-07		RES., FXD, FILM: 4.455K OHM, 0.1%, 0.125W	91637	MFF1816C44550B
R395	321-1611-07		RES., FXD, FILM: 550 OHM, 0.1%, 0.125W	91637	MFF1816C550R0B
R396	321-1612-07		RES., FXD, FILM: 4.455K OHM, 0.1%, 0.125W	91637	MFF1816C44550B
R397	321-0813-07		RES., FXD, FILM: 495 OHM, 0.1%, 0.125W	91637	MFF1816C495R0B
R502	321-0022-00		RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R503	321-0022-00		RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R505	321-0070-00		RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R506	321-0138-00		RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267R0F
R507	321-0064-00		RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R509	323-0138-00		RES., FXD, FILM: 267 OHM, 1%, 0.50W	75042	CECT0-2670F
R511	317-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R512	321-0022-00		RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R513	321-0022-00		RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R515	321-0070-00		RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R516	321-0138-00		RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267R0F
R517	321-0064-00		RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R521	315-0511-00		RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R522	315-0272-00		RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R523	315-0273-00		RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R524	315-0512-00		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R526	321-0241-00		RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R527	315-0912-00		RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R532	315-0472-00		RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R533	321-0296-00		RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R537	321-0296-00		RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R611	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R613	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R615	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R616	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R617	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R621	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R622	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R623	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R624	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R626	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R627	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R632	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R633	321-0296-00			RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R637	321-0296-00			RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R638	321-0296-00			RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R641	321-0144-00			RES., FXD, FILM: 309 OHM, 1%, 0.125W	91637	MFF1816G309ROF
R642	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249ROF
R643	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R644	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R645	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R646	301-0620-00			RES., FXD, CMPSN: 62 OHM, 5%, 0.50W	01121	EB6205
R647	301-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.50W	01121	EB5105
R648	317-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.125W	01121	BB5105
R663	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R665	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R666	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R667	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R669	323-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.50W	75042	CECTO-2670F
R671	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R673	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R675	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R676	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R677	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R681	323-0165-00			RES., FXD, FILM: 511 OHM, 1%, 0.5W	75042	CECTO-5110F
R683	321-0043-00			RES., FXD, FILM: 27.4 OHM, 1%, 0.125W	91637	MFF1816G27R40F
R684	321-0075-00			RES., FXD, FILM: 59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R685	323-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.50W	75042	CECTO-1001F
R686	311-0605-00			RES., VAR, NONWIR: 200 OHM, 10%, 0.50W	80740	62-54-3
R687	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R688	317-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.125W	01121	BB1515
R689	311-1261-00			RES., VAR, NONWIR: 500 OHM, 10%, 0.50W	32997	3329P-L58-501
R691	323-0165-00			RES., FXD, FILM: 511 OHM, 1%, 0.5W	75042	CECTO-5110F
R693	321-0043-00			RES., FXD, FILM: 27.4 OHM, 1%, 0.125W	91637	MFF1816G27R40F
R694	321-0075-00			RES., FXD, FILM: 59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R695	323-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.50W	75042	CECTO-1001F
R696	317-0241-00	B010100	B0202911	RES., FXD, CMPSN: 240 OHM, (NOM VALUE), SEL	01121	BB2415
R696	317-0750-00	B020912		RES., FXD, CMPSN: 75 OHM, (NOM VALUE), SEL	01121	BB7505
R697	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R698	317-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.125W	01121	BB1515
R822	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R832	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R841	321-1068-07			RES., FXD, FILM: 50.5 OHM, 0.1%, 0.125W	91637	MFF1816C50R50B
R842	321-1068-07			RES., FXD, FILM: 50.5 OHM, 0.1%, 0.125W	91637	MFF1816C50R50B

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R843	321-1068-07			RES., FXD, FILM: 50.5 OHM, 0.1%, 0.125W	91637	MFF1816C50R50B
R844	321-1068-07			RES., FXD, FILM: 50.5 OHM, 0.1%, 0.125W	91637	MFF1816C50R50B
R851	323-0187-00			RES., FXD, FILM: 866 OHM, 1%, 0.50W	75042	CECTO-8660F
R852	321-0088-00			RES., FXD, FILM: 80.6 OHM, 1%, 0.125W	91637	MFF1816G80R60F
R853	321-0088-00			RES., FXD, FILM: 80.6 OHM, 1%, 0.125W	91637	MFF1816G80R60F
R861	323-0187-00			RES., FXD, FILM: 866 OHM, 1%, 0.50W	75042	CECTO-8660F
R862	321-0088-00			RES., FXD, FILM: 80.6 OHM, 1%, 0.125W	91637	MFF1816G80R60F
R863	321-0088-00			RES., FXD, FILM: 80.6 OHM, 1%, 0.125W	91637	MFF1816G80R60F
R868	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R869	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R870	321-0218-00			RES., FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	MFF1816G18200F
R917	311-0546-00			RES., VAR, NONWIR: 10K OHM, 20%, 0.75W	80009	311-0546-00
R1205	304-0270-00			RES., FXD, CMPSN: 27 OHM, 10%, 1W	01121	GB2701
R1208	304-0473-00			RES., FXD, CMPSN: 47K OHM, 10%, 1W	01121	GB4731
R1210	303-0304-00			RES., FXD, CMPSN: 300K OHM, 5%, 1W	01121	GB3045
R1213	304-0473-00			RES., FXD, CMPSN: 47K OHM, 10%, 1W	01121	GB4731
R1219	302-0565-00			RES., FXD, CMPSN: 5.6M OHM, 10%, 0.50W	01121	EB5651
R1221	304-0154-00			RES., FXD, CMPSN: 150K OHM, 10%, 1W	01121	GB1541
R1225	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1231	307-0057-00			RES., FXD, CMPSN: 5.1 OHM, 5%, 0.50W	01121	EB51G5
R1232	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R1236	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1239	307-0057-00			RES., FXD, CMPSN: 5.1 OHM, 5%, 0.50W	01121	EB51G5
R1240	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R1242	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R1243	315-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
R1244	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R1245	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1246	316-0561-00			RES., FXD, CMPSN: 560 OHM, 10%, 0.25W	01121	CB5611
R1247	315-0684-00			RES., FXD, CMPSN: 680K OHM, 5%, 0.25W	01121	CB6845
R1248	302-0332-00			RES., FXD, CMPSN: 3.3K OHM, 10%, 0.50W	01121	EB3321
R1249	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1253	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R1258	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R1259	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1260	315-0334-00			RES., FXD, CMPSN: 330K OHM, 5%, 0.25W	01121	CB3345
R1261	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1263	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1265	315-0184-00			RES., FXD, CMPSN: 180K OHM, 5%, 0.25W	01121	CB1845
R1266	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1267	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R1268	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1269	315-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245
R1270	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R1271	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R1272	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1273	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1274	315-0563-00			RES., FXD, CMPSN: 56K OHM, 5%, 0.25W	01121	CB5635
R1275	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R1276	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1277	315-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.25W	01121	CB5605
R1279	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R1280	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1281	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R1282	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R1283	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R1284	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
R1285	321-0313-00			RES.,FXD,FILM:17.8K OHM,1%,0.125W	91637	MFF1816G17801F
R1286	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
R1287	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEATO-10R00F
R1290	321-0391-00			RES.,FXD,FILM:115K OHM,1%,0.125K	91637	MFF1816G11502F
R1291	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
R1293	311-1239-00			RES.,VAR, NONWIR:2.5K OHM,10%,0.50W	73138	72X-76-0-252K
R1294	321-0283-00			RES.,FXD,FILM:8.66K OHM,1%,0.125W	91637	MFF1816G86600F
R1296	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
R1297	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1300	321-0366-00			RES.,FXD,FILM:63.4K OHM,1%,0.125W	91637	MFF1816G63401F
R1301	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R1302	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R1303	321-0466-00			RES.,FXD,FILM:698K OHM,1%,0.125W	91637	MFF1816G69802F
R1304	321-0286-00			RES.,FXD,FILM:9.31K OHM,1%,0.125W	91637	MFF1816G93100F
R1305	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
R1321	315-0220-00	B010100	B010207	RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
R1321	315-0330-00	B010208		RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
R1322	307-0106-00	XB010208		RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
R1327	301-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.50W	01121	EB3915
R1375	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R1401	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R1402	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R1404	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R1406	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R1408	315-0274-00			RES.,FXD,CMPSN:270K OHM,5%,0.25W	01121	CB2745
R1412	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
R1413	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
R1414	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R1415	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
R1416	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R1417	321-0436-00			RES.,FXD,FILM:340K OHM,1%,0.125W	91637	MFF1816G34002F
R1418	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R1419	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
R1420	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
R1421	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
R1422	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R1424	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R1425	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
R1426	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R1428	308-0702-00			RES.,FXD,WW:0.33 OHM,5%,2W	75042	BWH-R3300J
R1429	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R1431	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R1432	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R1434	315-0334-00			RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R1436	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R1437	315-0274-00			RES.,FXD,CMPSN:270K OHM,5%,0.25W	01121	CB2745
R1440	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
R1441	321-1296-07			RES.,FXD,FILM:12K OHM,0.1%,0.125W	91637	MFF1816C12001B
R1443	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115

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R1444	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1446	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R1448	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R1449	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1451	301-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.50W	01121	EB3925
R1453	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R1456	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R1457	308-0643-00			RES., FXD, WW: 0.1 OHM, 3%, 3W	91637	RS2B-ER1000H
R1459	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R1461	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R1463	321-1296-07			RES., FXD, FILM: 12K OHM, 0.1%, 0.125W	91637	MFF1816C12001B
R1464	321-0332-07			RES., FXD, FILM: 28K OHM, 0.1%, 0.125W	91637	MFF1816C28001B
R1467	315-0184-00			RES., FXD, CMPSN: 180K OHM, 5%, 0.25W	01121	CB1845
R1480	315-0124-00			RES., FXD, CMPSN: 120K OHM, 5%, 0.25W	01121	CB1245
R1481	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1485	315-0162-00			RES., FXD, CMPSN: 1.6K OHM, 5%, 0.25W	01121	CB1625
R1487	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1490	301-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.50W	01121	EB4725
R1492	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R1493	315-0391-00			RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R1495	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1497	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R1498	308-0643-00			RES., FXD, WW: 0.1 OHM, 3%, 3W	91637	RS2B-ER1000H
R1499	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1502	315-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R1504	323-0264-00			RES., FXD, FILM: 5.49K OHM, 1%, 0.50W	91637	MFF1226G54900F
R1506	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1509	315-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245
R1511	315-0682-00			RES., FXD, CMPSN: 6.8K OHM, 5%, 0.25W	01121	CB6825
R1512	321-0272-00			RES., FXD, FILM: 6.65K OHM, 1%, 0.125W	91637	MFF1816G66500F
R1513	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R1514	321-0338-00			RES., FXD, FILM: 32.4K OHM, 1%, 0.125W	91637	MFF1816G32401F
R1517	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R1518	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1522	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R1524	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1528	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R1529	301-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.50W	01121	EB1235
R1531	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R1533	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R1535	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R1537	308-0703-00			RES., FXD, WW: 1.8 OHM, 5%, 2W	75042	BWH-1R800J
R1539	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1543	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R1544	321-0293-00			RES., FXD, FILM: 11K OHM, 1%, 0.125W	91637	MFF1816G11001F
R1545	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R1548	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R1549	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R1551	308-0702-00			RES., FXD, WW: 0.33 OHM, 5%, 2W	75042	BWH-R3300J
R1562	315-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
R1564	321-0924-07			RES., FXD, FILM: 40K OHM, 0.1%, 0.125W	91637	MFF1816C40001B
R1565	321-0926-07			RES., FXD, FILM: 4K OHM, 0.1%, 0.125W	91637	MFF1816C40000B
R1566	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1567	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R1568	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R1570	315-0334-00			RES., FXD, CMPSN: 330K OHM, 5%, 0.25W	01121	CB3345
R1571	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1573	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R1574	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R1577	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R1579	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R1580	315-0750-00			RES., FXD, CMPSN: 75 OHM, 5%, 0.25W	01121	CB7505
R1583	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1585	308-0460-00	XB020598		RES., FXD, WW: 56 OHM, 5%, 3W	91637	R52B-B56R00J
R1586	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R1587	308-0643-00			RES., FXD, WW: 0.1 OHM, 3%, 3W	91637	RS2B-ER1000H
R1589	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1591	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1603	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1604	301-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.50W	01121	EB2715
R1606	301-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.50W	01121	EB2715
R1610	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R1613	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R1614	321-0201-00			RES., FXD, FILM: 1.21K OHM, 1%, 0.125W	91637	MFF1816G12100F
R1615	307-0059-00			RES., FXD, CMPSN: 6.2 OHM, 5%, 0.50W	01121	EB62G5
R1622	321-0068-00			RES., FXD, FILM: 49.9 OHM, 1%, 0.125W	91637	MFF1816G49R90F
R1623	321-0243-00			RES., FXD, FILM: 3.32K OHM, 1%, 0.125W	91637	MFF1816G33200F
R1624	321-0074-00	B010100	B010199	RES., FXD, FILM: 57.6 OHM, 1%, 0.125W	91637	MFF1816G57R60F
R1624	321-0073-00	B010200		RES., FXD, FILM: 56.2 OHM, 1%, 0.125W	91637	MFF1816G56R20F
R1625	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R1626	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1629	311-1558-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.50W	73138	91-80-0
R1630	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1631	315-0184-00			RES., FXD, CMPSN: 180K OHM, 5%, 0.25W	01121	CB1845
R1632	315-0204-00			RES., FXD, CMPSN: 200K OHM, 5%, 0.25W	01121	CB2045
R1635	321-0209-00			RES., FXD, FILM: 1.47K OHM, 1%, 0.125W	91637	MFF1816G14700F
R1636	321-0236-00			RES., FXD, FILM: 2.8K OHM, 1%, 0.125W	91637	MFF1816G28000F
R1657	317-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.125W	01121	BB2705
R1658	311-0605-00			RES., VAR, NONWIR: 200 OHM, 10%, 0.50W	80740	62-54-3
R1659	317-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.125W	01121	BB2705
R1660	324-0114-00			RES., FXD, FILM: 150 OHM, 1%, 1W	91637	MFF1226G1500F
R1661	324-0114-00			RES., FXD, FILM: 150 OHM, 1%, 1W	91637	MFF1226G1500F
R1662	321-0039-00			RES., FXD, FILM: 24.9 OHM, 1%, 0.125W	91637	MFF1816G24R90F
R1663	321-0039-00			RES., FXD, FILM: 24.9 OHM, 1%, 0.125W	91637	MFF1816G24R90F
R1667	315-0561-00	B010100	B020489	RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R1667	315-0911-00	B020490		RES., FXD, CMPSN: 910 OHM 5%, 0.25W	01121	CB9115
R1668	315-0561-00	B010100	B020489	RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R1668	315-0911-00	B020490		RES., FXD, CMPSN: 910 OHM, 5%, 0.25W	01121	CB9115
R1670	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R1672	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R1676	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R1677	323-0069-00			RES., FXD, FILM: 51.1 OHM, 1%, 0.50W	91637	MFF1226G51R10F
R1679	323-0069-00			RES., FXD, FILM: 51.1 OHM, 1%, 0.50W	91637	MFF1226G51R10F
R1680	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R1682	323-0121-00			RES., FXD, FILM: 178 OHM, 1%, 0.50W	75042	CECTO-1780F

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1683	317-0111-00			RES., FXD, CMPSN: 110 OHM, 5%, 0.125W	01121	BB1115
R1685	317-0750-00			RES., FXD, CMPSN: 75 OHM, 5%, 0.125W	01121	BB7505
R1686	317-0750-00			RES., FXD, CMPSN: 75 OHM, 5%, 0.125W	01121	BB7505
R1687	317-0111-00			RES., FXD, CMPSN: 110 OHM, 5%, 0.125W	01121	BB1115
R1689	323-0121-00			RES., FXD, FILM: 178 OHM, 1%, 0.50W	75042	CECTO-1780F
R1692	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1694	322-0212-00			RES., FXD, FILM: 1.58K OHM, 1%, 0.25W	75042	CEBT0-1581F
R1695	311-1561-00			RES., VAR, NONWIR: 2.5K OHM, 20%, 0.50W	73138	91A R2500
R1696	321-0236-00			RES., FXD, FILM: 2.8K OHM, 1%, 0.125W	91637	MFF1816G28000F
R1700	311-1564-00			RES., VAR, NONWIR: 500 OHM, 20%, 0.50W	73138	91A R500
R1702	321-0185-00			RES., FXD, FILM: 825 OHM, 1%, 0.125W	91637	MFF1816G825ROF
R1711	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1718	321-0033-00			RES., FXD, FILM: 21.5 OHM, 1%, 0.125W	91637	MFF1816G21R50F
R1720	321-0117-00			RES., FXD, FILM: 162 OHM, 1%, 0.125W	91637	MFF1816G162ROF
R1722	321-0085-00			RES., FXD, FILM: 75 OHM, 1%, 0.125W	91637	MFF1816G75R00F
R1724	321-0085-00			RES., FXD, FILM: 75 OHM, 1%, 0.125W	91637	MFF1816G75R00F
R1726	308-0736-00			RES., FXD, WW: 200 OHM, 1%, 3W	91637	RS2B-B20OR0F
R1730	311-1259-00			RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3329P-L58-101
R1731	317-0131-00			RES., FXD, CMPSN: 130 OHM, 5%, 0.125W	01121	BB1315
R1732	317-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.125W	01121	BB2705
R1733	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R1734	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R1735	323-0069-00			RES., FXD, FILM: 51.1 OHM, 1%, 0.50W	91637	MFF1226G51R10F
R1737	323-0069-00			RES., FXD, FILM: 51.1 OHM, 1%, 0.50W	91637	MFF1226G51R10F
R1738	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R1739	317-0047-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.125W	01121	BB47G5
R1741	317-0111-00			RES., FXD, CMPSN: 110 OHM, 5%, 0.125W	01121	BB1115
R1743	311-1261-00			RES., VAR, NONWIR: 500 OHM, 10%, 0.50W	32997	3329P-L58-501
R1745	317-0561-00			RES., FXD, CMPSN: 560 OHM, 5%, 0.125W	01121	BB5615
R1747	317-0621-00	B010100	B010205	RES., FXD, CMPSN: 620 OHM, (NOM VALUE), SEL	01121	BB6215
R1747	317-0561-00	B010206		RES., FXD, CMPSN: 560 OHM, (NOM VALUE), SEL	01121	BB5615
R1749	311-0635-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	73138	82-32-0
R1751	311-1265-00	XB020490		RES., VAR, NONWIR: 2K OHM, 10%, 0.50W	32997	3329P-L58-202
R1753	323-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.50W	75042	CECTO-1000F
R1754	323-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.50W	75042	CECTO-1000F
R1756	317-0111-00			RES., FXD, CMPSN: 110 OHM, 5%, 0.125W	01121	BB1115
R1758	311-1261-00			RES., VAR, NONWIR: 500 OHM, 10%, 0.50W	32997	3329P-L58-501
R1760	317-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.125W	01121	BB7515
R1762	317-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.125W	01121	BB4715
R1764	311-1265-00			RES., VAR, NONWIR: 2K OHM, 10%, 0.50W	32997	3329P-L58-202
R1767	323-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.50W	75042	CECTO-1000F
R1768	323-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.50W	75042	CECTO-1000F
R1770	308-0692-00			RES., FXD, WW: 44 OHM, 1%, 3W	91637	RS2B44R00F
R1771	323-0122-00			RES., FXD, FILM: 182 OHM, 1%, 0.50W	75042	CECTO-1820F
R1782	307-0292-15			RES., FXD, FILM: TERMINATION BOARD	80009	307-0292-15
R1783	321-0324-00			RES., FXD, FILM: 23.2K OHM, 1%, 0.125W	91637	MFF1816G23201F
R1784	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R1785	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R1786	315-0362-00			RES., FXD, CMPSN: 3.6K OHM, 5%, 0.25W	01121	CB3625
R1790	323-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.50W	91637	MFF1226G45R30F
R1792	323-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.50W	91637	MFF1226G45R30F
R1795	323-0077-00			RES., FXD, FILM: 61.9 OHM, 1%, 0.50W	75042	CECTO-61R90F
R1796	323-0145-00			RES., FXD, FILM: 316 OHM, 1%, 0.50W	91637	MFF1226G316ROF

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R1797	321-0063-00			RES., FXD, FILM:44.2 OHM, 1%, 0.125W	91637	MFF1816G44R20F
R1799	308-0248-00			RES., FXD, WW:150 OHM, 1%, 5W	91637	RS2A-B150ROF
R1813	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R1814	321-0284-00			RES., FXD, FILM:8.87K OHM, 1%, 0.125W	91637	MFF1816G88700F
R1815	311-1228-00			RES., VAR, NONWIR:10K OHM, 20%, 0.50W	32997	3386F-T04-103
R1816	321-0284-00			RES., FXD, FILM:8.87K OHM, 1%, 0.125W	91637	MFF1816G88700F
R1821	315-0681-00			RES., FXD, CMPSN:680 OHM, 5%, 0.25W	01121	CB6815
R1822	321-0075-00			RES., FXD, FILM:59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R1823	321-0181-00			RES., FXD, FILM:750 OHM, 1%, 0.125W	91637	MFF1816G750ROF
R1824	315-0332-00			RES., FXD, CMPSN:3.3K OHM, 5%, 0.25W	01121	CB3325
R1830	321-0345-00			RES., FXD, FILM:38.3K OHM, 1%, 0.125W	91637	MFF1816G38301F
R1832	311-1221-00			RES., VAR, NONWIR:50 OHM, 20%, 0.50W	32997	3386F-T04-500
R1834	315-0222-00			RES., FXD, CMPSN:2.2K OHM, 5%, 0.25W	01121	CB2225
R1835	321-0132-00			RES., FXD, FILM:232 OHM, 1%, 0.125W	91637	MFF1816G232ROF
R1836	311-1227-00			RES., VAR, NONWIR:5K OHM, 20%, 0.50W	32997	3386F-T04-502
R1837	321-0100-00			RES., FXD, FILM:107 OHM, 1%, 0.125W	91637	MFF1816G107ROF
R1838	321-0132-00			RES., FXD, FILM:232 OHM, 1%, 0.125W	91637	MFF1816G232ROF
R1842	315-0331-00			RES., FXD, CMPSN:330 OHM, 5%, 0.25W	01121	CB3315
R1843	315-0431-00			RES., FXD, CMPSN:430 OHM, 5%, 0.25W	01121	CB4315
R1844	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705
R1849	321-0351-00			RES., FXD, FILM:44.2K OHM, 1%, 0.125W	91637	MFF1816G44201F
R1851	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705
R1852	322-0215-00			RES., FXD, FILM:1.69K OHM, 1%, 0.25W	75042	CEBTO-1691F
R1854	301-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.50W	01121	EB1035
R1855	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1858	305-0242-00			RES., FXD, CMPSN:2.4K OHM, 5%, 2W	01121	HB2425
R1861	321-0289-01			RES., FXD, FILM:10K OHM, 0.5%, 0.125W	91637	MFF1816G10001D
R1862	315-0331-00			RES., FXD, CMPSN:330 OHM, 5%, 0.25W	01121	CB3315
R1863	321-0317-00			RES., FXD, FILM:19.6K OHM, 1%, 0.125W	91637	MFF1816G19601F
R1864	315-0103-00			RES., FXD, CMPSN:10K OHM, 5%, 0.25W	01121	CB1035
R1865	323-0385-01			RES., FXD, FILM:100K OHM, 0.5%, 0.50W	75042	CECTO-1003D
R1868	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1871	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1873	315-0510-00			RES., FXD, CMPSN:51 OHM, 5%, 0.25W	01121	CB5105
R1874	315-0133-00			RES., FXD, CMPSN:13K OHM, 5%, 0.25W	01121	CB1335
R1875	311-1261-00			RES., VAR, NONWIR:500 OHM, 10%, 0.50W	32997	3329P-L58-501
R1876	315-0243-00			RES., FXD, CMPSN:24K OHM, 5%, 0.25W	01121	CB2435
R1877	315-0472-00			RES., FXD, CMPSN:4.7K OHM, 5%, 0.25W	01121	CB4725
R1878	315-0821-00			RES., FXD, CMPSN:820 OHM, 5%, 0.25W	01121	CB8215
R1879	315-0621-00			RES., FXD, CMPSN:620 OHM, 5%, 0.25W	01121	CB6215
R1881	321-0237-00			RES., FXD, FILM:2.87K OHM, 1%, 0.125W	91637	MFF1816G28700F
R1882	321-0322-00			RES., FXD, FILM:22.1K OHM, 1%, 0.125W	91637	MFF1816G22101F
R1883	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1884	315-0100-00			RES., FXD, CMPSN:10 OHM, 5%, 0.25W	01121	CB1005
R1891	321-0309-00			RES., FXD, FILM:16.2K OHM, 1%, 0.125W	91637	MFF1816G16201F
R1892	322-0322-00			RES., FXD, FILM:22.1K OHM, 1%, 0.25W	75042	CEBTO-2212F
R1893	315-0470-00			RES., FXD, CMPSN:47 OHM, 5%, 0.25W	01121	CB4705
R1894	322-0283-00			RES., FXD, FILM:8.66K OHM, 1%, 0.25W	91637	MFF1421G86600F
R1895	315-0823-00			RES., FXD, CMPSN:82K OHM, 5%, 0.25W	01121	CB8235
R1896	315-0203-00			RES., FXD, CMPSN:20K OHM, 5%, 0.25W	01121	CB2035
R1897	311-1232-00			RES., VAR, NONWIR:50K OHM, 20%, 0.50W	32997	3386F-T04-503
R1902	307-0103-00			RES., FXD, CMPSN:2.7 OHM, 5%, 0.25W	01121	CB27G5
R1906	307-0103-00			RES., FXD, CMPSN:2.7 OHM, 5%, 0.25W	01121	CB27G5

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R1913	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249ROF
R1914	321-0158-00			RES., FXD, FILM: 432 OHM, 1%, 0.125W	91637	MFF1816G432ROF
R1916	315-0304-00			RES., FXD, CMPSN: 300K OHM, 5%, 0.25W	01121	CB3045
R1917	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R1921	323-0160-00			RES., FXD, FILM: 453 OHM, 1%, 0.50W	75042	CECTO-4530F
R1922	321-0075-00			RES., FXD, FILM: 59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R1923	321-0181-00			RES., FXD, FILM: 750 OHM, 1%, 0.125W	91637	MFF1816G750ROF
R1924	322-0227-00			RES., FXD, FILM: 2.26K OHM, 1%, 0.25W	91637	MFF1421G22600F
R1930	321-0246-00			RES., FXD, FILM: 3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R1931	321-0295-00			RES., FXD, FILM: 11.5K OHM, 1%, 0.125W	91637	MFF1816G11501F
R1932	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R1934	321-0173-00			RES., FXD, FILM: 619 OHM, 1%, 0.125W	91637	MFF1816G619ROF
R1935	311-1227-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	32997	3386F-T04-502
R1936	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R1938	321-0248-00			RES., FXD, FILM: 3.74K OHM, 1%, 0.125W	91637	MFF1816G37400F
R1939	321-0202-00			RES., FXD, FILM: 1.24K OHM, 1%, 0.125W	91637	MFF1816G12400F
R1941	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R1943	315-0431-00			RES., FXD, CMPSN: 430 OHM, 5%, 0.25W	01121	CB4315
R1944	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1945	323-0197-00			RES., FXD, FILM: 1.1K OHM, 1%, 0.50W	75042	CECTO-1101F
R1949	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R1951	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1952	322-0215-00			RES., FXD, FILM: 1.69K OHM, 1%, 0.25W	75042	CEBTO-1691F
R1954	301-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.50W	01121	EB1035
R1955	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R1958	305-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 2W	01121	HB2425
R1961	321-0289-01			RES., FXD, FILM: 10K OHM, 0.5%, 0.125W	91637	MFF1816G10001D
R1962	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R1963	321-0896-03			RES., FXD, FILM: 9.8K OHM, 0.25%, 0.125W	91637	MFF1816D98000C
R1964	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R1965	323-0385-01			RES., FXD, FILM: 100K OHM, 0.5%, 0.50W	75042	CECTO-1003D
R1968	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R1969	301-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.50W	01121	EB3025
R1971	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R1972	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R1973	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R1974	315-0133-00			RES., FXD, CMPSN: 13K OHM, 5%, 0.25W	01121	CB1335
R1981	321-0292-00			RES., FXD, FILM: 10.7K OHM, 1%, 0.125W	91637	MFF1816G10701F
R1982	321-0277-00			RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	91637	MFF1816G75000F
R1983	315-0270-00			RES., FXD, CMPSN: 27 OHM, 5%, 0.25W	01121	CB2705
R1984	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R1989	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R1991	321-0240-00			RES., FXD, FILM: 3.09K OHM, 1%, 0.125W	91637	MFF1816G30900F
R1992	322-0336-00			RES., FXD, FILM: 30.9K OHM, 1%, 0.25W	75042	CEBTO-3092F
R1993	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R1994	321-0223-00			RES., FXD, FILM: 2.05K OHM, 1%, 0.125W	91637	MFF1816G20500F
R2013	315-0102-03			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2015	301-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.50W	01121	EB1055
R2016	301-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.50W	01121	EB2025
R2017	315-0102-03			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2018	301-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.50W	01121	EB1535
R2031	301-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.50W	01121	EB1035
R2033	301-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.50W	01121	EB1035

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2034	315-0301-02			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R2041	301-0754-00			RES., FXD, CMPSN: 750K OHM, 5%, 0.50W	01121	EB7545
R2042	301-0754-00			RES., FXD, CMPSN: 750K OHM, 5%, 0.50W	01121	EB7545
R2052	315-0243-03			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R2055	315-0102-03			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2056	301-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.50W	01121	EB2725
R2063	301-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.50W	01121	EB1025
R2064	307-0506-00			RES, NTWK, FXD, FI: HV DIVIDER	80009	307-0506-00
R2066	315-0102-03			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2068	315-0206-01			RES., FXD, CMPSN: 20M OHM, 5%, 0.25W	01121	CB2065
R2074	315-0104-03			RES., FXD CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2101	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2102	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R2103	321-0364-00			RES., FXD, FILM: 60.4K OHM, 1%, 0.125W	91637	MFF1816G60401F
R2104	321-0293-00			RES., FXD, FILM: 11K OHM, 1%, 0.125W	91637	MFF1816G11001F
R2105	311-1238-00			RES., VAR, NONWIR: 5K OHM, 10%, 0.50W	73138	72X-27-0-502K
R2106	321-0314-00			RES., FXD, FILM: 18.2K OHM, 1%, 0.125W	91637	MFF1816G18201F
R2108	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R2109	315-0433-00			RES., FXD, CMPSN: 43K OHM, 5%, 0.25W	01121	CB4335
R2110	311-1242-00			RES., VAR, NONWIR: 200K OHM, 10%, 0.50W	01121	E4A204
R2111	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2112	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2113	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2114	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R2116	303-0182-00			RES., FXD, CMPSN: 1.8K OHM, 5%, 1W	01121	GB1825
R2119	303-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 1W	01121	GB5605
R2121	301-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.50W	01121	EB1005
R2124	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R2125	315-0562-00			RES., FXD, CMPSN: 5.6K OHM, 5%, 0.25W	01121	CB5625
R2132	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R2134	315-0820-00			RES., FXD, CMPSN: 82 OHM, 5%, 0.25W	01121	CB8205
R2135	311-1198-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.5W	80294	3389H
R2136	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R2137	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R2139	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2140	311-1245-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	73138	72-28-0
R2141	323-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.50W	75042	CECT0-1004F
R2142	323-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.50W	75042	CECT0-1004F
R2144	321-0409-00			RES., FXD, FILM: 178K OHM, 1%, 0.125W	91637	MFF1816G17802F
R2145	321-0418-00			RES., FXD, FILM: 221K OHM, 1%, 0.125W	91637	MFF1816G22102F
R2146	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2147	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2150	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2151	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R2152	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R2153	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R2154	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R2155	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R2160	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2161	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2162	321-0372-00			RES., FXD, FILM: 73.2K OHM, 1%, 0.125W	91637	MFF1816G73201F
R2164	321-0397-00			RES., FXD, FILM: 133K OHM, 1%, 0.125W	91637	MFF1816G13302F
R2165	311-1848-00			RES., VAR, NONWIR: 5K X 50K OHM, 20%, 0.50W	01121	14M636

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2166	323-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.50W	75042	CECT0-1004F
R2167	323-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.50W	75042	CECT0-1004F
R2168	315-0155-00			RES., FXD, CMPSN: 1.5M OHM, 5%, 0.25W	01121	CB1555
R2171	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2172	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2173	301-0824-00			RES., FXD, CMPSN: 820K OHM, 5%, 0.50W	01121	EB8245
R2174	301-0824-00			RES., FXD, CMPSN: 820K OHM, 5%, 0.50W	01121	EB8245
R2175	311-1241-00			RES., VAR, NONWIR: 100K OHM, 10%, 0.5W	32997	3386X-T07-104
R2178	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R2180	311-1247-00			RES., VAR, NONWIR: 1M OHM, 10%, 0.50W	73138	72X-35-0-105K
R2181	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R2182	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R2183	322-0377-00			RES., FXD, FILM: 82.5K OHM, 1%, 0.25W	91637	MFF1421G82501F
R2187	321-0298-00			RES., FXD, FILM: 12.4K OHM, 1%, 0.125W	91637	MFF1816G12401F
R2188	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2189	301-0304-00			RES., FXD, CMPSN: 300K OHM, 5%, 0.50W	01121	EB3045
R2191	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2192	301-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.50W	01121	EB1055
R2193	301-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.50W	01121	EB1055
R2194	303-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 1W	01121	GB2245
R2195	311-1847-00			RES., VAR, NONWIR: 250K OHM, 0.5W	12697	382-CM40967
R2196	303-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 1W	01121	GB1545
R2197	301-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.50W	01121	EB1535
R2198	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2200	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2201	321-0306-00			RES., FXD, FILM: 15K OHM, 1%, 0.125W	91637	MFF1816G15001F
R2202	321-0300-00			RES., FXD, FILM: 13K OHM, 1%, 0.125W	91637	MFF1816G13001F
R2204	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R2205	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2206	321-0345-00			RES., FXD, FILM: 38.3K OHM, 1%, 0.125W	91637	MFF1816G38301F
R2207	321-0350-00			RES., FXD, FILM: 43.2K OHM, 1%, 0.125W	91637	MFF1816G43201F
R2209	321-0394-00			RES., FXD, FILM: 124K OHM, 1%, 0.125W	91637	MFF1816G12402F
R2214	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R2215	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2216	321-0345-00			RES., FXD, FILM: 38.3K OHM, 1%, 0.125W	91637	MFF1816G38301F
R2217	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2218	307-0505-00			RES, NTWK, FXD, FI: HV REG	80009	307-0505-00
R2219	321-0481-00			RES., FXD, FILM: 1M OHM, 1%, 0.125W	91637	MFF1816G10003F
R2220	311-1242-00			RES., VAR, NONWIR: 200K OHM, 10%, 0.50W	01121	E4A204
R2221	315-0475-00			RES., FXD, CMPSN: 4.7M OHM, 5%, 0.25W	01121	CB4755
R2222	316-0126-00			RES., FXD, CMPSN: 12M OHM, 10%, 0.25W	01121	CB1261
R2223	315-0106-00			RES., FXD, CMPSN: 10M OHM, 5%, 0.25W	01121	CB1065
R2224	321-0400-00			RES., FXD, FILM: 143K OHM, 1%, 0.125W	91637	MFF1816G14302F
R2226	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R2227	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R2228	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R2231	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2232	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R2233	321-0182-00			RES., FXD, FILM: 768 OHM, 1%, 0.125W	91637	MFF1816G7680F
R2234	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R2235	311-1263-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W	32997	3329P-L58-102
R2236	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R2240	321-0319-00			RES., FXD, FILM: 20.5K OHM, 1%, 0.125W	91637	MFF1816G20501F

Replaceable Electrical Parts—7834

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2241	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2242	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2244	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R2248	323-0312-00			RES., FXD, FILM: 17.4K OHM, 1%, 0.50W	91637	MFF1226G17401F
R2249	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2251	321-0261-00			RES., FXD, FILM: 5.11K OHM, 1%, 0.125W	91637	MFF1816G51100F
R2252	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R2253	315-0180-00			RES., FXD, CMPSN: 18 OHM, 5%, 0.25W	01121	CB1805
R2254	321-0158-00			RES., FXD, FILM: 432 OHM, 1%, 0.125W	91637	MFF1816G432R0F
R2255	305-0163-00			RES., FXD, CMPSN: 16K OHM, 5%, 2W	01121	HB1635
R2261	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2262	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2263	315-0330-00			RES., FXD, CMPSN: 33 OHM, 5%, 0.25W	01121	CB3305
R2264	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2271	315-0241-00			RES., FXD, CMPSN: 240 OHM, 5%, 0.25W	01121	CB2415
R2272	315-0331-00			RES., FXD, CMPSN: 330 OHM, 5%, 0.25W	01121	CB3315
R2274	315-0220-00			RES., FXD, CMPSN: 22 OHM, 5%, 0.25W	01121	CB2205
R2282	301-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.50W	01121	EB2425
R2283	301-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.50W	01121	EB3025
R2284	315-0106-00			RES., FXD, CMPSN: 10M OHM, 5%, 0.25W	01121	CB1065
R2285	311-1214-00			RES., VAR, NONWIR: 200K OHM, 20%, 0.50W	01121	E2B204
R2289	301-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.50W	01121	EB1515
R2294	315-0155-00			RES., FXD, CMPSN: 1.5M OHM, 5%, 0.25W	01121	CB1555
R2297	301-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.50W	01121	EB4715
R2298	301-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.50W	01121	EB1015
R2302	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2303	321-0303-00			RES., FXD, FILM: 14K OHM, 1%, 0.125W	91637	MFF1816G14001F
R2305	315-0684-00			RES., FXD, CMPSN: 680K OHM, 5%, 0.25W	01121	CB6845
R2306	321-0303-00			RES., FXD, FILM: 14K OHM, 1%, 0.125W	91637	MFF1816G14001F
R2309	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2310	311-1848-00			RES., VAR, NONWIR: 5K X 50K OHM, 20%, 0.50W	01121	14M636
R2312	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2313	311-1839-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W, W/4PST SW	01121	14M083
R2315	311-1245-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	73138	72-28-0
R2316	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2317	315-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
R2318	321-0308-00			RES., FXD, FILM: 15.8K OHM, 1%, 0.125W	91637	MFF1816G15801F
R2319	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2320	311-1104-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	12697	381-CM40095
R2321	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2322	321-0290-00			RES., FXD, FILM: 10.2K OHM, 1%, 0.125W	91637	MFF1816G10201F
R2323	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R2324	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2325	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2326	321-0277-00			RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	91637	MFF1816G75000F
R2327	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2328	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R2332	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2333	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R2335	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R2336	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2338	321-0316-00			RES., FXD, FILM: 19.1K OHM, 1%, 0.125W	91637	MFF1816G19101F
R2339	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R2342	315-0473-00		RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2343	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2344	315-0183-00		RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R2345	315-0623-00		RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R2346	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2354	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2355	315-0623-00		RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R2356	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2361	321-0301-00		RES., FXD, FILM: 13.3K OHM, 1%, 0.125W	91637	MFF1816G13301F
R2362	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2363	321-0289-00		RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R2364	301-0152-00		RES., FXD, CMPSN: 1.5K OHM, 5%, 0.50W	01121	EB1525
R2365	311-1238-00		RES., VAR, NONWIR: 5K OHM, 10%, 0.50W	73138	72X-27-0-502K
R2366	311-1238-00		RES., VAR, NONWIR: 5K OHM, 10%, 0.50W	73138	72X-27-0-502K
R2368	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2371	315-0470-00		RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2372	315-0432-00		RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R2373	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2374	315-0132-00		RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R2376	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2377	315-0753-00		RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R2378	321-0320-00		RES., FXD, FILM: 21K OHM, 1%, 0.125W	91637	MFF1816G21001F
R2379	321-0394-00		RES., FXD, FILM: 124K OHM, 1%, 0.125W	91637	MFF1816G12402F
R2383	315-0122-00		RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R2384	315-0101-00		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R2385	315-0104-00		RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2393	315-0470-00		RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2394	315-0561-00		RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R2396	315-0432-00		RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R2404	315-0152-00		RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2405	315-0470-00		RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2406	315-0470-00		RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2409	315-0221-00		RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2422	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2425	311-1241-00		RES., VAR, NONWIR: 100K OHM, 10%, 0.5W	32997	3386X-T07-104
R2428	321-0306-00		RES., FXD, FILM: 15K OHM, 1%, 0.125W	91637	MFF1816G15001F
R2431	315-0222-00		RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2432	321-0352-00		RES., FXD, FILM: 45.3K OHM, 1%, 0.125W	91637	MFF1816G45301F
R2435	311-1241-00		RES., VAR, NONWIR: 100K OHM, 10%, 0.5W	32997	3386X-T07-104
R2436	315-0471-00		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2437	315-0471-00		RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2439	315-0221-00		RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R2451	315-0102-00		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2452	315-0152-00		RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2454	315-0752-00		RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R2464	321-0335-00		RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R2465	311-0310-00		RES., VAR, NONWIR: 5K OHM, 20%, 0.50W	01121	W-7350A
R2466	321-0371-00		RES., FXD, FILM: 71.5K OHM, 1%, 0.125W	91637	MFF1816G71501F
R2467	321-0312-00		RES., FXD, FILM: 17.4K OHM, 1%, 0.125W	91637	MFF1816G17401F
R2468	315-0103-00		RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2470	311-1228-00		RES., VAR, NONWIR: 10K OHM, 20%, 0.50W	32997	3386F-T04-103
R2471	321-0208-00		RES., FXD, FILM: 1.43K OHM, 1%, 0.125W	91637	MFF1816G14300F
R2472	321-0208-00		RES., FXD, FILM: 1.43K OHM, 1%, 0.125W	91637	MFF1816G14300F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2473	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R2474	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R2475	311-1214-00			RES., VAR, NONWIR: 200K OHM, 20%, 0.50W	01121	E2B204
R2476	321-0307-00			RES., FXD, FILM: 15.4K OHM, 1%, 0.125W	91637	MFF1816G15401F
R2478	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2500	311-1840-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	01121	14M031
R2501	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2502	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2506	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2507	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R2508	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2509	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2512	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R2513	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2516	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2517	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2518	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R2521	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2522	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2523	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2526	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2527	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R2528	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2529	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R2531	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2532	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2533	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R2534	315-0914-00			RES., FXD, CMPSN: 910K OHM, 5%, 0.25W	01121	CB9145
R2535	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R2536	321-0347-00			RES., FXD, FILM: 40.2K OHM, 1%, 0.125W	91637	MFF1816G40201F
R2537	311-1838-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W, W/SWITCHES	80009	311-1838-00
R2538	321-0337-00			RES., FXD, FILM: 31.6K OHM, 1%, 0.125W	91637	MFF1816G31601F
R2539	321-0285-00			RES., FXD, FILM: 9.09K OHM, 1%, 0.125W	91637	MFF1816G90900F
R2540	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R2542	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2556	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2558	301-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.50W	01121	EB6815
R2562	321-0280-00			RES., FXD, FILM: 8.06K OHM, 1%, 0.125W	91637	MFF1816G80600F
R2563	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2564	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R2565	321-0268-00			RES., FXD, FILM: 6.04K OHM, 1%, 0.125W	91637	MFF1816G60400F
R2566	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2570	311-1840-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	01121	14M031
R2571	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2572	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2576	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2577	321-0433-00			RES., FXD, FILM: 316K OHM, 1%, 0.125W	91637	MFF1816G31602F
R2578	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2581	315-0204-00			RES., FXD, CMPSN: 200K OHM, 5%, 0.25W	01121	CB2045
R2582	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2584	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R2585	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2586	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2587	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2588	315-0391-00			RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R2593	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2594	321-0280-00			RES., FXD, FILM: 8.06K OHM, 1%, 0.125W	91637	MFF1816G80600F
R2595	315-0361-00			RES., FXD, CMPSN: 360 OHM, 5%, 0.25W	01121	CB3615
R2604	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2605	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R2606	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2607	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2608	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2609	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2610	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2611	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R2612	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R2613	321-0379-00			RES., FXD, FILM: 86.6K OHM, 1%, 0.125W	91637	MFF1816G86601F
R2614	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2615	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2616	311-1837-00			RES., VAR, NONWIR: 500K OHM, 1%, 0.5W	01121	15M190
R2622	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2623	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2624	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2626	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R2631	315-0131-00			RES., FXD, CMPSN: 130 OHM, 5%, 0.25W	01121	CB1315
R2632	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2634	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2641	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2642	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R2643	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2644	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R2646	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2651	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2652	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2653	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2654	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2655	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2656	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2657	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2658	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2662	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2663	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2664	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2668	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2671	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2672	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2673	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2674	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2675	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2676	321-0277-00			RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	91637	MFF1816G75000F
R2678	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2680	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2681	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R2682	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2683	315-0432-00			RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2684	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2685	321-0330-00			RES., FXD, FILM: 26.7K OHM, 1%, 0.125W	91637	MFF1816G26701F
R2686	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2687	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2688	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2689	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R2691	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R2692	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R2693	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R2694	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2696	321-0280-00			RES., FXD, FILM: 8.06K OHM, 1%, 0.125W	91637	MFF1816G80600F
R2701	321-0248-00			RES., FXD, FILM: 3.74K OHM, 1%, 0.125W	91637	MFF1816G37400F
R2702	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R2703	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R2705	311-1231-00			RES., VAR, NONWIR: 25K OHM, 20%, 0.50W	32997	3386F-T04-253
R2706	321-0383-00			RES., FXD, FILM: 95.3K OHM, 1%, 0.125W	91637	MFF1816G95301F
R2708	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R2709	321-0375-00			RES., FXD, FILM: 78.7K OHM, 1%, 0.125W	91637	MFF1816G78701F
R2711	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2712	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2713	315-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R2714	315-0204-00			RES., FXD, CMPSN: 200K OHM, 5%, 0.25W	01121	CB2045
R2715	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R2716	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R2717	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R2718	321-0397-00			RES., FXD, FILM: 133K OHM, 1%, 0.125W	91637	MFF1816G13302F
R2719	321-0423-00			RES., FXD, FILM: 249K OHM, 1%, 0.125W	91637	MFF1816G24902F
R2720	311-0546-00			RES., VAR, NONWIR: 10K OHM, 20%, 0.75W	80009	311-0546-00
R2721	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2722	315-0184-00			RES., FXD, CMPSN: 180K OHM, 5%, 0.25W	01121	CB1845
R2723	321-0299-00			RES., FXD, FILM: 12.7K OHM, 1%, 0.125W	91637	MFF1816G12701F
R2724	321-0383-00			RES., FXD, FILM: 95.3K OHM, 1%, 0.125W	91637	MFF1816G95301F
R2725	311-1231-00			RES., VAR, NONWIR: 25K OHM, 20%, 0.50W	32997	3386F-T04-253
R2726	321-0383-00			RES., FXD, FILM: 95.3K OHM, 1%, 0.125W	91637	MFF1816G95301F
R2727	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R2728	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2729	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R2731	315-0681-00			RES., FXD, CMPSN: 680 OHM, 5%, 0.25W	01121	CB6815
R2732	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R2733	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2734	321-0356-00			RES., FXD, FILM: 49.9K OHM, 1%, 0.125W	91637	MFF1816G49901F
R2735	311-1232-00			RES., VAR, NONWIR: 50K OHM, 20%, 0.50W	32997	3386F-T04-503
R2736	321-0373-00			RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R2741	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2742	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2743	315-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245
R2744	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R2745	311-1231-00			RES., VAR, NONWIR: 25K OHM, 20%, 0.50W	32997	3386F-T04-253
R2746	321-0311-00			RES., FXD, FILM: 16.9K OHM, 1%, 0.125W	91637	MFF1816G16901F
R2747	321-0349-00			RES., FXD, FILM: 42.2K OHM, 1%, 0.125W	91637	MFF1816G42201F
R2748	321-0460-00			RES., FXD, FILM: 604K OHM, 1%, 0.125W	91637	MFF1816G60402F
R2751	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2752	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2753	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	91637	MFF1816G15002F
R2754	321-0410-00			RES., FXD, FILM: 182K OHM, 1%, 0.125W	91637	MFF1816G18202F
R2755	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R2770	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R2772	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R2774	315-0394-00			RES., FXD, CMPSN: 390K OHM, 5%, 0.25W	01121	CB3945
R2775	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R2779	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R2782	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2783	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2785	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R2786	321-0181-00			RES., FXD, FILM: 750 OHM, 1%, 0.125W	91637	MFF1816G750ROF
R2787	321-0202-00			RES., FXD, FILM: 1.24K OHM, 1%, 0.125W	91637	MFF1816G12400F
R2788	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2789	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2802	315-0113-00			RES., FXD, CMPSN: 11K OHM, 5%, 0.25W	01121	CB1135
R2804	315-0391-00			RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R2805	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R2808	301-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.50W	01121	EB7535
R2809	315-0391-00			RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R2812	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2813	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2814	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R2815	322-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.25W	75042	CEBTO-1003F
R2816	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R2817	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R2819	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2821	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2822	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R2825	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R2826	315-0433-00			RES., FXD, CMPSN: 43K OHM, 5%, 0.25W	01121	CB4335
R2827	315-0335-00			RES., FXD, CMPSN: 3.3M OHM, 5%, 0.25W	01121	CB3355
R2828	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R2831	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R2833	303-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 1W	01121	GB6835
R2835	315-0335-00			RES., FXD, CMPSN: 3.3M OHM, 5%, 0.25W	01121	CB3355
R2836	315-0125-00			RES., FXD, CMPSN: 1.2M OHM, 5%, 0.25W	01121	CB1255
R2837	315-0155-00			RES., FXD, CMPSN: 1.5M OHM, 5%, 0.25W	01121	CB1555
R2838	315-0305-00			RES., FXD, CMPSN: 3M OHM, 5%, 0.25W	01121	CB3055
R2839	307-0106-00			RES., FXD, CMPSN: 4.7 OHM, 5%, 0.25W	01121	CB47G5
R2841	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2842	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R2843	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R2844	321-0317-00			RES., FXD, FILM: 19.6K OHM, 1%, 0.125W	91637	MFF1816G19601F
R2845	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R2846	311-1226-00			RES., VAR, NONWIR: 2.5K OHM, 20%, 0.50W	32997	3386F-T04-252
R2847	321-0363-00			RES., FXD, FILM: 59K OHM, 1%, 0.125W	91637	MFF1816G59001F
R2848	315-0184-00			RES., FXD, CMPSN: 180K OHM, 5%, 0.25W	01121	CB1845
R2849	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R2850	311-1226-00			RES., VAR, NONWIR: 2.5K OHM, 20%, 0.50W	32997	3386F-T04-252
R2851	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R2852	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R2853	321-0251-00			RES., FXD, FILM: 4.02K OHM, 1%, 0.125W	91637	MFF1816G40200F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2854	321-0360-00			RES., FXD, FILM: 54.9K OHM, 1%, 0.125W	91637	MFF1816G54901F
R2855	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R2856	321-0314-00			RES., FXD, FILM: 18.2K OHM, 1%, 0.125W	91637	MFF1816G18201F
R2857	321-0300-00			RES., FXD, FILM: 13K OHM, 1%, 0.125W	91637	MFF1816G13001F
R2861	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2862	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R2863	322-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.25W	75042	CEBTO-1003F
R2864	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2865	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2867	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R2868	301-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.50W	01121	EB2035
R2869	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2874	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R2876	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2900	321-0229-00			RES., FXD, FILM: 2.37K OHM, 1%, 0.125W	91637	MFF1816G23700F
R2901	321-0361-00			RES., FXD, FILM: 56.2K OHM, 1%, 0.125W	91637	MFF1816G56201F
R2902	321-0346-00			RES., FXD, FILM: 39.2K OHM, 1%, 0.125W	91637	MFF1816G39201F
R2903	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2904	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2906	321-0388-00			RES., FXD, FILM: 107K OHM, 1%, 0.125W	91637	MFF1816G10702F
R2907	321-0466-00			RES., FXD, FILM: 698K OHM, 1%, 0.125W	91637	MFF1816G69802F
R2911	321-0298-00			RES., FXD, FILM: 12.4K OHM, 1%, 0.125W	91637	MFF1816G12401F
R2912	321-0408-00			RES., FXD, FILM: 174K OHM, 1%, 0.125W	91637	MFF1816G17402F
R2913	321-0382-00			RES., FXD, FILM: 93.1K OHM, 1%, 0.125W	91637	MFF1816G93101F
R2914	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R2915	321-0423-00			RES., FXD, FILM: 249K OHM, 1%, 0.125W	91637	MFF1816G24902F
R2918	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2919	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R2924	315-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.25W	01121	CB4715
R2926	303-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 1W	01121	GB8235
R2927	303-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 1W	01121	GB8235
R2930	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R2931	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2932	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R2933	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2937	315-0125-00			RES., FXD, CMPSN: 1.2M OHM, 5%, 0.25W	01121	CB1255
R2940	321-0431-00			RES., FXD, FILM: 301K OHM, 1%, 0.125W	91637	MFF1816G30102F
R2941	321-0379-00			RES., FXD, FILM: 86.6K OHM, 1%, 0.125W	91637	MFF1816G86601F
R2942	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2946	301-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.50W	01121	EB3935
R2947	321-0452-00			RES., FXD, FILM: 499K OHM, 1%, 0.125W	91637	MFF1816G49902F
R2948	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2951	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R2952	321-0277-00			RES., FXD, FILM: 7.5K OHM, 1%, 0.125W	91637	MFF1816G75000F
R2953	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R2954	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R2955	321-0437-00			RES., FXD, FILM: 348K OHM, 1%, 0.125W	91637	MFF1816G34802F
R2956	321-0429-00			RES., FXD, FILM: 287K OHM, 1%, 0.125W	91637	MFF1816G28702F
R2962	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R2963	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R2964	321-0466-00			RES., FXD, FILM: 698K OHM, 1%, 0.125W	91637	MFF1816G69802F
R2966	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R2967	315-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.25W	01121	CB8235

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R2970	321-0397-00			RES., FXD, FILM: 133K OHM, 1%, 0.125W	91637	MFF1816G13302F
R2971	321-0387-00			RES., FXD, FILM: 105K OHM, 1%, 0.125W	91637	MFF1816G10502F
R2972	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2976	301-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.50W	01121	EB3935
R2977	321-0452-00			RES., FXD, FILM: 499K OHM, 1%, 0.125W	91637	MFF1816G49902F
R2978	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2980	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R2981	321-0466-00			RES., FXD, FILM: 698K OHM, 1%, 0.125W	91637	MFF1816G69802F
R2982	321-0496-00			RES., FXD, FILM: 1.43M OHM, 1%, 0.125W	91637	HFF1813G14303F
R2983	321-0437-00			RES., FXD, FILM: 348K OHM, 1%, 0.125W	91637	MFF1816G34802F
R2986	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R2987	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R2990	321-0429-00			RES., FXD, FILM: 287K OHM, 1%, 0.125W	91637	MFF1816G28702F
R2991	321-0397-00			RES., FXD, FILM: 133K OHM, 1%, 0.125W	91637	MFF1816G13302F
R2992	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R2993	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R2996	301-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.50W	01121	EB3935
R2997	321-0452-00			RES., FXD, FILM: 499K OHM, 1%, 0.125W	91637	MFF1816G49902F
R3010	315-0623-00			RES., FXD, CMPSN: 62K OHM, 5%, 0.25W	01121	CB6235
R3011	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3012	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3015	315-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R3016	321-0445-00			RES., FXD, FILM: 422K OHM, 1%, 0.125W	91637	MFF1816G42202F
R3018	321-0396-00			RES., FXD, FILM: 130K OHM, 1%, 0.125W	91637	MFF1816G13002F
R3021	321-0414-00			RES., FXD, FILM: 200K OHM, 1%, 0.125W	91637	MFF1816G20002F
R3022	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R3026	321-0452-00			RES., FXD, FILM: 499K OHM, 1%, 0.125W	91637	MFF1816G49902F
R3027	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3044	301-0363-00			RES., FXD, CMPSN: 36K OHM, 5%, 0.50W	01121	EB3635
R3045	321-0386-00			RES., FXD, FILM: 102K OHM, 1%, 0.125W	91637	MFF1816G10202F
R3046	321-0402-00			RES., FXD, FILM: 150K OHM, 1%, 0.125W	91637	MFF1816G15002F
R3047	321-0385-00			RES., FXD, FILM: 100K OHM, 1%, 0.125W	91637	MFF1816G10002F
R3048	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3049	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R3052	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R3054	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R3055	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R3064	315-0244-00			RES., FXD, CMPSN: 240K OHM, 5%, 0.25W	01121	CB2445
R3066	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3068	308-0290-00			RES., FXD, WW: 8 OHM, 5%, 5W	91637	RS2AD8R000J
R3077	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R3078	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R3201	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3202	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3203	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3204	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3212	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3213	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3214	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3215	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3216	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3217	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3218	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number.
R3219	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R3227	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R3228	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R3229	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R3233	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3234	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R3241	315-0133-00			RES., FXD, CMPSN: 13K OHM, 5%, 0.25W	01121	CB1335
R3242	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R3243	315-0133-00			RES., FXD, CMPSN: 13K OHM, 5%, 0.25W	01121	CB1335
R3244	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R3245	321-0308-00			RES., FXD, FILM: 15.8K OHM, 1%, 0.125W	91637	MFF1816G15801F
R3246	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R3247	321-0319-00			RES., FXD, FILM: 20.5K OHM, 1%, 0.125W	91637	MFF1816G20501F
R3248	321-0335-00			RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R3251	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R3252	321-0335-00			RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R3253	321-0344-00			RES., FXD, FILM: 37.4K OHM, 1%, 0.125W	91637	MFF1816G37401F
R3254	321-0335-00			RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R3255	315-0513-00			RES., FXD, CMPSN: 51K OHM, 5%, 0.25W	01121	CB5135
R3256	315-0154-00			RES., FXD, CMPSN: 150K OHM, 5%, 0.25W	01121	CB1545
R3257	321-0335-00			RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R3258	321-0335-00			RES., FXD, FILM: 30.1K OHM, 1%, 0.125W	91637	MFF1816G30101F
R3264	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R3320	315-0470-00			RES., FXD, CMPSN: 47 OHM, 5%, 0.25W	01121	CB4705
R3321	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R3323	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R3325	315-0241-00			RES., FXD, CMPSN: 240 OHM, 5%, 0.25W	01121	CB2415
R3326	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R3328	321-0262-00			RES., FXD, FILM: 5.23K OHM, 1%, 0.125W	91637	MFF1816G52300F
R3330	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R3333	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R3334	321-0190-00			RES., FXD, FILM: 931 OHM, 1%, 0.125W	91637	MFF1816G931ROF
R3340	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R3341	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R3343	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R3344	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R3346	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R3347	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R3348	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R3349	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R3352	323-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.50W	75042	CECT0-1001F
R3354	315-0560-00			RES., FXD, CMPSN: 56 OHM, 5%, 0.25W	01121	CB5605
R3358	321-0143-00			RES., FXD, FILM: 301 OHM, 1%, 0.125W	91637	MFF1816G301ROF
R3360	321-0226-00			RES., FXD, FILM: 2.21K OHM, 1%, 0.125W	91637	MFF1816G22100F
R3361	321-0180-00			RES., FXD, FILM: 732 OHM, 1%, 0.125W	91637	MFF1816G732ROF
R3363	322-0189-00			RES., FXD, FILM: 909 OHM, 1%, 0.25W	75042	CEBT0-9090F
R3364	315-0390-00			RES., FXD, CMPSN: 39 OHM, 5%, 0.25W	01121	CB3905
R3401	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R3402	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3403	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3404	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3405	315-0203-00			RES., FXD, CMPSN: 20K OHM, 5%, 0.25W	01121	CB2035
R3406	315-0134-00			RES., FXD, CMPSN: 130K OHM, 5%, 0.25W	01121	CB1345

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R3407	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R3408	315-0300-00			RES., FXD, CMPSN: 30 OHM, 5%, 0.25W	01121	CB3005
R3409	321-0259-00			RES., FXD, FILM: 4.87K OHM, 1%, 0.125W	91637	MFF1816G48700F
R3410	321-0181-00			RES., FXD, FILM: 750 OHM, 1%, 0.125W	91637	MFF1816G750R0F
R3411	321-0297-00			RES., FXD, FILM: 12.1K OHM, 1%, 0.125W	91637	MFF1816G12101F
R3412	321-0212-00			RES., FXD, FILM: 1.58K OHM, 1%, 0.125W	91637	MFF1816G15800F
R3414	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R3416	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R3418	321-0268-00			RES., FXD, FILM: 6.04K OHM, 1%, 0.125W	91637	MFF1816G60400F
R3419	321-0322-00			RES., FXD, FILM: 22.1K OHM, 1%, 0.125W	91637	MFF1816G22101F
R3420	321-0262-00			RES., FXD, FILM: 5.23K OHM, 1%, 0.125W	91637	MFF1816G52300F
R3422	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R3423	321-0372-00			RES., FXD, FILM: 73.2K OHM, 1%, 0.125W	91637	MFF1816G73201F
R3425	321-0403-00			RES., FXD, FILM: 154K OHM, 1%, 0.125W	91637	MFF1816G15402F
R3427	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R3430	315-0432-00			RES., FXD, CMPSN: 4.3K OHM, 5%, 0.25W	01121	CB4325
R3431	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R3432	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R3433	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R3434	315-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R3435	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R3436	315-0183-00			RES., FXD, CMPSN: 18K OHM, 5%, 0.25W	01121	CB1835
R3437	311-1225-00			RES., VAR, NONWIR: 1K OHM, 20%, 0.50W	32997	3386F-T04-102
R3438	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R3439	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R3440	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R3441	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R3442	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R3445	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R3447	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R3449	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R3450	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3451	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3452	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3466	321-0153-00			RES., FXD, FILM: 383 OHM, 1%, 0.125W	91637	MFF1816G383R0F
R3468	321-0191-00			RES., FXD, FILM: 953 OHM, 1%, 0.125W	91637	MFF1816G953R0F
R3470	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R3472	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R3473	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R3474	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R3475	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R3476	321-0296-00			RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R3478	315-0753-00			RES., FXD, CMPSN: 75K OHM, 5%, 0.25W	01121	CB7535
R3479	315-0823-00			RES., FXD, CMPSN: 82K OHM, 5%, 0.25W	01121	CB8235
R3480	321-0222-00			RES., FXD, FILM: 2K OHM, 1%, 0.125W	91637	MFF1816G20000F
R3481	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R3482	321-0250-00			RES., FXD, FILM: 3.92K OHM, 1%, 0.125W	91637	MFF1816G39200F
R3483	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R3484	321-0216-00			RES., FXD, FILM: 1.74K OHM, 1%, 0.125W	91637	MFF1816G17400F
R3485	321-0245-00			RES., FXD, FILM: 3.48K OHM, 1%, 0.125W	91637	MFF1816G34800F
R3486	321-0199-00			RES., FXD, FILM: 1.15K OHM, 1%, 0.125W	91637	MFF1816G11500F
R3487	321-0273-00			RES., FXD, FILM: 6.81K OHM, 1%, 0.125W	91637	MFF1816G68100F
R3488	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R3489	321-0209-00			RES., FXD, FILM: 1.47K OHM, 1%, 0.125W	91637	MFF1816G14700F
R3490	311-1224-00			RES., VAR, NONWIR: 500 OHM, 20%, 0.50W	32997	3386F-T04-501
R3491	321-0204-00			RES., FXD, FILM: 1.3K OHM, 1%, 0.125W	91637	MFF1816G13000F
R3492	321-0245-00			RES., FXD, FILM: 3.48K OHM, 1%, 0.125W	91637	MFF1816G34800F
R3493	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R3494	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R3495	315-0101-00	XB020450		RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R3497	321-0241-00			RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R3498	321-0255-00			RES., FXD, FILM: 4.42K OHM, 1%, 0.125W	91637	MFF1816G44200F
R3499	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4303	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R4304	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R4305	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R4306	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R4307	321-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.125W	91637	MFF1816G10000F
R4312	321-0147-00			RES., FXD, FILM: 332 OHM, 1%, 0.125W	91637	MFF1816G332ROF
R4313	321-0239-00			RES., FXD, FILM: 3.01K OHM, 1%, 0.125W	91637	MFF1816G30100F
R4314	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R4315	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4316	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R4318	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R4319	315-0392-00			RES., FXD, CMPSN: 3.9K OHM, 5%, 0.25W	01121	CB3925
R4320	315-0122-00			RES., FXD, CMPSN: 1.2K OHM, 5%, 0.25W	01121	CB1225
R4321	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R4323	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R4333	315-0682-00			RES., FXD, CMPSN: 6.8K OHM, 5%, 0.25W	01121	CB6825
R4334	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R4335	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R4336	315-0752-00			RES., FXD, CMPSN: 7.5K OHM, 5%, 0.25W	01121	CB7525
R4342	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R4343	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4344	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R4345	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4355	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4356	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R4357	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R4358	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4363	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4366	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4367	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4369	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R4374	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4380	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R4381	315-0303-00			RES., FXD, CMPSN: 30K OHM, 5%, 0.25W	01121	CB3035
R4382	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R4390	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R4391	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4392	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4394	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R4413	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4420	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R4423	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R4424	315-0512-00			RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R4425	315-0201-00	B010100	B010186	RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R4425	315-0102-00	B010187		RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4426	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4431	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4432	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R4437	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4438	315-0821-00			RES., FXD, CMPSN: 820 OHM, 5%, 0.25W	01121	CB8215
R4441	315-0822-00			RES., FXD, CMPSN: 8.2K OHM, 5%, 0.25W	01121	CB8225
R4442	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R4448	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R4449	315-0302-00			RES., FXD, CMPSN: 3K OHM, 5%, 0.25W	01121	CB3025
R4456	321-0241-00	B010100	B010199	RES., FXD, FILM: 3.16K OHM, 1%, 0.125W	91637	MFF1816G31600F
R4456	321-0237-00	B010200		RES., FXD, FILM: 2.87K OHM, 1%, 0.125W	91637	MFF1816G28700F
R4457	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R4461	321-0288-00			RES., FXD, FILM: 9.76K OHM, 1%, 0.125W	91637	MFF1816G97600F
R4462	321-0246-00			RES., FXD, FILM: 3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R4467	321-0288-00			RES., FXD, FILM: 9.76K OHM, 1%, 0.125W	91637	MFF1816G97600F
R4468	321-0246-00			RES., FXD, FILM: 3.57K OHM, 1%, 0.125W	91637	MFF1816G35700F
R4471	321-0245-00			RES., FXD, FILM: 3.48K OHM, 1%, 0.125W	91637	MFF1816G34800F
R4472	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R4473	301-0471-00			RES., FXD, CMPSN: 470 OHM, 5%, 0.50W	01121	EB4715
R4474	322-0210-00			RES., FXD, FILM: 1.5K OHM, 1%, 0.25W	75042	CEBT0-1501F
R4475	315-0361-00			RES., FXD, CMPSN: 360 OHM, 5%, 0.25W	01121	CB3615
R4476	315-0221-00			RES., FXD, CMPSN: 220 OHM, 5%, 0.25W	01121	CB2215
R4479	321-0289-00			RES., FXD, FILM: 10K OHM, 1%, 0.125W	91637	MFF1816G10001F
R4480	311-1269-00			RES., VAR, NONWIR: 20K OHM, 10%, 0.50W	32997	3329P-L58-203
R4481	321-0240-00			RES., FXD, FILM: 3.09K OHM, 1%, 0.125W	91637	MFF1816G30900F
R4482	315-0100-00			RES., FXD, CMPSN: 10 OHM, 5%, 0.25W	01121	CB1005
R4483	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4484	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R4485	321-0237-00			RES., FXD, FILM: 2.87K OHM, 1%, 0.125W	91637	MFF1816G28700F
R4486	315-0242-00			RES., FXD, CMPSN: 2.4K OHM, 5%, 0.25W	01121	CB2425
R4487	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R4488	315-0751-00			RES., FXD, CMPSN: 750 OHM, 5%, 0.25W	01121	CB7515
R4489	321-0312-00			RES., FXD, FILM: 17.4K OHM, 1%, 0.125W	91637	MFF1816G17401F
R4490	315-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.25W	01121	CB1015
R4491	315-0201-00			RES., FXD, CMPSN: 200 OHM, 5%, 0.25W	01121	CB2015
R4492	315-0152-00			RES., FXD, CMPSN: 1.5K OHM, 5%, 0.25W	01121	CB1525
R4493	321-0215-00			RES., FXD, FILM: 1.69K OHM, 1%, 0.125W	91637	MFF1816G16900F
R4494	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R4495	315-0622-00			RES., FXD, CMPSN: 6.2K OHM, 5%, 0.25W	01121	CB6225
R4496	321-0242-00			RES., FXD, FILM: 3.24K OHM, 1%, 0.125W	91637	MFF1816G32400F
R4497	315-0272-00			RES., FXD, CMPSN: 2.7K OHM, 5%, 0.25W	01121	CB2725
R4498	321-0243-00			RES., FXD, FILM: 3.32K OHM, 1%, 0.125W	91637	MFF1816G33200F
R4602	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4603	325-0114-00			RES., FXD, FILM: 105 OHM, 0.5%, 0.05W	14298	EE 1/20 +/-5%
R4605	323-0134-00			RES., FXD, FILM: 243 OHM, 1%, 0.50W	91637	MFF1226G243ROF
R4607	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4608	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4610	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
R4611	315-0561-00			RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R4613	323-0134-00			RES., FXD, FILM: 243 OHM, 1%, 0.50W	91637	MFF1226G243ROF
R4615	321-0119-00			RES., FXD, FILM: 169 OHM, 1%, 0.125W	91637	MFF1816G169ROF

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R4616	321-0119-00			RES., FXD, FILM: 169 OHM, 1%, 0.125W	91637	MFF1816G169ROF
R4617	321-0048-00			RES., FXD, FILM: 30.9 OHM, 1%, 0.125W	91637	MFF1816G30R90F
R4618	321-0048-00			RES., FXD, FILM: 30.9 OHM, 1%, 0.125W	91637	MFF1816G30R90F
R4619	311-1259-00			RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3329P-L58-101
R4620	325-0114-00			RES., FXD, FILM: 105 OHM, 0.5%, 0.05W	14298	EE 1/20 +/-5%
R4621	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4623	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4625	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4627	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4630	321-0097-00			RES., FXD, FILM: 100 OHM, 1%, 0.125W	91637	MFF1816G100ROF
R4632	315-0301-00			RES., FXD, CMPSN: 300 OHM, 5%, 0.25W	01121	CB3015
R4634	315-0121-00			RES., FXD, CMPSN: 120 OHM, 5%, 0.25W	01121	CB1215
R4636	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R4638	315-0121-00			RES., FXD, CMPSN: 120 OHM, 5%, 0.25W	01121	CB1215
R4640	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R4642	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R4643	315-0181-00			RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R4645	315-0121-00			RES., FXD, CMPSN: 120 OHM, 5%, 0.25W	01121	CB1215
R4647	315-0132-00			RES., FXD, CMPSN: 1.3K OHM, 5%, 0.25W	01121	CB1325
R4649	315-0121-00			RES., FXD, CMPSN: 120 OHM, 5%, 0.25W	01121	CB1215
R4650	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4652	315-0161-00			RES., FXD, CMPSN: 160 OHM, 5%, 0.25W	01121	CB1615
R4656	315-0362-00			RES., FXD, CMPSN: 3.6K OHM, 5%, 0.25W	01121	CB3625
R4657	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4662	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4663	325-0114-00			RES., FXD, FILM: 105 OHM, 0.5%, 0.05W	14298	EE 1/20 +/-5%
R4665	323-0134-00			RES., FXD, FILM: 243 OHM, 1%, 0.50W	91637	MFF1226G243ROF
R4667	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4668	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4669	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R4673	323-0134-00			RES., FXD, FILM: 243 OHM, 1%, 0.50W	91637	MFF1226G243ROF
R4675	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4676	321-0126-00			RES., FXD, FILM: 200 OHM, 1%, 0.125W	91637	MFF1816G200ROF
R4677	315-0621-00			RES., FXD, CMPSN: 620 OHM, 5%, 0.25W	01121	CB6215
R4678	315-0561-00			RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R4681	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R4682	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4683	325-0114-00			RES., FXD, FILM: 105 OHM, 0.5%, 0.05W	14298	EE 1/20 +/-5%
R4685	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4687	325-0044-00			RES., FXD, FILM: 100 OHM, 0.5%, 0.05W	03888	PME50-F1000ROD
R4688	SELECTED					
R4689	317-0162-00			RES., FXD, CMPSN: 1.6K OHM, 5%, 0.125	01121	BB1625
RT1209	307-0353-00			RES., FXD, FILM: 5 OHM, 10%, DISC	15454	5DA5RO-K-270SS
RT1213	307-0353-00			RES., FXD, FILM: 5 OHM, 10%, DISC	15454	5DA5RO-K-270SS
RT1731	307-0364-00			RES., THERMAL: 50 OHM, 5%, 0.125W	15454	DG125500J
RT1833	307-0124-00			RES., THERMAL: 5K OHM, 10%	50157	1D1618
S342	263-0021-00			ACTR ASSY, PB: 4 LATCH, 7.5MM, 6 CONT	80009	263-0021-00
S344	263-0022-00			ACTR ASSY, PB: 5 LATCH, 7.5MM, 5 CONT	80009	263-0022-00
S352	263-0013-09			ACTR ASSY, PB: 3 LATCH, 10MM, 3 CONT	80009	263-0013-09
S354	263-0013-09			ACTR ASSY, PB: 3 LATCH, 10MM, 3 CONT	80009	263-0013-09
S395	263-0013-08			ACTR ASSY, PB: 3 LATCH, 10MM, 5 CONT	80009	263-0013-08
S865	260-0984-00			SWITCH, SLIDE: DP 3 POSN, 0.5A, 125VAC-DC	79727	G-128-S-0012

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
S1200	260-1709-00			SWITCH, PUSH: POWER	77342	A9M1-762-6-3
S1212	260-1300-00			SWITCH, SLIDE:	82389	46206LFE
S1212	260-1300-00			SWITCH, SLIDE:	82389	46206LFE
S1305	260-1710-00			SW, THERMOSTATIC: 10A, 250V, OPEN 206 DEG	14604	2450-47-16
S1314	260-0450-00			SWITCH, SLIDE: 3 POS, DOUBLE POLE	82389	11D-1007
S2313	311-1839-00			RES., VAR, NONWIR: 5K OHM, 20%, 0.50W, W/4PST SW	01121	14M083
S2320	311-1104-00			RES., VAR, NONWIR: 10K OHM, 10%, 0.50W	12697	381-CM40095
S2404	263-0022-01			ACTR ASSY, PB: 5 LATCH, 7.5MM, 6 CONT	80009	263-0022-01
S2537	311-1838-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W, W/SWITCHES	80009	311-1838-00
S2538	311-1838-00			RES., VAR, NONWIR: 1K OHM, 10%, 0.50W, W/SWITCHES	80009	311-1838-00
S2558	260-1209-00			SWITCH, PUSH: 4PDT	80009	260-1209-00
S2610	260-1833-00			SWITCH, SLIDE: DPDT	82389	11P-1020
S2616	311-1837-00			SWITCH, ROCKER: DPDT	09353	5201-05-
S2624	260-1211-00			SWITCH, PUSH: DPDT, PUSH-PUSH	80009	260-1211-00
S3320	260-0723-00			SWITCH, SLIDE: DPDT, 0.5A, 125VAC	79727	GF126-0028
S3340	260-0984-00			SWITCH, SLIDE: DP 3 POSN, 0.5A, 125VAC-DC	79727	G-128-S-0012
T1208	120-0636-00			XFMR, PWR, STPDN: PRI 2.625V, SEC 1V, 0.005A	80009	120-0636-00
T1225	120-0743-00			XFMR, TOROID: 13 TURNS, BIFILAR	80009	120-0743-00
T1230	120-0744-00			XFMR, TOROID: 5 WINDINGS	80009	120-0744-00
T1235	120-0747-00			XFMR, TOROID: 55 TURNS, SINGLE	80009	120-0747-00
T1310	120-1067-00			XFMR, PWR, STPDN:	80009	120-1067-00
T2010	120-1065-00			XFMR, PWR, STPDN:	80009	120-1065-00
U92	156-0043-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U322	156-0382-00			MICROCIRCUIT, DI: QUAD 2-INPUT NAND GATE	01295	SN74LS00N
U326	156-0382-00			MICROCIRCUIT, DI: QUAD 2-INPUT NAND GATE	01295	SN74LS00N
U330	156-0388-00			MICROCIRCUIT, DI: DUAL D-TYPE FLIP-FLOP	01295	SN74LS74N
U332	156-0030-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U334	156-0043-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U520	155-0078-13	B010100	B020949	MICROCIRCUIT, LI: ML, VERTICAL AMPL, SEL	80009	155-0078-13
U520	155-0078-10	B020950		MICROCIRCUIT, LI: ML, VERTICAL AMPLIFIER	80009	155-0078-10
U526	156-0043-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U532	156-0030-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U580	155-0078-13	B010100	B020949	MICROCIRCUIT, LI: ML, VERTICAL AMPL, SEL	80009	155-0078-13
U580	155-0078-10	B020950		MICROCIRCUIT, LI: ML, VERTICAL AMPLIFIER	80009	155-0078-10
U620	155-0078-13	B010100	B020949	MICROCIRCUIT, LI: ML, VERTICAL AMPL, SEL	80009	155-0078-13
U620	155-0078-10	B020950		MICROCIRCUIT, LI: ML, VERTICAL AMPLIFIER	80009	155-0078-10
U680	155-0078-13	B020200	B020949	MICROCIRCUIT, LI: ML, VERTICAL AMPL, SEL	80009	155-0078-13
U680	155-0078-10	B020950		MICROCIRCUIT, LI: ML, VERTICAL AMPLIFIER	80009	155-0078-10
U884	155-0022-00			MICROCIRCUIT, DI: ML, CHANNEL SWITCH	80009	155-0022-00
U1275	155-0067-02			MICROCIRCUIT, DI: ML, POWER SUPPLY REGULATOR	80009	155-0067-02
U1278	156-0065-00			MICROCIRCUIT, LI: FIVE NPN TRANSISTOR ARRAY	80009	156-0065-00
U1615	156-0281-00			MICROCIRCUIT, LI: 4 TRANSISTOR ARRAY	80009	156-0281-00
U1685	155-0059-00			MICROCIRCUIT, LI: ML, HIGH FREQUENCY AMPL	80009	155-0059-00
U1745	155-0064-00			MICROCIRCUIT, LI: OUTPUT AMPLIFIER	80009	155-0064-00
U2012	152-0652-00			SEMICONV DEVICE: HIGH VOLTAGE MULT	14099	SCMA10426
U2224	156-0067-00			MICROCIRCUIT, LI: OPERATIONAL AMPLIFIER	80009	156-0067-00
U2468	156-0158-00			MICROCIRCUIT, LI: DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
U2552	156-0043-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U2556	156-0030-00			MICROCIRCUIT, DI: QUAD 2-INPUT POS NAND GATE	01295	SN7400N
U2562	156-0172-00			MICROCIRCUIT, DI: DUAL RETRIG ONE-SHOT W/CLR	80009	156-0172-00
U2565	156-0186-00			MICROCIRCUIT, DI: QUAD 2-INPUT NAND GATE	01295	SN7403N
U2588	156-0383-00			MICROCIRCUIT, DI: QUAD 2-INPUT NOR GATE	01295	SN74LS02N

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U2592	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U2594	156-0172-00			MICROCIRCUIT,DI:DUAL RETRIG ONE-SHOT W/CLR	80009	156-0172-00
U2608	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U2682	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U2684	156-0172-00			MICROCIRCUIT,DI:DUAL RETRIG ONE-SHOT W/CLR	80009	156-0172-00
U3232	155-0015-01			MICROCIRCUIT,DI:ML,ANALOG DATA SWITCH	80009	155-0015-01
U3262	155-0015-01			MICROCIRCUIT,DI:ML,ANALOG DATA SWITCH	80009	155-0015-01
U3401	155-0018-00			MICROCIRCUIT,DI:ML,ZERO LOGIC	80009	155-0018-00
U3418	155-0014-01			MICROCIRCUIT,DI:ML,ANALOG TO DECIMAL CONV	80009	155-0014-01
U3429	155-0014-01			MICROCIRCUIT,DI:ML,ANALOG TO DECIMAL CONV	80009	155-0014-01
U3433	155-0021-01			MICROCIRCUIT,DI:ML,TIMING GENERATOR	80009	155-0021-01
U3445	155-0017-00			MICROCIRCUIT,DI:ML,ZERO LOGIC COUNTER	80009	155-0017-00
U3447	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U3449	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U3450	156-0032-00			MICROCIRCUIT,DI:4-BIT BINARY COUNTER	80009	156-0032-00
U3461	155-0023-00			MICROCIRCUIT,DI:ML,CHAR GEN NUMERALS	80009	155-0023-00
U3463	155-0024-00			MICROCIRCUIT,DI:ML,CHAR GEN SPCL SYMBOLS	80009	155-0024-00
U3465	155-0025-00			MICROCIRCUIT,DI:ML,CHAR GEN PREFIXES	80009	155-0025-00
U3467	155-0026-00			MICROCIRCUIT,DI:ML,CHAR GEN LETTERS	80009	155-0026-00
U3469	155-0027-00			MICROCIRCUIT,DI:ML,CHAR GEN SPCL ALPHA	80009	155-0027-00
U3470	155-0019-00			MICROCIRCUIT,DI:ML,DECIMAL POINT AND SPACE	80009	155-0019-00
U3480	155-0020-00			MICROCIRCUIT,DI:ML,CHANNEL SW OUTPUT ASSY	80009	155-0020-00
U4320	155-0011-00			MICROCIRCUIT,DI:ML,CLOCK AND CHOP BLANKING	80009	155-0011-00
U4340	155-0010-00			MICROCIRCUIT,DI:ML,CHOP DIVIDER/BLANKING	80009	155-0010-00
U4358	155-0013-00			MICROCIRCUIT,DI:ML,HORIZ CHOP ALTN BINARY	80009	155-0013-00
U4368	155-0013-00			MICROCIRCUIT,DI:ML,HORIZ CHOP ALTN BINARY	80009	155-0013-00
U4412	155-0013-00			MICROCIRCUIT,DI:ML,HORIZ CHOP ALTN BINARY	80009	155-0013-00
U4428	155-0009-00			MICROCIRCUIT,DI:ML,HORIZ LOCKOUT LOGIC	80009	155-0009-00
U4494	155-0012-00			MICROCIRCUIT,LI:ML,Z-AXIS AND AMPLIFIER	80009	155-0012-00
U4625	155-0095-01			MICROCIRCUIT,LI:FREQUENCY DIFF AMPLIFIER	80009	155-0095-01
U4641	156-0197-00			MICROCIRCUIT,LI:5 TRANSISTOR ARRAY	80009	156-0197-00
U4685	155-0095-01			MICROCIRCUIT,LI:FREQUENCY DIFF AMPLIFIER	80009	155-0095-01
V2200	154-0745-00	B010100	B019999	ELECTRON TUBE:CRT,P31	80009	154-0745-00
V2200	154-0780-00	B020000		ELECTRON TUBE:CRT,STORAGE,INT SCALE	80009	154-0780-00
VR1246	152-0428-00			SEMICONV DEVICE:ZENER,0.4W,120V,5%	04713	1N987B
VR1253	152-0590-00			SEMICONV DEVICE:ZENER,18V,5% AT 7MA	04713	1N967B
VR1279	152-0243-00			SEMICONV DEVICE:ZENER,0.4W,15V,5%	80009	152-0243-00
VR1297	152-0212-00			SEMICONV DEVICE:ZENER,0.5W,9V,5%	80009	152-0212-00
VR1401	152-0226-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	81483	69-6584
VR1461	152-0226-00			SEMICONV DEVICE:ZENER,0.4W,5.1V,5%	81483	69-6584
VR1501	152-0127-00			SEMICONV DEVICE:ZENER,0.4W,7.5V,5%	80009	152-0127-00
VR1505	152-0212-00			SEMICONV DEVICE:ZENER,0.5W,9V,5%	80009	152-0212-00
VR1848	153-0050-00			SEMICONV DEVICE:ZENER,0.4W,14.5V,5%,SEL	80009	153-0050-00
VR1948	153-0050-00			SEMICONV DEVICE:ZENER,0.4W,14.5V,5%,SEL	80009	153-0050-00
VR1968	152-0590-00			SEMICONV DEVICE:ZENER,18V,5% AT 7MA	04713	1N967B
VR2021	152-0247-00			SEMICONV DEVICE:ZENER,0.4W,150V,5%	04713	1N989B
VR2133	152-0289-00			SEMICONV DEVICE:ZENER,0.4W,180V,5%	04713	1N991B
VR2808	152-0280-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR2867	152-0280-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	80009	152-0280-00
VR2927	152-0289-00			SEMICONV DEVICE:ZENER,0.4W,180V,5%	04713	1N991B
VR3470	152-0405-00			SEMICONV DEVICE:ZENER,1W,15V,5%	80009	152-0405-00
VR3471	152-0405-00			SEMICONV DEVICE:ZENER,1W,15V,5%	80009	152-0405-00
VR3472	152-0405-00			SEMICONV DEVICE:ZENER,1W,15V,5%	80009	152-0405-00
VR4334	152-0166-00			SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R538	321-0296-00			RES., FXD, FILM: 11.8K OHM, 1%, 0.125W	91637	MFF1816G11801F
R540	317-0101-00			RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R541	321-0144-00			RES., FXD, FILM: 309 OHM, 1%, 0.125W	91637	MFF1816G309ROF
R542	321-0135-00			RES., FXD, FILM: 249 OHM, 1%, 0.125W	91637	MFF1816G249ROF
R543	317-0101-00	B010100	B010186	RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R543	317-0820-00	B010187		RES., FXD, CMPSN: 82 OHM, 5%, 0.125W	01121	BB8205
R544	317-0101-00	B010100	B010186	RES., FXD, CMPSN: 100 OHM, 5%, 0.125W	01121	BB1015
R544	317-0820-00	B010187		RES., FXD, CMPSN: 82 OHM, 5%, 0.125W	01121	BB8205
R545	321-0065-00			RES., FXD, FILM: 46.4 OHM, 1%, 0.125W	91637	MFF1816G46R40F
R546	323-0119-00			RES., FXD, FILM: 169 OHM, 1%, 0.50W	75042	CECTO-1690F
R547	311-1007-00			RES., VAR, NONWIR: 20 OHM, 20%, 0.50W	73138	82-38-0
R548	321-0221-00			RES., FXD, FILM: 1.96K OHM, 1%, 0.125W	91637	MFF1816G19600F
R549	321-0219-00			RES., FXD, FILM: 1.87K OHM, 1%, 0.125W	91637	MFF1816G18700F
R552	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R553	315-0511-00			RES., FXD, CMPSN: 510 OHM, 5%, 0.25W	01121	CB5115
R555	321-0065-00			RES., FXD, FILM: 46.4 OHM, 1%, 0.125W	91637	MFF1816G46R40F
R556	323-0119-00			RES., FXD, FILM: 169 OHM, 1%, 0.50W	75042	CECTO-1690F
R558	315-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.25W	01121	CB1515
R562	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R563	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R565	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R566	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R567	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R569	323-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.50W	75042	CECTO-2670F
R571	317-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.125W	01121	BB1035
R572	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R573	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R575	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R576	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R577	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R579	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R581	323-0165-00			RES., FXD, FILM: 511 OHM, 1%, 0.5W	75042	CECTO-5110F
R582	317-0150-00			RES., FXD, CMPSN: 15 OHM, 5%, 0.125W	01121	BB1505
R583	321-0066-00			RES., FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	MFF1816G47R50F
R584	321-0075-00			RES., FXD, FILM: 59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R585	323-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.50W	75042	CECTO-1001F
R586	311-0605-00			RES., VAR, NONWIR: 200 OHM, 10%, 0.50W	80740	62-54-3
R587	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R588	317-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.125W	01121	BB1515
R589	311-1261-00			RES., VAR, NONWIR: 500 OHM, 10%, 0.50W	32997	3329P-L58-501
R591	323-0165-00			RES., FXD, FILM: 511 OHM, 1%, 0.5W	75042	CECTO-5110F
R592	317-0150-00			RES., FXD, CMPSN: 15 OHM, 5%, 0.125W	01121	BB1505
R593	321-0066-00			RES., FXD, FILM: 47.5 OHM, 1%, 0.125W	91637	MFF1816G47R50F
R594	321-0075-00			RES., FXD, FILM: 59 OHM, 1%, 0.125W	91637	MFF1816G59R00F
R595	323-0193-00			RES., FXD, FILM: 1K OHM, 1%, 0.50W	75042	CECTO-1001F
R596	317-0241-00			RES., FXD, CMPSN: 240 OHM, 5%, 0.125W	01121	BB2415
R597	315-0510-00			RES., FXD, CMPSN: 51 OHM, 5%, 0.25W	01121	CB5105
R598	317-0151-00			RES., FXD, CMPSN: 150 OHM, 5%, 0.125W	01121	BB1515
R603	321-0022-00			RES., FXD, FILM: 16.5 OHM, 1%, 0.125W	91637	MFF1816G16R50F
R605	321-0070-00			RES., FXD, FILM: 52.3 OHM, 1%, 0.125W	91637	MFF1816G52R30F
R606	321-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.125W	91637	MFF1816G267ROF
R607	321-0064-00			RES., FXD, FILM: 45.3 OHM, 1%, 0.125W	91637	MFF1816G45R30F
R609	323-0138-00			RES., FXD, FILM: 267 OHM, 1%, 0.50W	75042	CECTO-2670F

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 (μ s).
- Resistors = Ohms (Ω).

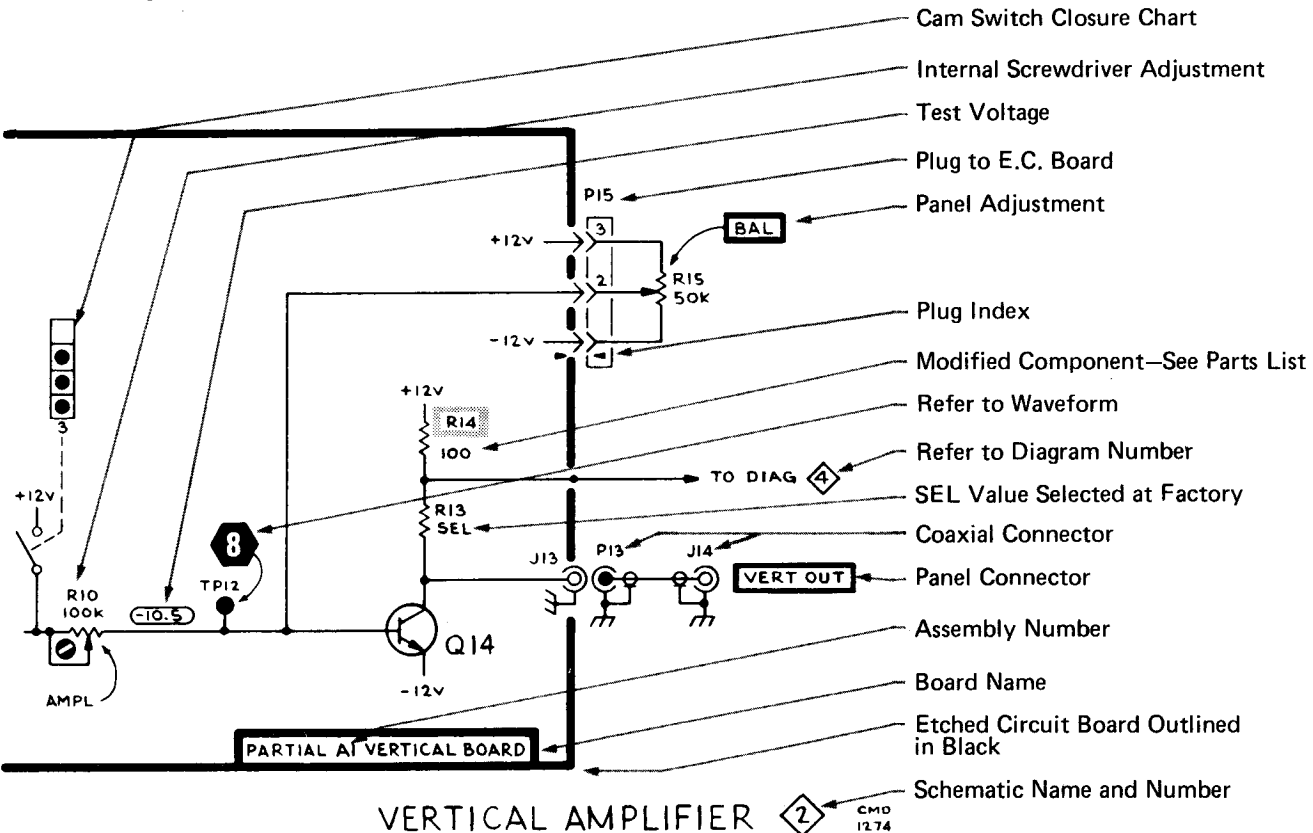
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

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

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

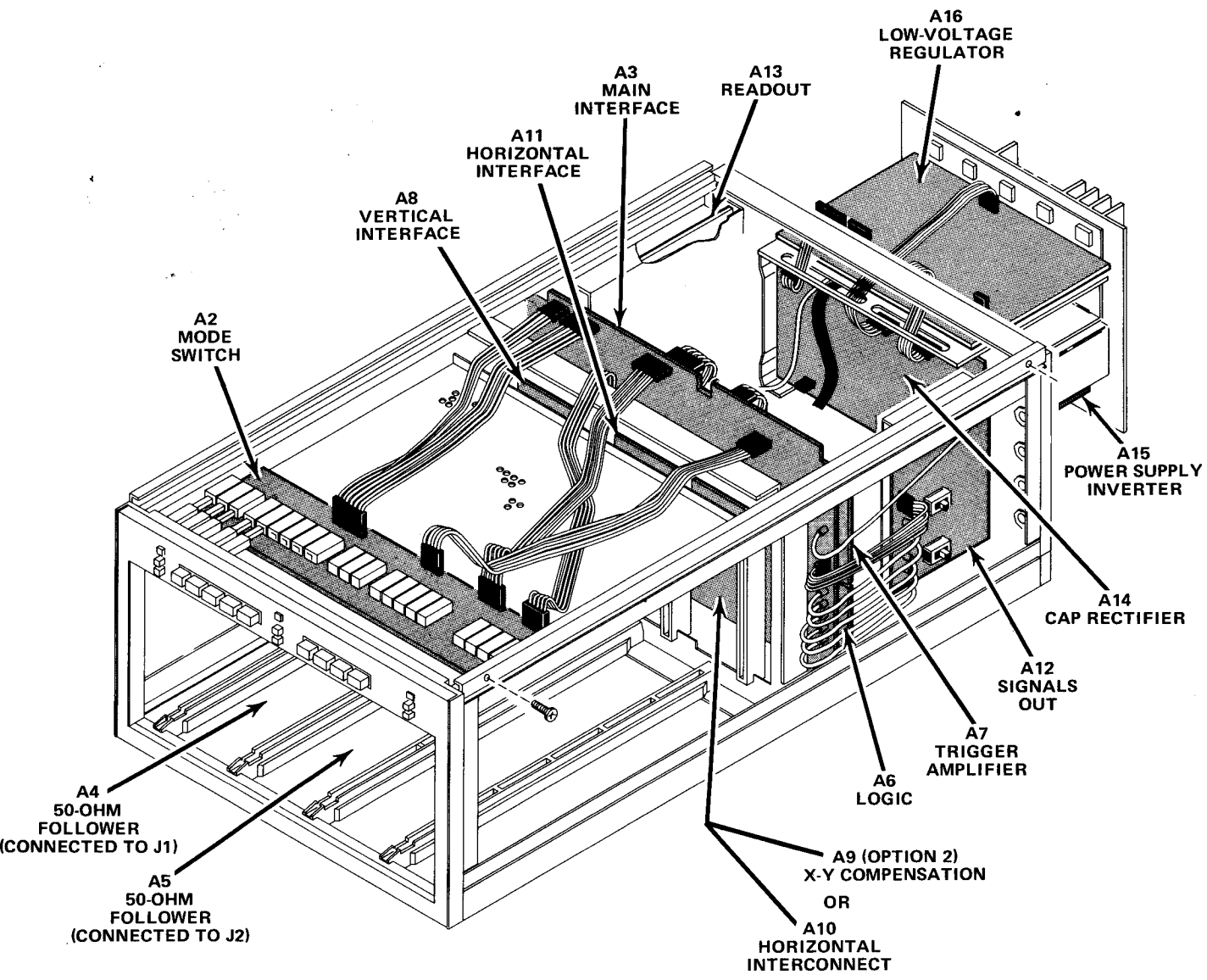
A	Assembly, separable or repairable (circuit board, etc.)	H	Heat dissipating device (heat sink, heat radiator, etc.)	RT	Thermistor
AT	Attenuator, fixed or variable	HR	Heater	S	Switch
B	Motor	HY	Hybrid circuit	T	Transformer
BT	Battery	J	Connector, stationary portion	TC	Thermocouple
C	Capacitor, fixed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

The following special symbols are used on the diagrams:



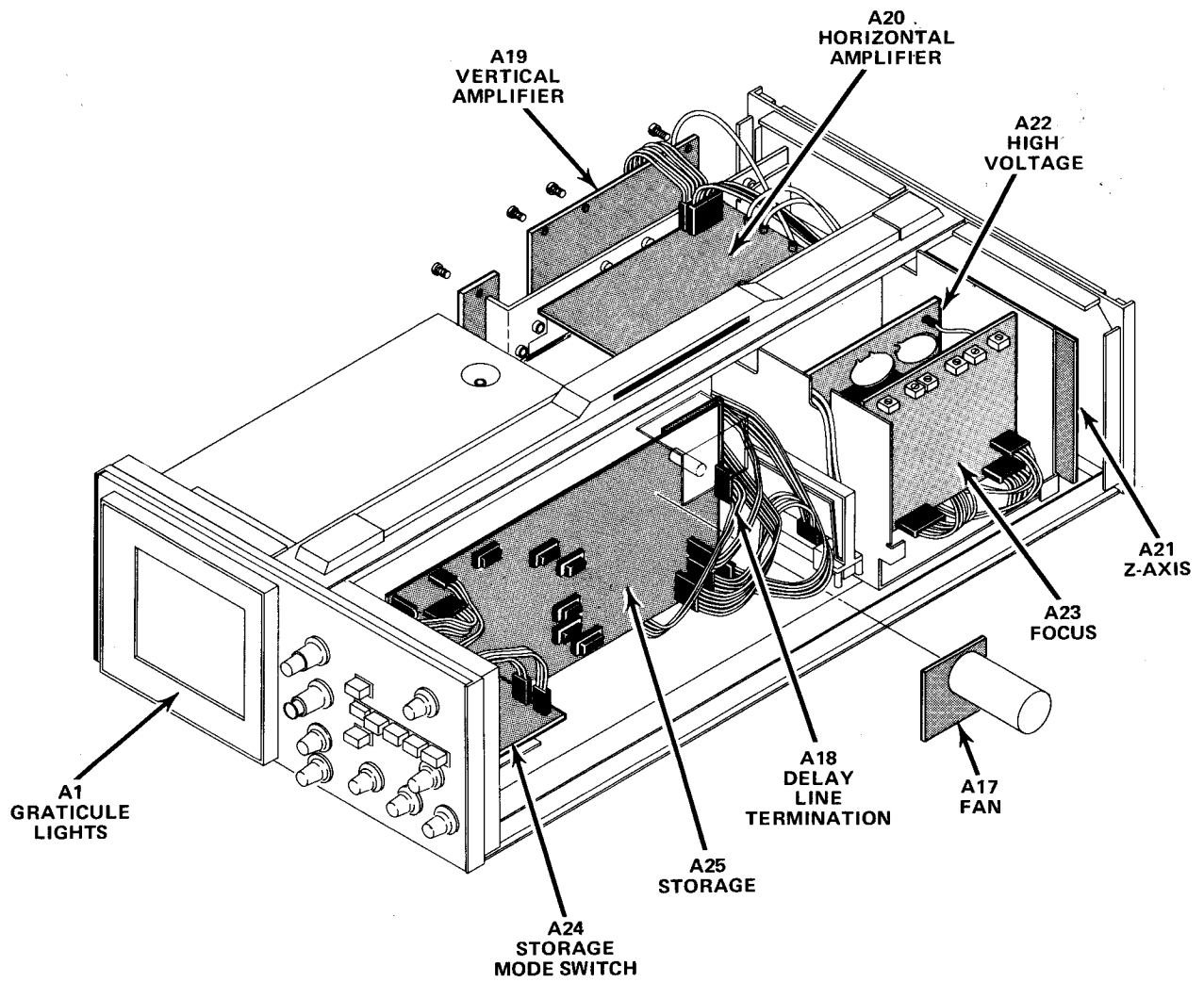
A4
50-ON
FOLLOW
(CONNECTE

(CO



1988-23(a)

Figure 8-1 Location of circuit boards in the 7834 acquisition unit.



1988-23(b)

Figure 8-2 Location of circuit boards in the 7834 display unit.

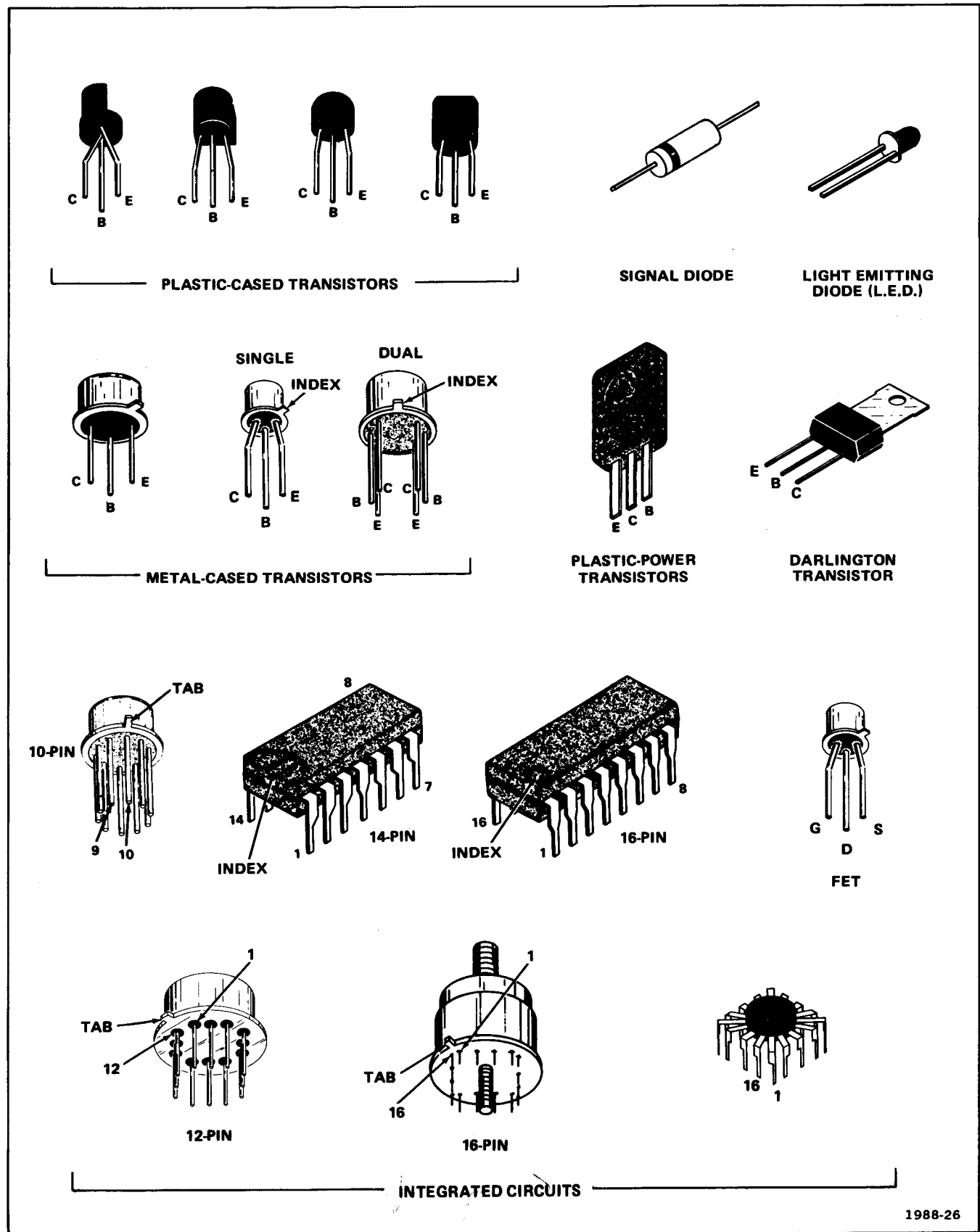
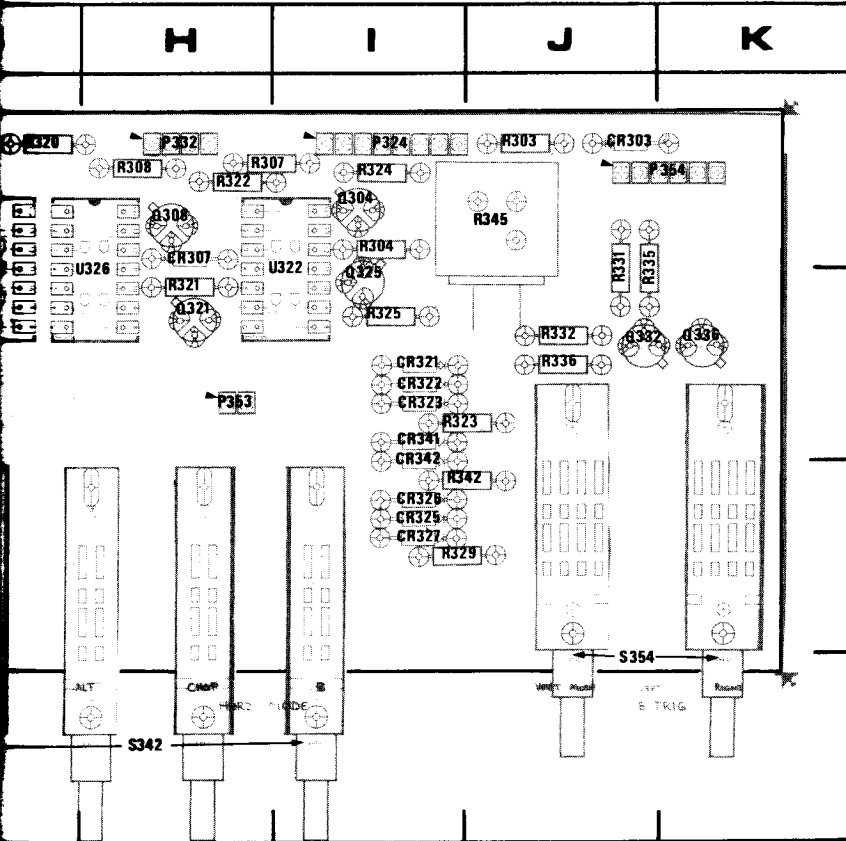
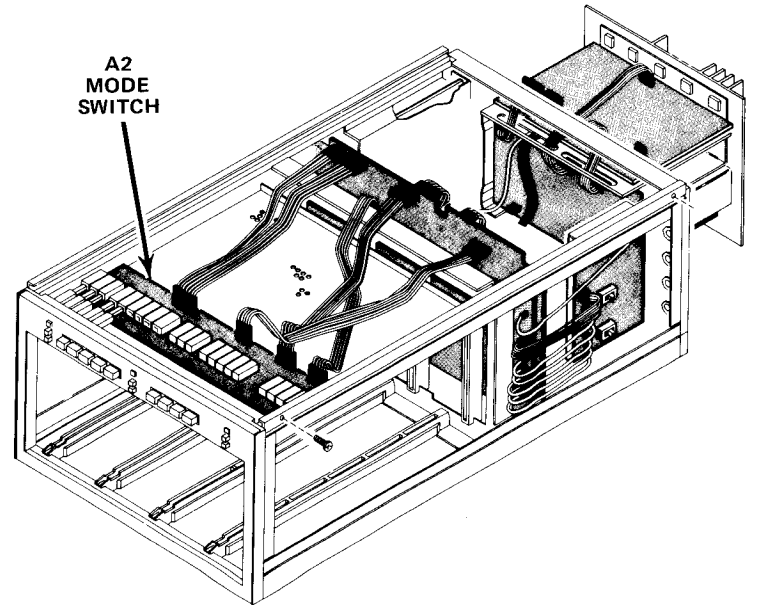


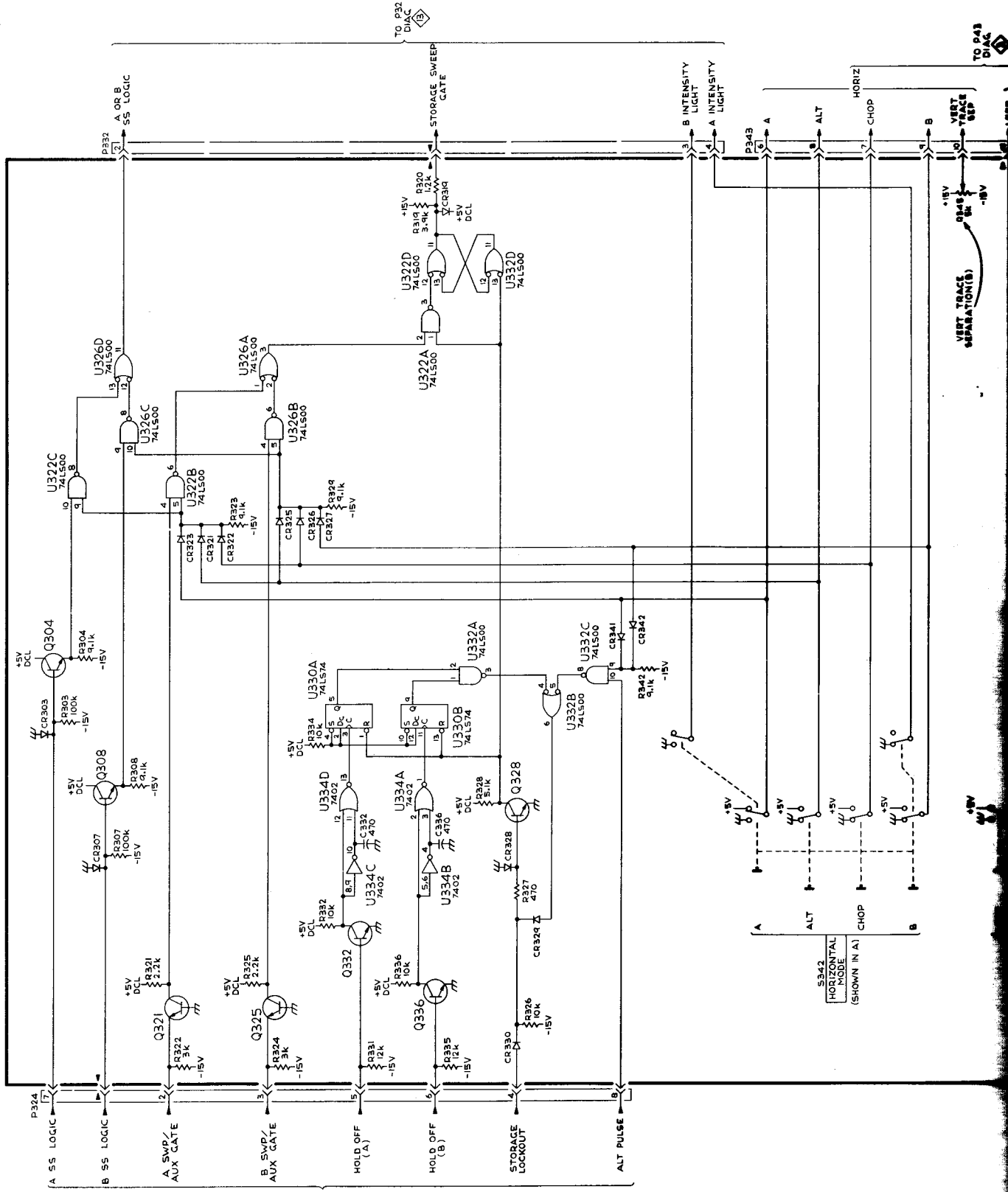
Figure 8-3. Semiconductor lead configurations.



1988-153

GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
1J	R382	2C	S344	4D
2J	R383	2C	S352	3F
2I	R384	2E	S354	4J
3I	R385	1C	S395	4A
1J	R386	2B		
2E	R387	2B	U322	1I
1E	R392	2B	U326	1H
1B	R393	2C	U330	1F
1B	R394	2B	U332	1G
1B	R395	2C	U334	1E
1C	R396	2C		
2C	R397	2C		
1A				
1C	S342	4H		

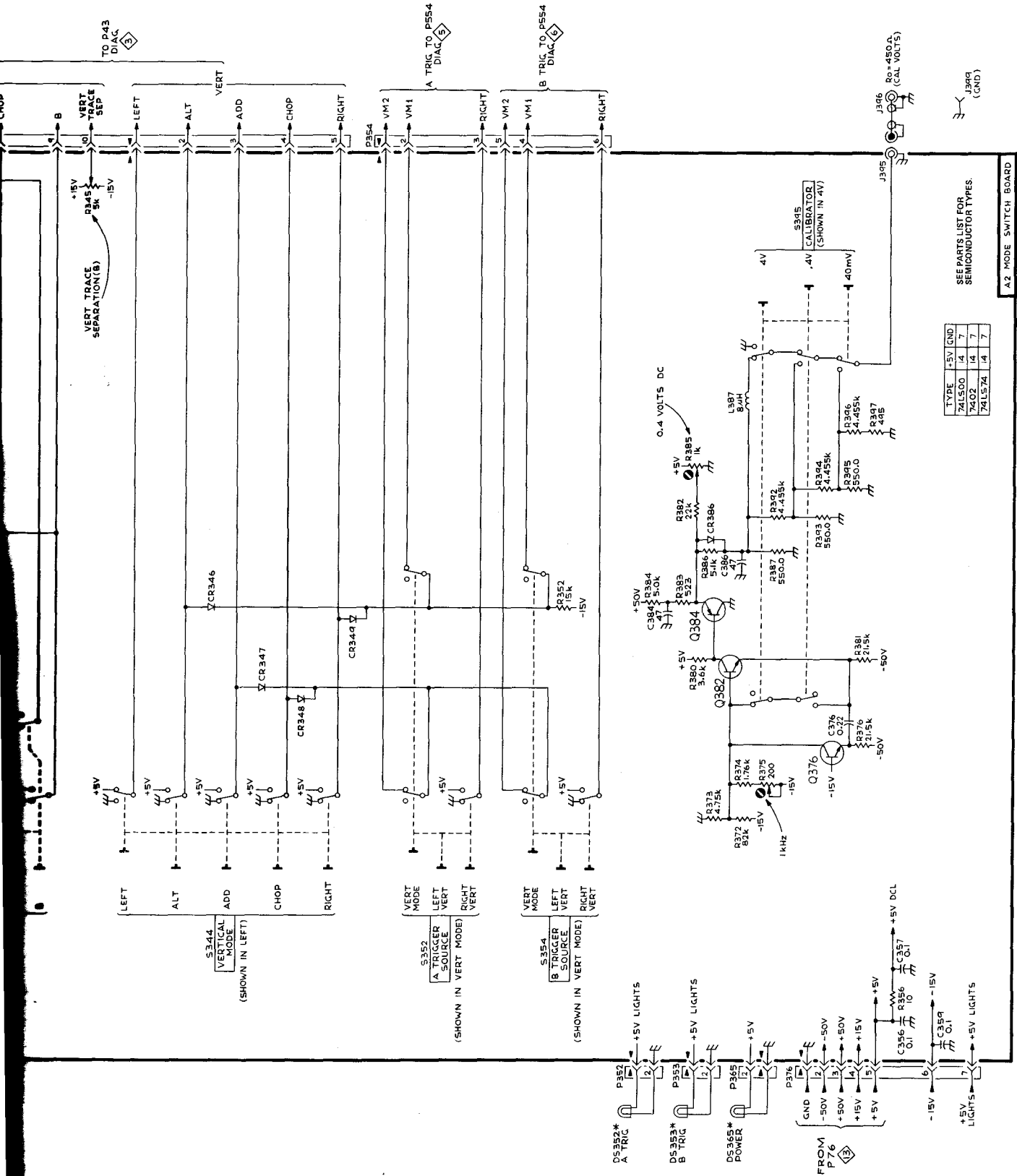




7834

FROM P24
DIAAG

REV. B, NOV
1988-51



TYPE	+5V	GND
74LS00	4	7
7402	4	7
74LS74	4	7

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

A2 MODE SWITCH BOARD

NOTE: * FRONT PANEL INDICATOR

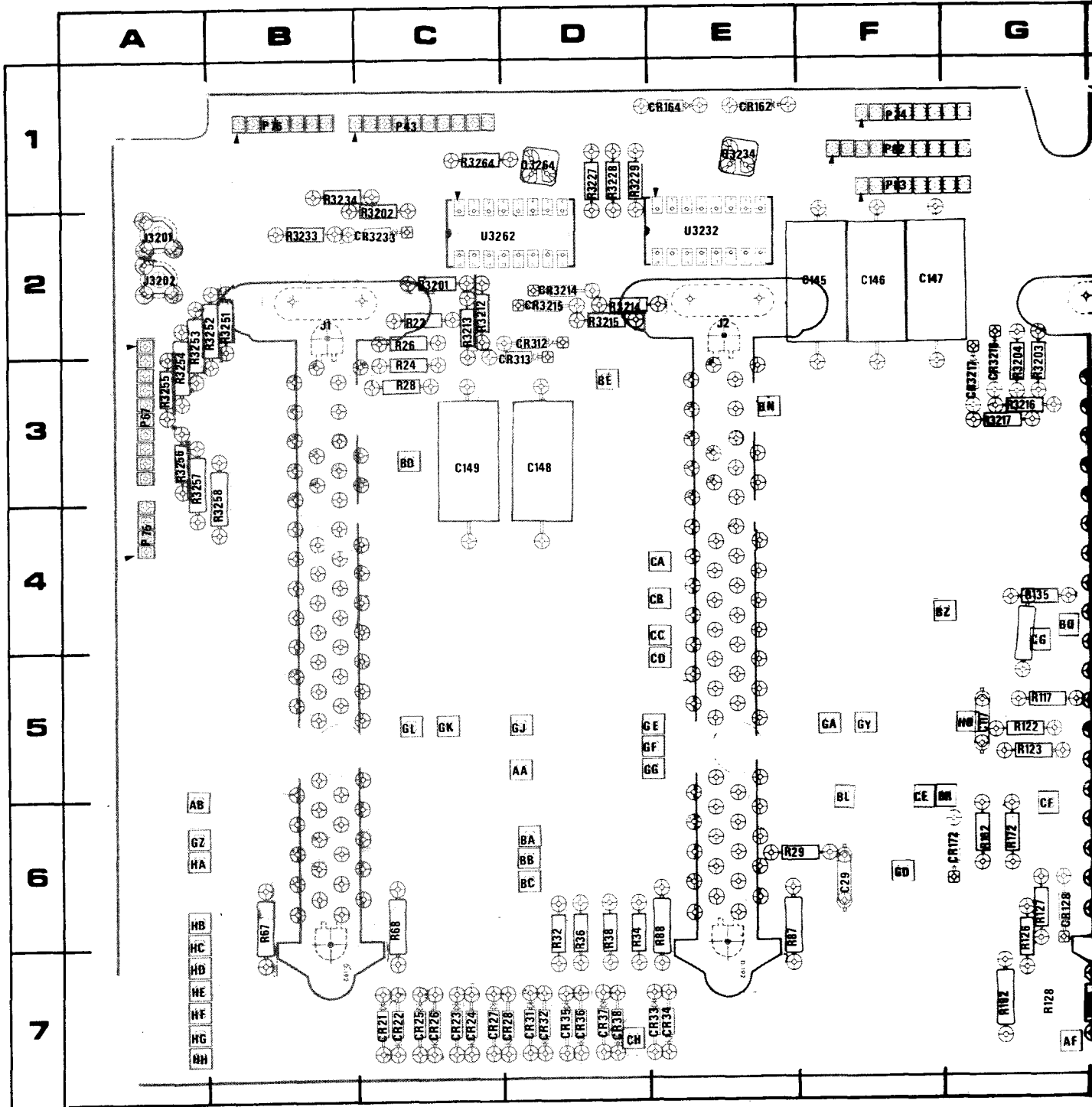
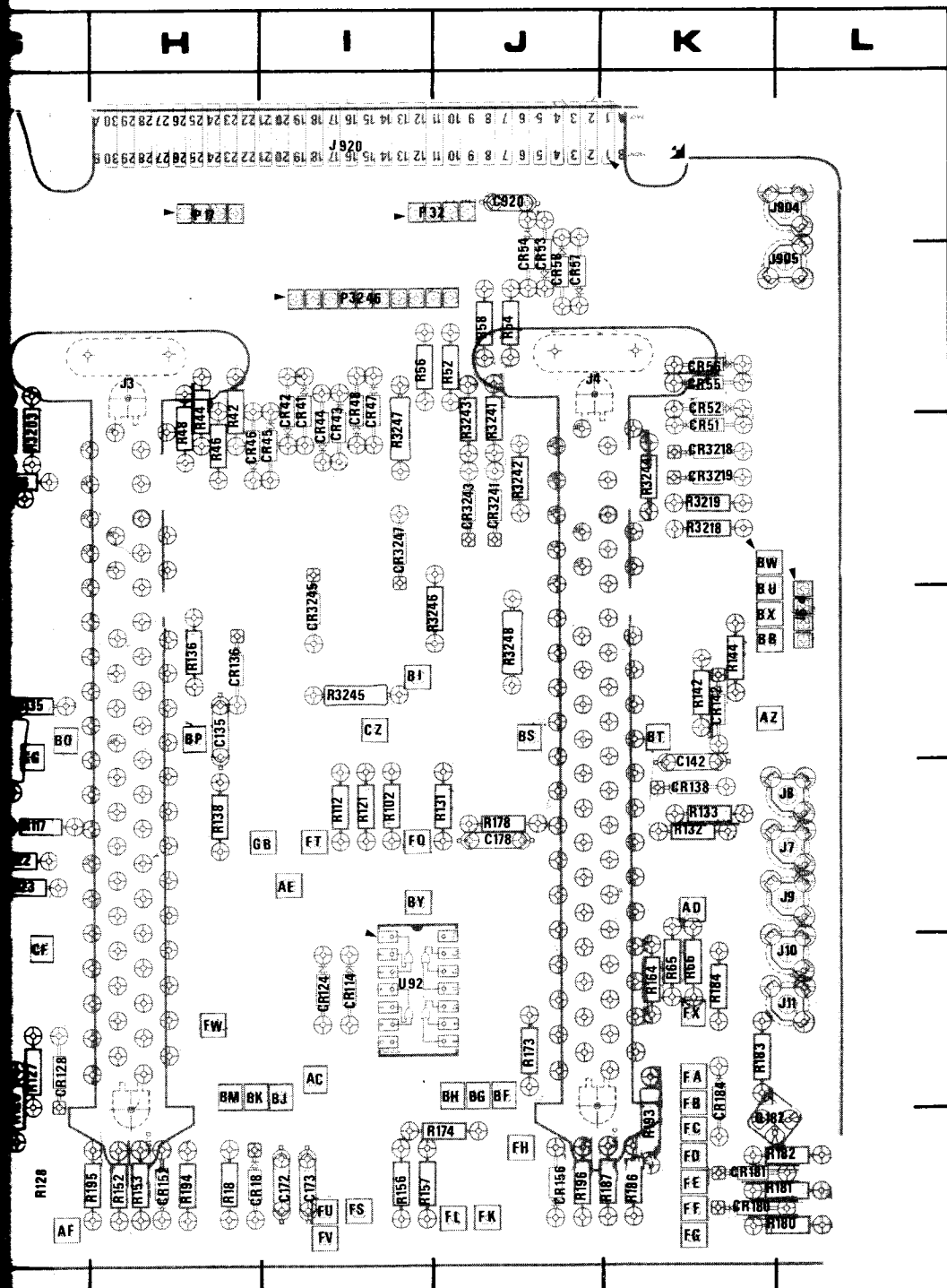
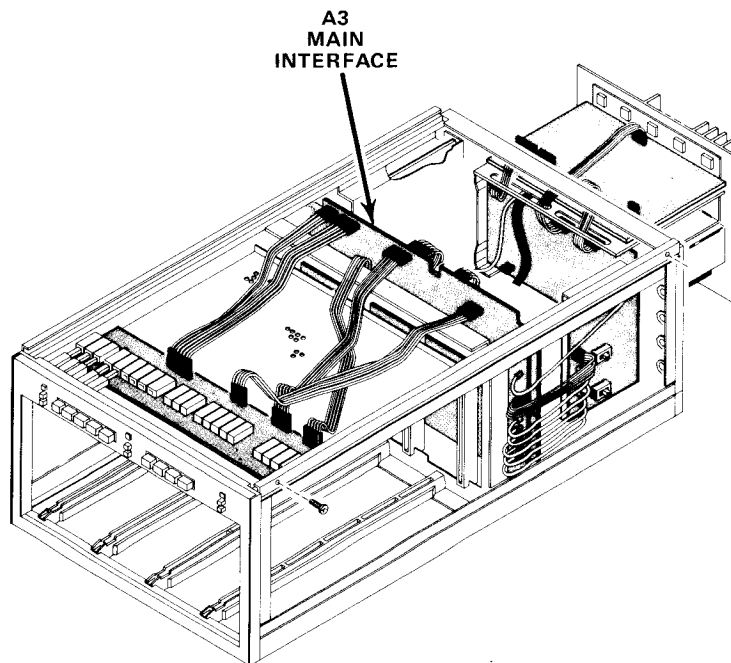


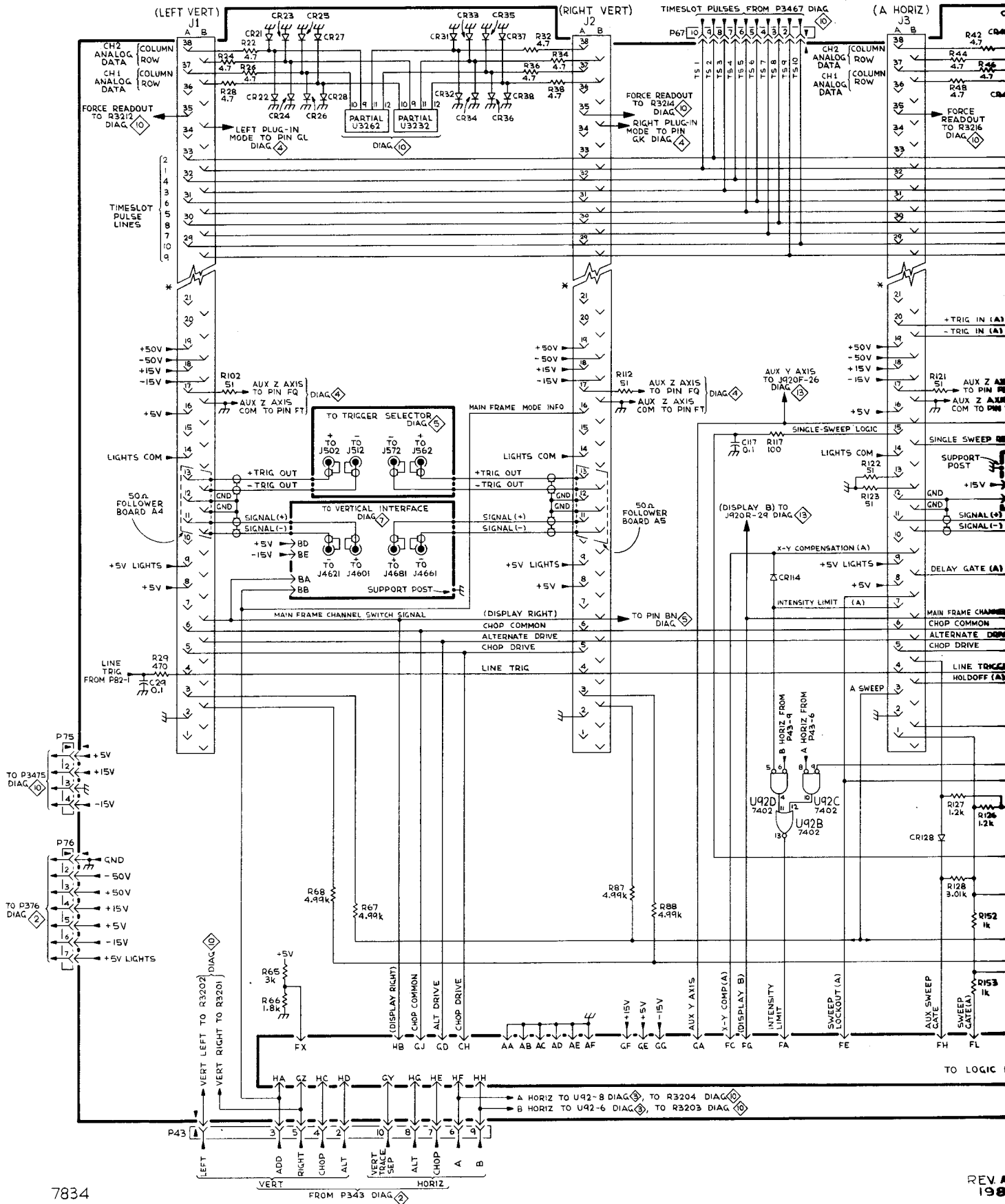
Figure 8-5. A3—Main Interface circuit board assembly.



CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO
C29	6F	CR31	7D	CR31
C117	5G	CR32	7D	CR32
C135	4H	CR33	7E	CR33
C142	5K	CR34	7E	CR34
C145	2F	CR35	7D	CR35
C146	2F	CR36	7D	CR36
C147	2F	CR37	7D	CR37
C148	3D	CR38	7D	CR38
C149	3C	CR41	3I	CR41
C172	7I	CR42	3I	CR42
C173	7I	CR43	3I	CR43
C178	5J	CR44	3I	CR44
C920	1J	CR45	3I	CR45
		CR46	3H	CR46
CR18	7H	CR47	3I	CR47
CR21	7C	CR48	3I	CR48
CR22	7C	CR51	3K	CR51
CR23	7C	CR52	2K	CR52
CR24	7C	CR53	2J	CR53
CR25	7C	CR54	2J	CR54
CR26	7C	CR55	2K	CR55
CR27	7C	CR56	2K	CR56
CR28	7D	CR57	2J	CR57

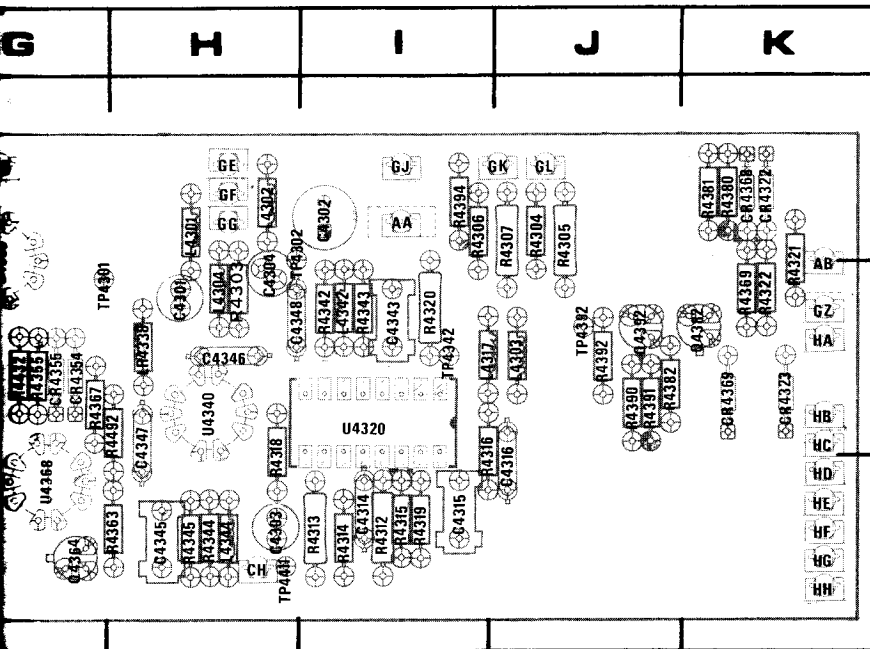
	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
1	7D	CR58	2J	CR3233	2C	P32	1J	R38	6D	R128	7G	R184	6K	R3233	2B
2	7D	CR114	6I	CR3241	3J	P43	1C	R42	3H	R131	5J	R186	7K	R3234	1B
3	7E	CR124	6I	CR3243	3J	P67	3A	R44	3H	R132	5K	R187	7K	R3241	3J
4	7E	CR128	6G	CR3245	4I	P75	4A	R46	3H	R133	5K	R192	7G	R3242	3J
5	7D	CR136	4H	CR3247	3I	P76	1B	R48	3H	R135	4G	R193	7K	R3243	3J
6	7D	CR138	5K			P82	1F	R52	2J	R136	4H	R194	7H	R3244	3K
7	7D	CR142	4K	J1	2B	P83	1F	R54	2J	R138	5H	R195	7H	R3245	4I
8	7D	CR152	7H	J2	2E	P91	4L	R56	2I	R142	4K	R196	7J	R3246	4J
9	3I	CR156	7J	J3	2H	P3246	2I	R58	2J	R144	4K	R3201	2C	R3247	3I
10	3I	CR162	1E	J4	2J			R65	6K	R152	7H	R3202	2C	R3248	4J
11	3I	CR164	1E	J7	5L	Q182	7K	R66	6K	R153	7H	R3203	3G	R3251	2B
12	3I	CR172	6G	J8	5L	Q3234	1E	R67	6B	R156	7I	R3204	3G	R3252	2A
13	3I	CR180	7K	J9	5L	Q3264	1D	R68	6C	R157	7I	R3212	2C	R3253	3A
14	3H	CR181	7K	J10	6L			R87	6E	R162	6G	R3213	2C	R3254	3A
15	3I	CR184	7K	J11	6L	R18	7H	R88	6E	R164	6K	R3214	2D	R3255	3A
16	3I	CR312	2D	J904	1L	R22	2C	R102	5I	R172	6G	R3215	2D	R3256	3A
17	3K	CR313	3D	J905	2L	R24	3C	R112	5I	R173	6J	R3216	3G	R3257	3A
18	2K	CR3214	2D	J920	1I	R26	2C	R117	5G	R174	7J	R3217	3G	R3258	4A
19	2J	CR3215	2D	J3201	2A	R28	3C	R121	5I	R178	5J	R3218	3K	R3264	1C
20	2J	CR3216	4G	J3202	2A	R29	6E	R122	5G	R180	7K	R3219	3K		
21	2K	CR3217	3G			R32	6D	R123	5G	R181	7K	R3227	1D	U92	6I
22	2K	CR3218	3K	P17	1H	R34	6D	R126	6G	R182	7K	R3228	1D	U3232	2E
23	2J	CR3219	3K	P24	1F	R36	6D	R127	6G	R183	6K	R3229	1D	U3262	2C





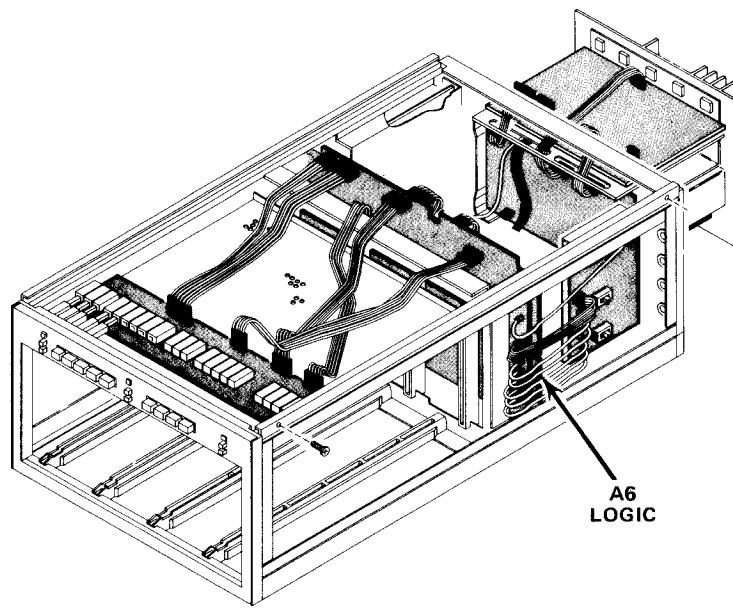
7834

REV A
198



1988-155

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
R4381	1K	R4449	2F	R4485	2D	TP4412	2F
R4382	2J	R4456	2G	R4486	3D	TP4413	3B
R4390	2J	R4457	3F	R4487	2D	TP4462	3A
R4391	2J	R4461	3A	R4488	3C	TP4468	3A
R4392	2J	R4462	1A	R4489	2D	TP4483	2D
R4394	1I	R4467	3A	R4491	3C	TP4493	2D
R4413	2F	R4468	1B	R4492	2H		
R4420	3A	R4471	1C	R4493	2C	U4320	2I
R4423	3B	R4472	1C	R4494	2C	U4340	2H
R4424	3E	R4473	2D	R4495	2D	U4358	2G
R4425	3B	R4474	1B	R4496	3C	U4368	3G
R4426	3E	R4475	1A	R4497	3D	U4412	3F
R4431	2E	R4476	1B	R4498	3D	U4428	2B
R4432	2G	R4479	2C			U4494	2C
R4437	2E	R4480	2A	TP4301	2G		
R4438	2E	R4481	2C	TP4302	1H	VR4334	2E
R4441	2E	R4482	3D	TP4342	2I		
R4442	1E	R4483	2D	TP4392	2J		
R4448	1F	R4484	3D	TP4411	3H		



A6
LOGIC

VOLTAGE CONDITIONS

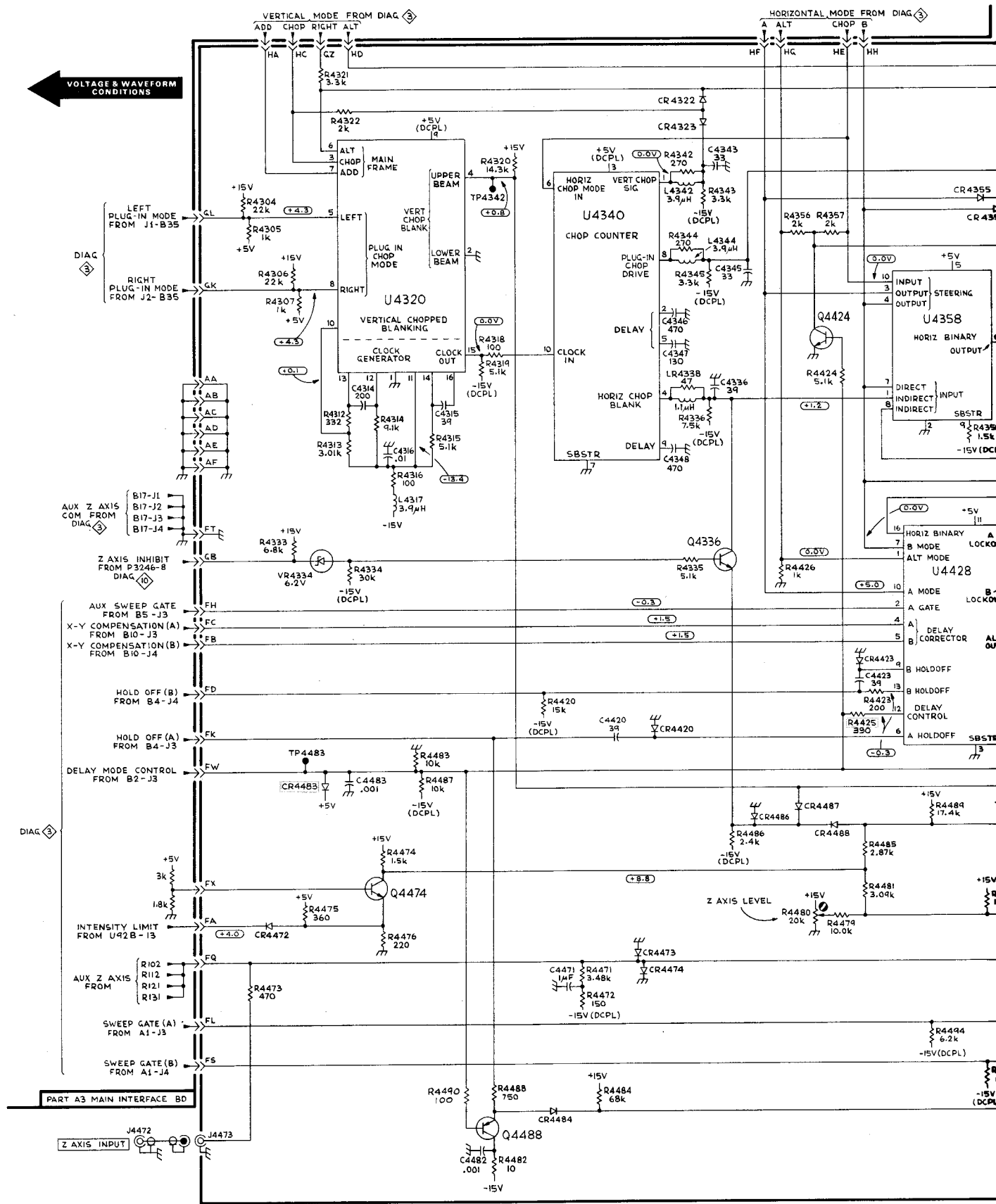
The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.



VOLTAGE & WAVEFORM CONDITIONS

PART A3 MAIN INTERFACE BD

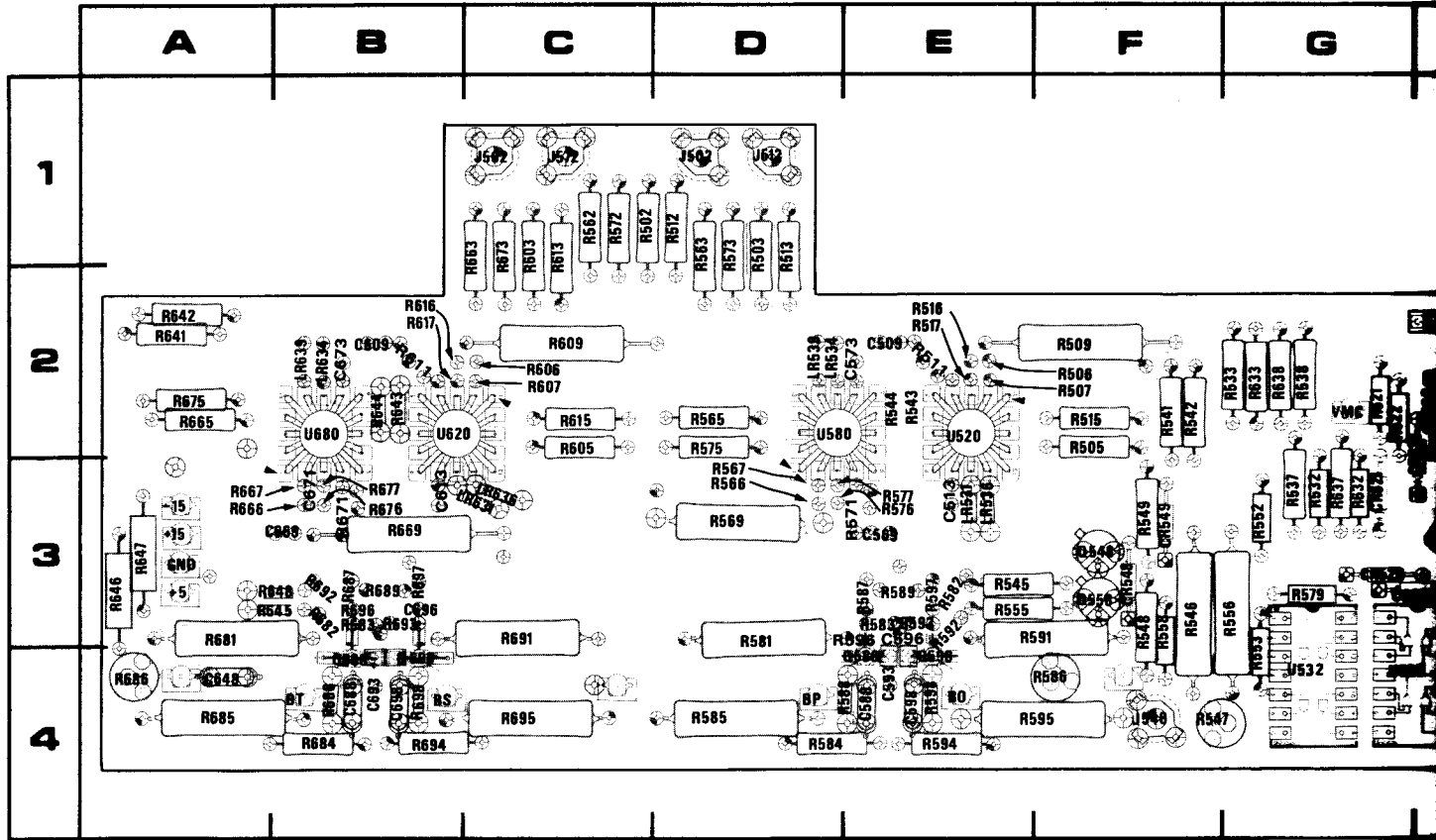
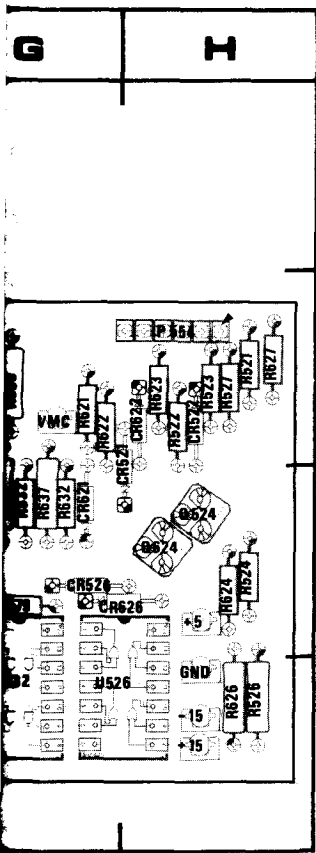


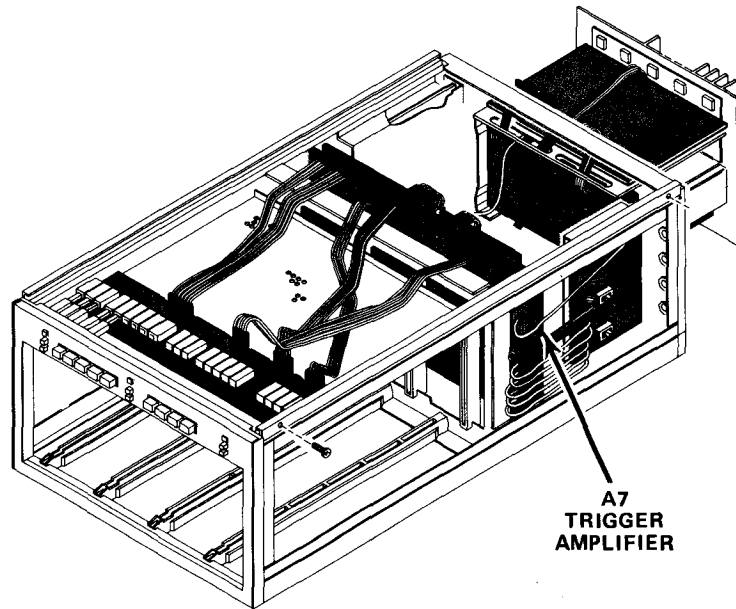
Figure 8-7. A7—Trigger Amplifier circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C509	2E	J502	1D	Q624	3H	R533	2G	R567	3D	R597	3E	R642	2A		
C513	3E	J512	1D	Q688	4B	R537	3G	R569	3D	R598	4E	R643	2B		
C569	3E	J548	4F	Q698	4B	R538	2G	R571	3E	R603	1C	R644	2B		
C573	2E	J562	1C			R541	2F	R572	1C	R605	2C	R645	3B		
C588	4E	J572	1C	R502	1C	R542	2F	R573	1D	R606	2C	R646	3A		
C593	4E			R503	1D	R543	2E	R575	2D	R607	2C	R647	3A		
C596	4E			R505	2F	R544	2E	R576	3E	R609	2C	R648	3B		
C598	4E			R506	2F	R545	3E	R577	3E	R611	2B	R663	1C		
C609	2B	LR531	3E	R507	2F	R546	3F	R579	3G	R613	1C	R665	2A		
C613	3B	LR534	2D	R509	2F	R547	4F	R581	3D	R615	2C	R666	3A		
C648	4A	LR536	3E	R511	2E	R548	3F	R582	3E	R616	2B	R667	3A		
C669	3B	LR539	2D	R512	1D	R549	3F	R583	3E	R617	2B	R669	3B		
C671	3B	LR631	3C	R513	1D	R552	3G	R584	4D	R621	2G	R671	3B		
C673	2B	LR634	2B	R515	2F	R553	4G	R585	4D	R622	2G	R673	1C		
C688	4B	LR636	3C	R516	2E	R553	4H	R586	4F	R623	2H	R675	2A		
C693	4B	LR639	2B	R517	2E	R555	3E	R587	3E	R624	3H	R676	3B		
C696	3B			R521	2H	R556	3G	R588	4E	R626	4H	R677	3B		
C698	4B	P554	2H	R522	2H	R558	3F	R589	3E	R627	2H	R681	3A		
CR521	2H	Q524	3H	R523	2H	R562	1C	R591	3F	R632	3G	R682	3B		
CR521	3G	Q548	3F	R524	3H	R563	1D	R592	3E	R633	2G	R683	3B		
CR522	2H	Q558	3F	R526	4H	R565	2D	R593	3E	R637	3G	R684	4B		
CR526	3G	Q588	4E	R527	2H	R566	3D	R594	4E	R638	2G	R685	4A		
CR548	3F	Q598	4E	R532	3G			R595	4F	R641	2A	R686	4A		
CR549	3F							R596	4E						
CR621	3G														
CR622	2H														
CR626	3G														



1988-156A

GRID COORD	CKT NO	GRID COORD
3A	R687	3B
3B	R688	4B
3B	R689	3B
3B	R691	3C
3A	R692	3B
3A	R693	3B
3B	R694	4B
3C	R695	4C
3A	R696	3B
3A	R697	3B
3A	R698	4B
3B	U520	3E
3C	U526	4G
3A	U532	4G
3B	U580	2D
3B	U620	2B
3A	U680	2B
3B		
3B		
3A		
3A		



A7
TRIGGER
AMPLIFIER

VOLTAGE CONDITIONS

The voltages shown were obtained with the 7834 controls set as follows:

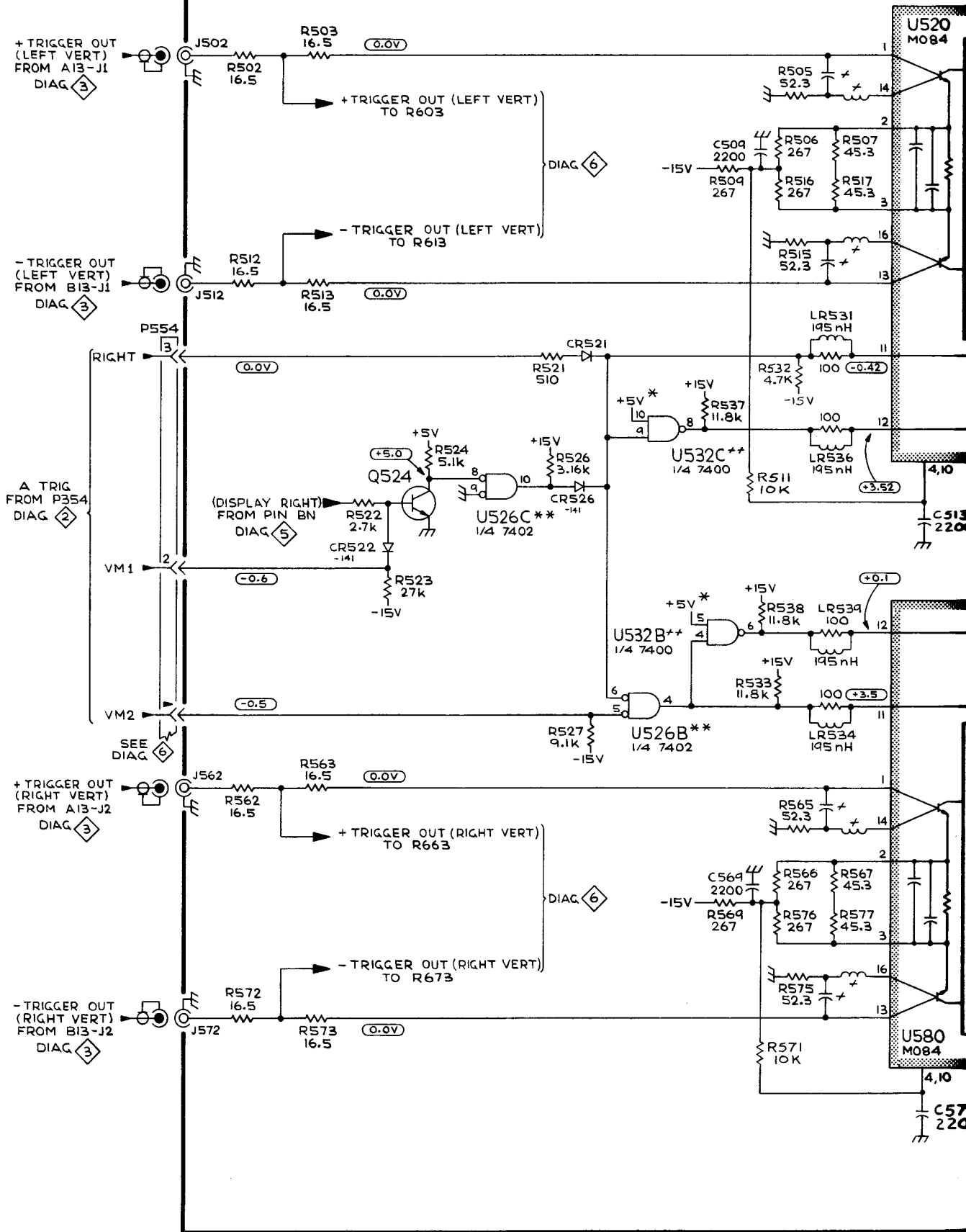
Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

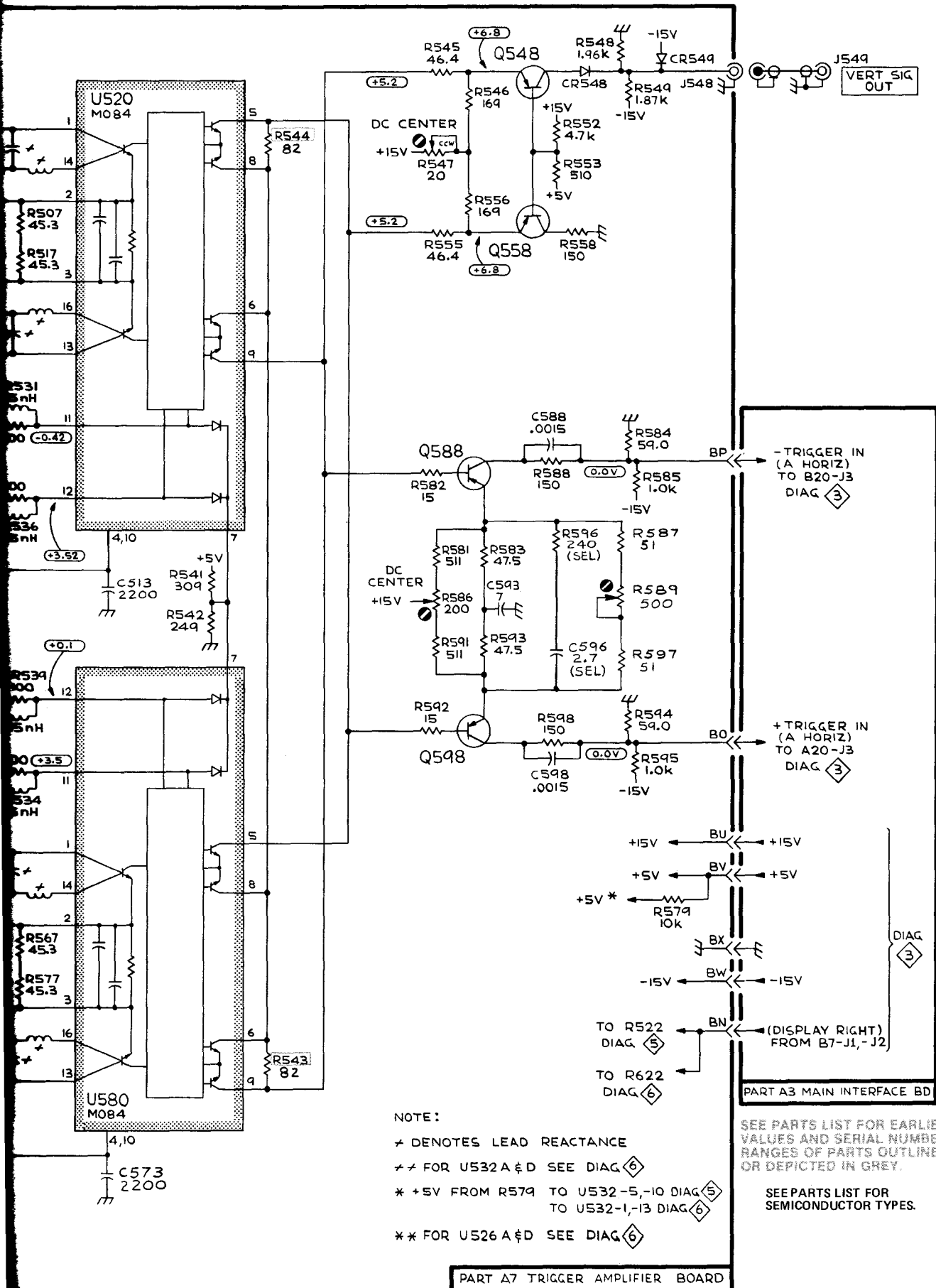
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

VOLTAGE & WAVEFORM CONDITIONS





NOTE:

- * DENOTES LEAD REACTANCE
- ** FOR U532A & D SEE DIAG 6
- * +5V FROM R579 TO U532-5,-10 DIAG 5
TO U532-1,-13 DIAG 6
- ** FOR U526A & D SEE DIAG 6

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

PART A7 TRIGGER AMPLIFIER BOARD

A TRIGGER SELECTOR 5

A TRIGGER SELECTOR



PART A3 MAIN INTERFACE BD

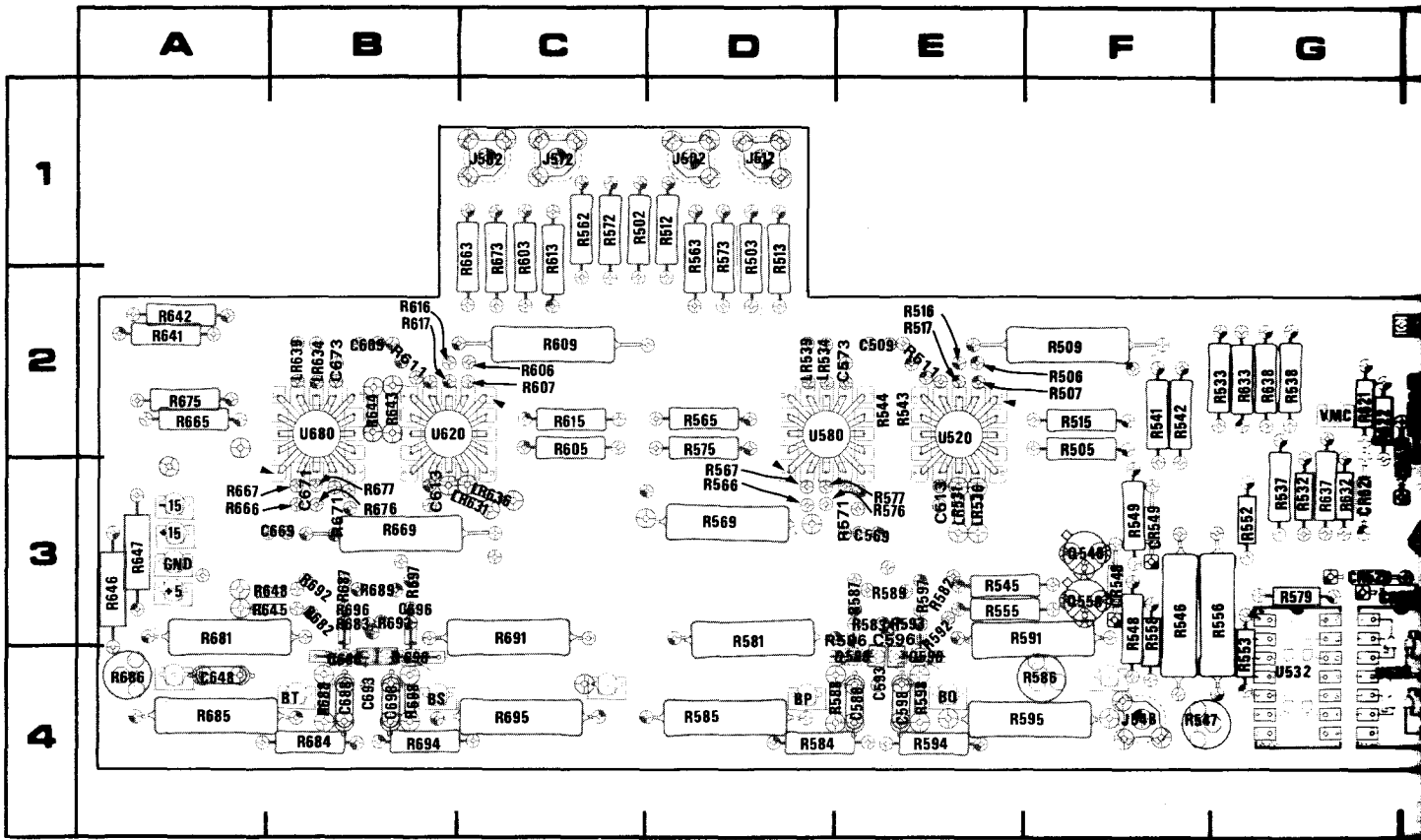
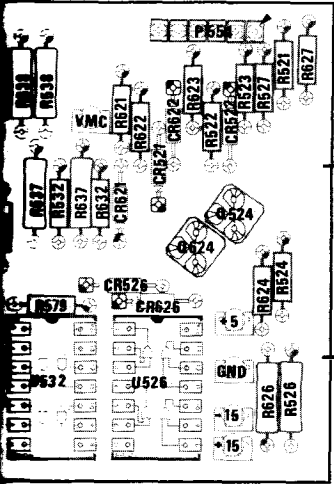


Figure 8-8. A7-Trigger Amplifier circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C509	2E	J502	1D	Q624	3H	R533	2G	R567	3D	R597	3E	R642	2A	R663	1C
C513	3E	J512	1D	Q688	4B	R537	3G	R569	3D	R598	4E	R643	2B	R665	2A
C569	3E	J548	4F	Q698	4B	R538	2G	R571	3E	R603	1C	R644	2B	R666	3A
C573	2E	J562	1C			R541	2F	R572	1C	R605	2C	R645	3B	R667	3A
C588	4E	J572	1C	R502	1C	R542	2F	R573	1D	R606	2C	R646	3A	R668	3B
C593	4E			R503	1D	R543	2E	R575	2D	R607	2C	R647	3A	R669	3B
C596	4E			R505	2F	R544	2E	R576	3E	R609	2C	R648	3B	R670	3B
C598	4E	LR531	3E	R506	2F	R545	3E	R577	3E	R611	2B	R649	3B	R671	3B
C609	2B	LR534	2D	R507	2F	R546	3F	R579	3G	R613	1C	R650	3B	R672	1C
C613	3B	LR536	3E	R509	2F	R547	4F	R581	3D	R615	2C	R651	3B	R673	1C
C648	4A	LR539	2D	R511	2E	R548	3F	R582	3E	R616	2B	R652	3B	R674	1C
C669	3B	LR631	3C	R512	1D	R549	3F	R583	3E	R617	2B	R653	3B	R675	2A
C671	3B	LR634	2B	R513	1D	R552	3G	R584	4D	R621	2G	R654	3B	R676	3B
C673	2B	LR636	3C	R515	2F	R553	4G	R585	4D	R622	2G	R655	3B	R677	3B
C688	4B	LR639	2B	R516	2E	R555	4H	R586	4F	R623	2H	R656	3B	R678	3B
C693	4B			R517	2E	R556	3E	R587	3E	R624	3H	R657	3B	R679	3B
C696	3B	P554	2H	R521	2H	R558	3G	R588	4E	R626	4H	R658	3B	R680	3B
C698	4B			R522	2H	R559	3F	R589	3E	R627	2H	R659	3B	R681	3A
CR521	2H	Q524	3H	R523	2H	R562	1C	R591	3F	R632	3G	R660	3B	R682	3B
CR521	3G	Q548	3F	R524	3H	R563	1D	R592	3E	R633	2G	R661	3B	R683	3B
CR522	2H	Q558	3F	R526	4H	R565	2D	R593	3E	R637	3G	R662	3B	R684	4B
CR526	3G	Q588	4E	R527	2H	R566	3D	R594	4E	R638	2G	R663	3B	R685	4A
CR548	3F	Q598	4E	R532	3G			R595	4F	R641	2A	R664	3B	R686	4A
CR549	3F							R596	4E			R665	3B		
CR621	3G											R666	3A		
CR622	2H											R667	3A		
CR626	3G											R668	3B		

G

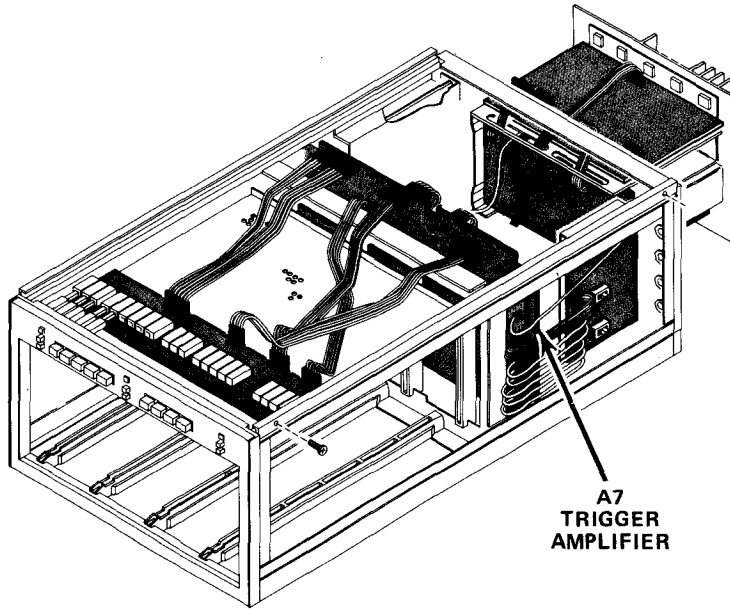
H



1988-156A

GRID COORD	CKT NO	GRID COORD
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2A	R687	3B
2B	R688	4B
2B	R689	3B
3B	R691	3C
3A	R692	3B
3A	R693	3B
3B	R694	4B
1C	R695	4C
2A	R696	3B
3A	R697	3B
3A	R698	4B
3B		
3B	U520	3E
1C	U526	4G
2A	U532	4G
3B	U580	2D
3B	U620	2B
3A	U680	2B
3B		
3B		
4B		
4A		
4A		

A7
TRIGGER
AMPLIFIER

VOLTAGE CONDITIONS

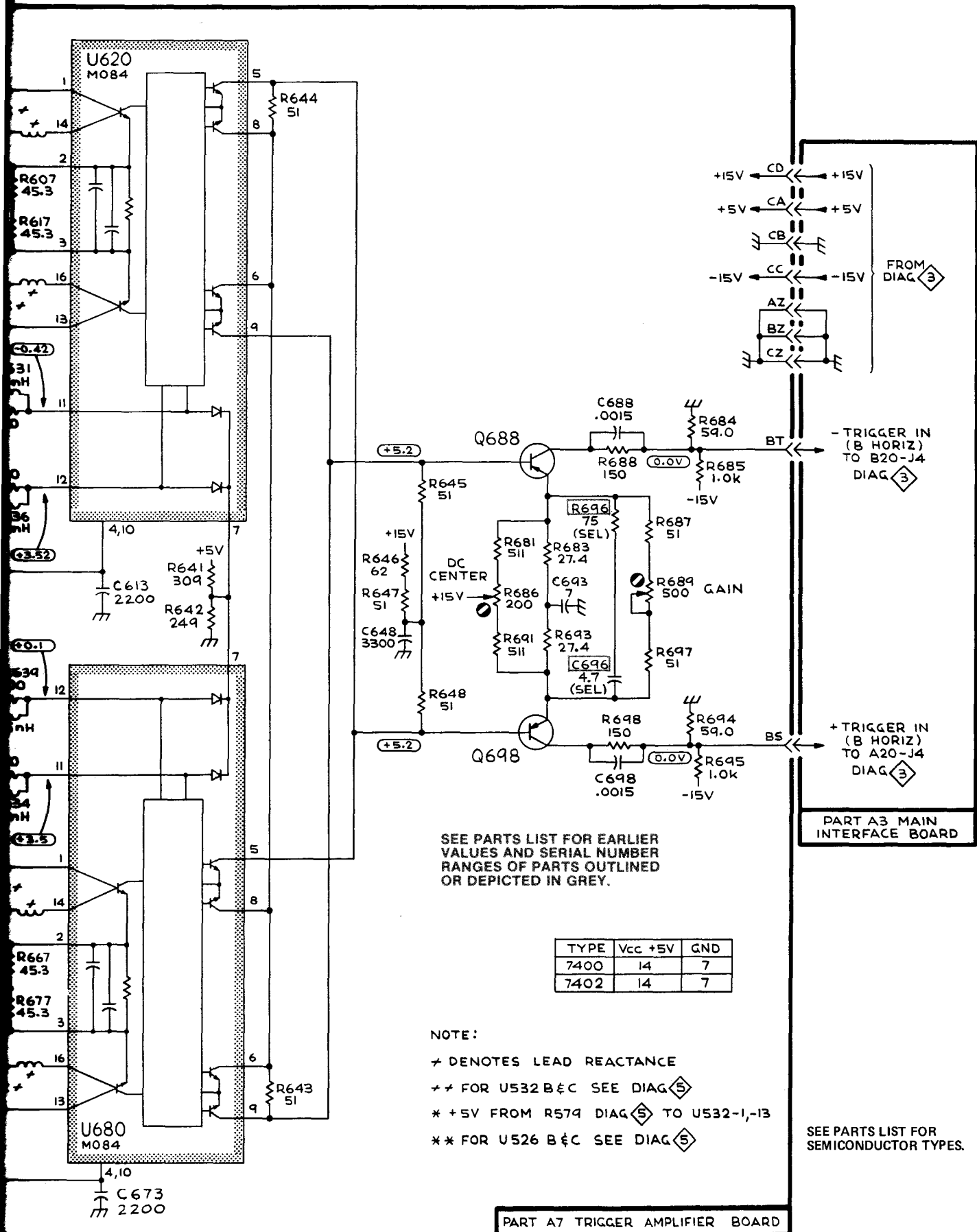
The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

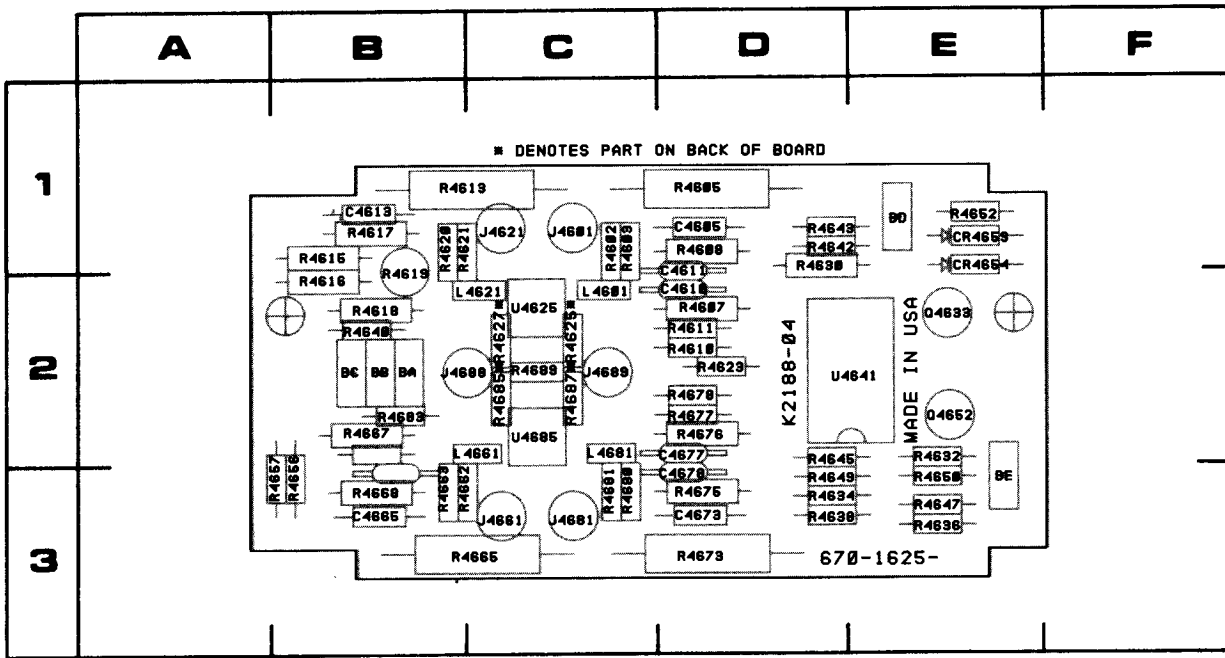
TYPE	Vcc +5V	GND
7400	14	7
7402	14	7

- NOTE:
- * DENOTES LEAD REACTANCE
 - ** FOR U526 B & C SEE DIAG 5
 - * +5V FROM R579 DIAG 5 TO U532-1,-13
 - ** FOR U526 B & C SEE DIAG 5

PART A7 TRIGGER AMPLIFIER BOARD

PART A3 MAIN INTERFACE BOARD

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.



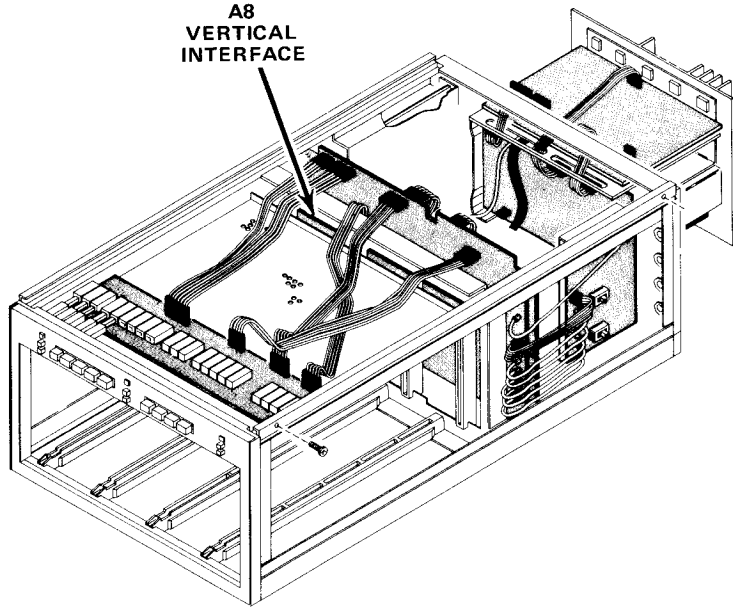
1988-158

Figure 8-9. A8-Vertical Interface circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C4605	1D	J4688	2B	R4610	2D	R4636	3E	R4668	3B
C4610	2D	J4689	2C	R4611	2D	R4638	3D	R4673	3D
C4611	2D			R4613	1B	R4640	2B	R4675	3D
C4613	1B	L4601	2C	R4615	1B	R4642	1D	R4676	2D
C4665	3B	L4621	2C	R4616	2B	R4643	1D	R4677	2D
C4673	3D	L4661	2B	R4617	1B	R4645	2D	R4678	2D
C4677	2D	L4681	2C	R4618	2B	R4647	3E	R4680	3C
C4678	3D			R4619	2B	R4649	3D	R4681	3C
		Q4633	2E	R4620	1B	R4650	3E	R4683	2B
CR4653	1E	Q4652	2E	R4621	1B	R4652	1E	R4685	2C
CR4654	1E			R4623	2D	R4656	3B	R4687	2C
		R4602	1C	R4625	2C	R4657	3B	R4689	2C
J4601	1C	R4603	1C	R4627	2C	R4662	3B		
J4621	1C	R4605	1D	R4630	1D	R4663	3B	U4625	2C
J4661	3C	R4607	2D	R4632	2E	R4665	3C	U4641	2D
J4681	3C	R4608	1D	R4634	3D	R4667	2B	U4685	2C

ASSEMBLY A8

A8
VERTICAL
INTERFACE



VOLTAGE CONDITIONS

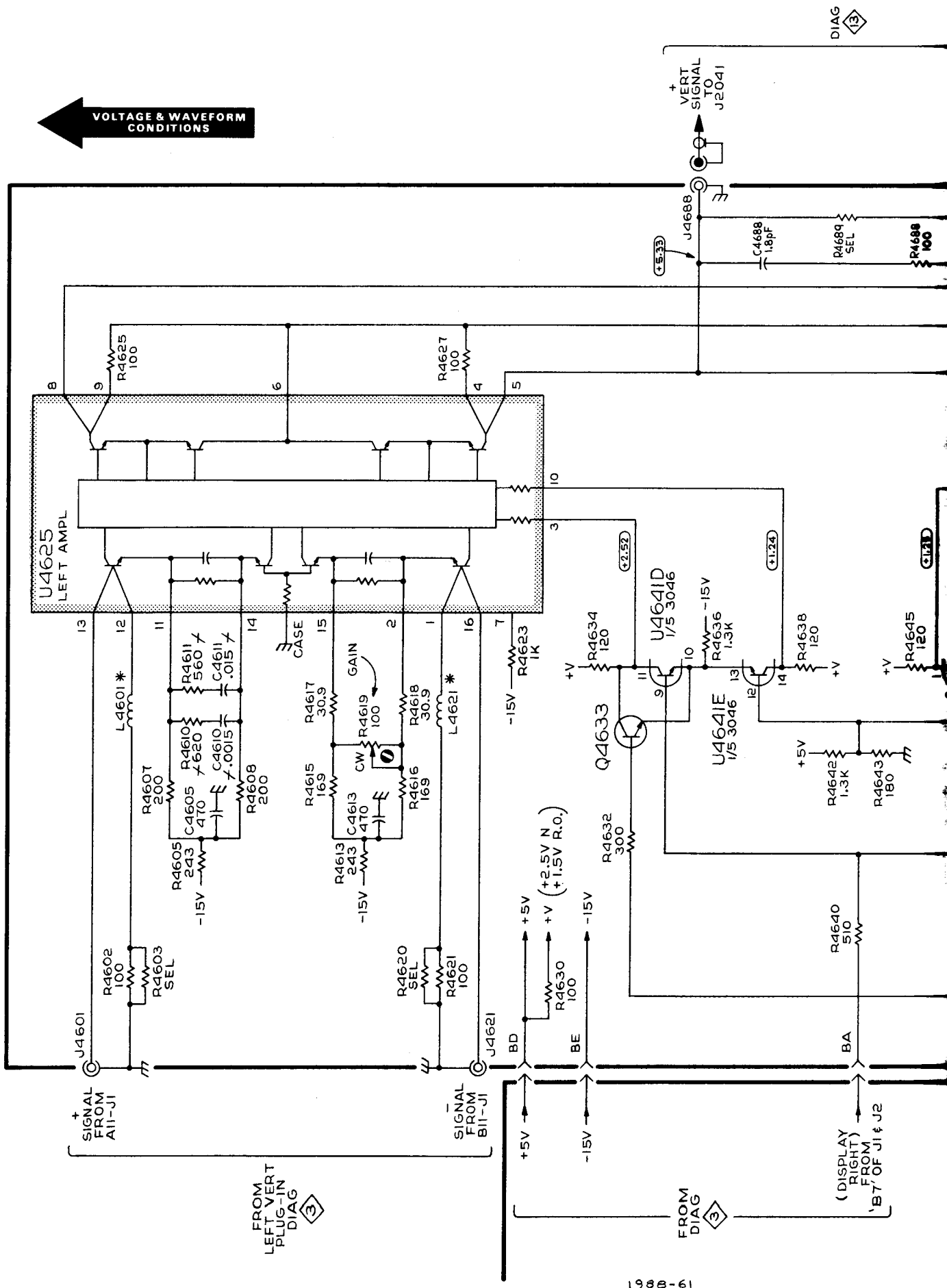
The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a $10\text{ M}\Omega$ input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.



VOLTAGE & WAVEFORM CONDITIONS

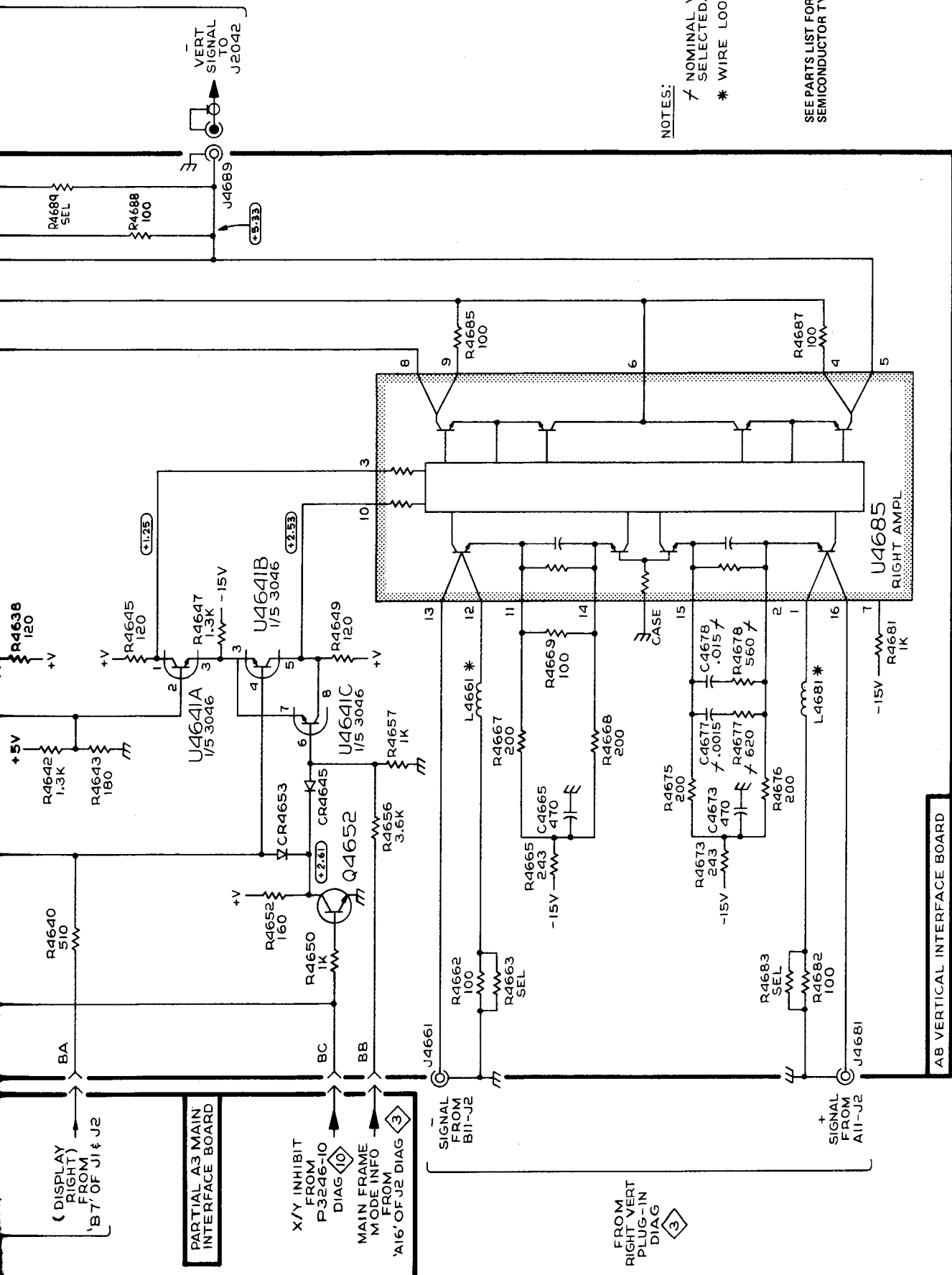
DIAG 3

FROM LEFT VERT PLUG-IN DIAG 3

FROM DIAG 3

(DISPLAY RIGHT) FROM 'B7 OF J1 & J2

DIAG 3



NOTES:
 / NOMINAL VALUE SELECTED.
 * WIRE LOOP.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

PARTIAL A3 MAIN INTERFACE BOARD

X/Y INHIBIT FROM P3246-10 DIAG 10
 MAIN FRAME MODE INFO FROM 'A16' OF J2 DIAG 3

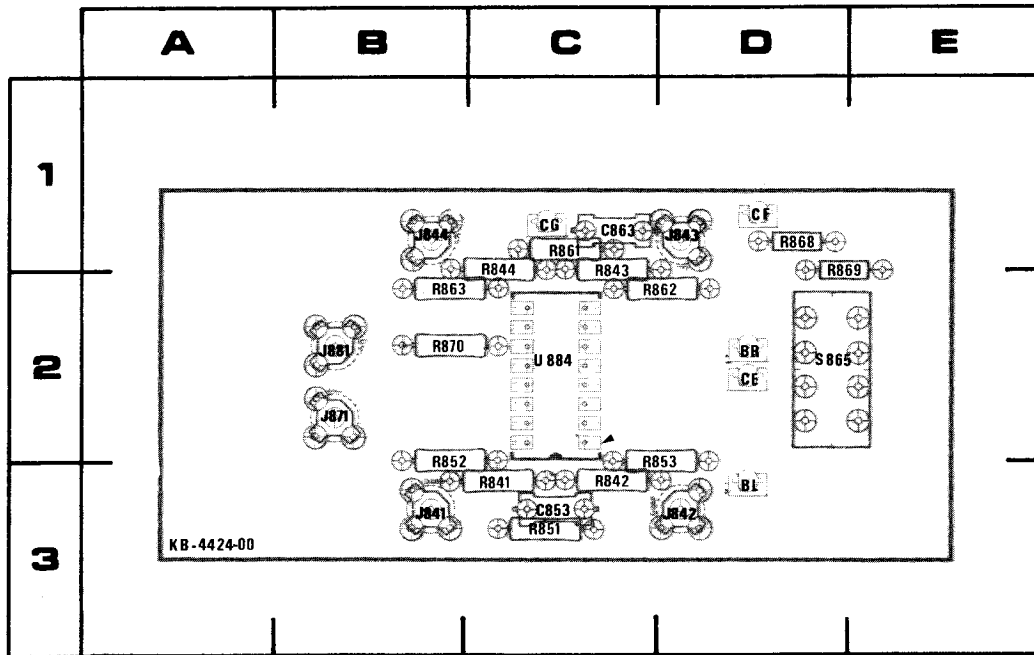
FROM RIGHT VERT PLUG-IN DIAG 3

AB VERTICAL INTERFACE BOARD

VERTICAL INTERFACE 7

VERTICAL INTERFACE

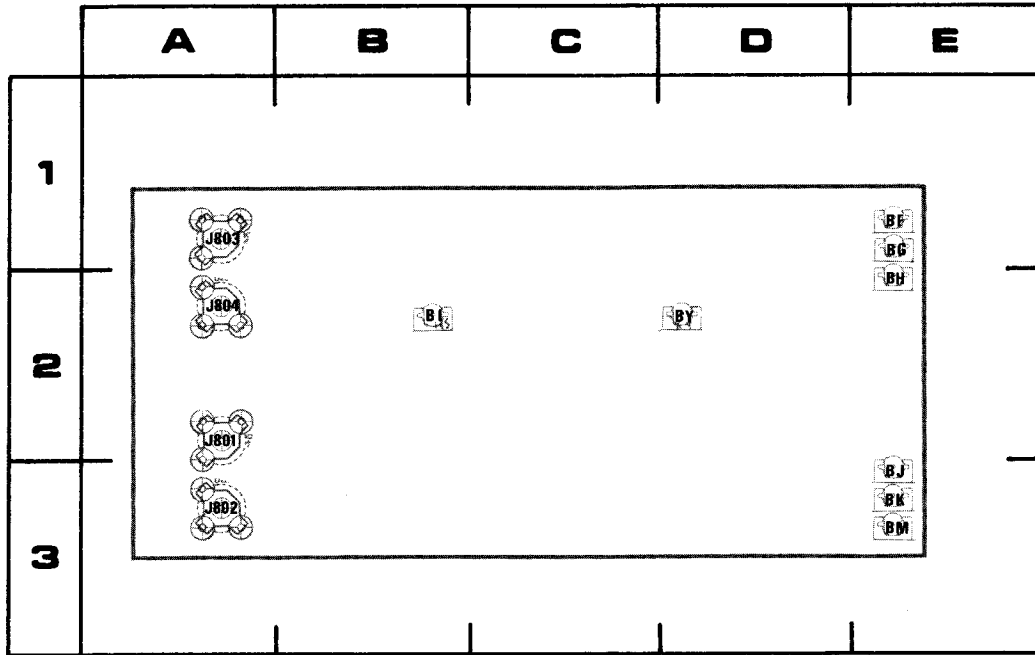
7



1988-159

Figure 8-10. A11—Horizontal Interface circuit board assembly.

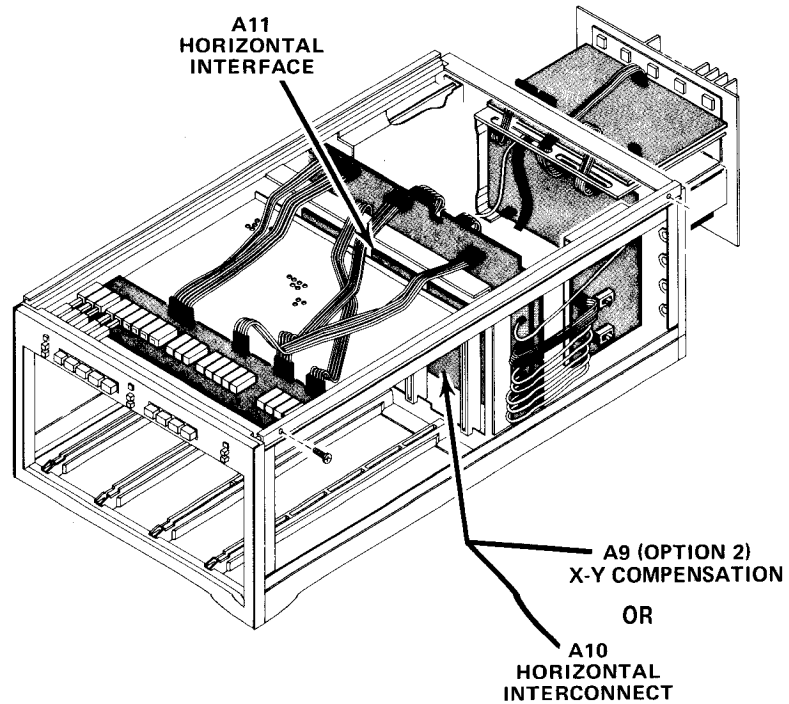
CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C853	3C	J871	2B	R851	3C	R869	2D
C863	1C	J881	2B	R852	2B	R870	2B
J841	3B	R841	3C	R853	2C	S865	2D
J842	3D	R842	3C	R861	1C	U884	2C
J843	1D	R843	1C	R862	2C		
J844	1B	R844	1C	R863	2B		
				R868	1D		



1988-160

Figure 8-11. A10—Horizontal Interconnect circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD
J801	2A	J803	1A
J802	3A	J804	2A



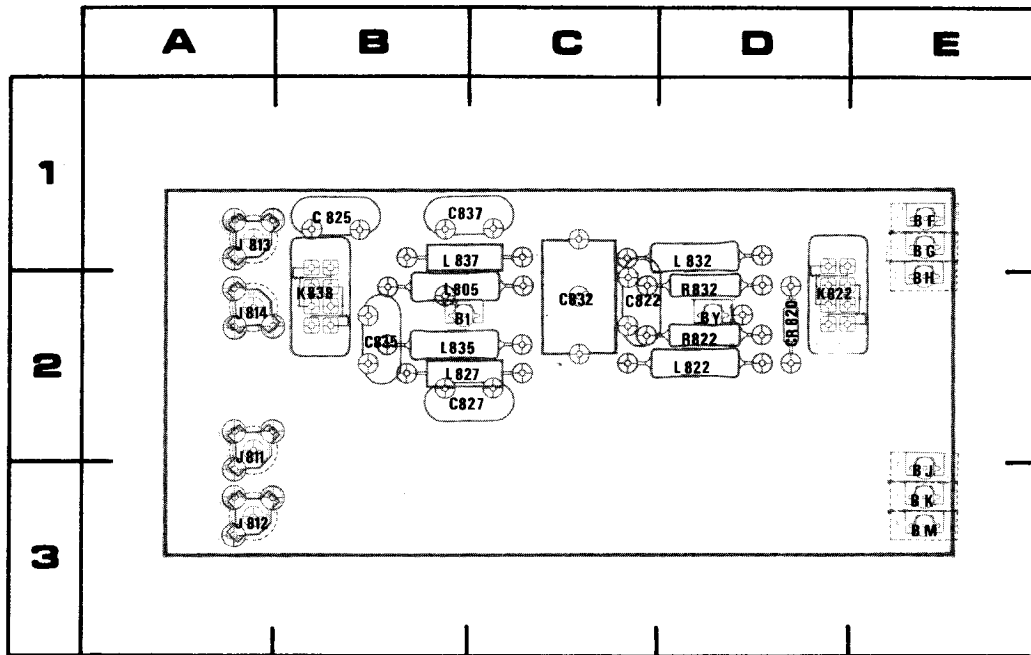


Figure 8-12. A9-X-Y Compensation circuit board assembly.

1988-161

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C822	2C	CR820	2D	K822	2D	L832	1D
C825	1B			K838	2B	L835	2B
C827	2B	J811	2A			L837	1B
C832	2C	J812	3A	L805	2B		
C835	2B	J813	1A	L822	2D	R822	2D
C837	1B	J814	2A	L827	2B	R832	2D

VOLTAGE CONDITIONS

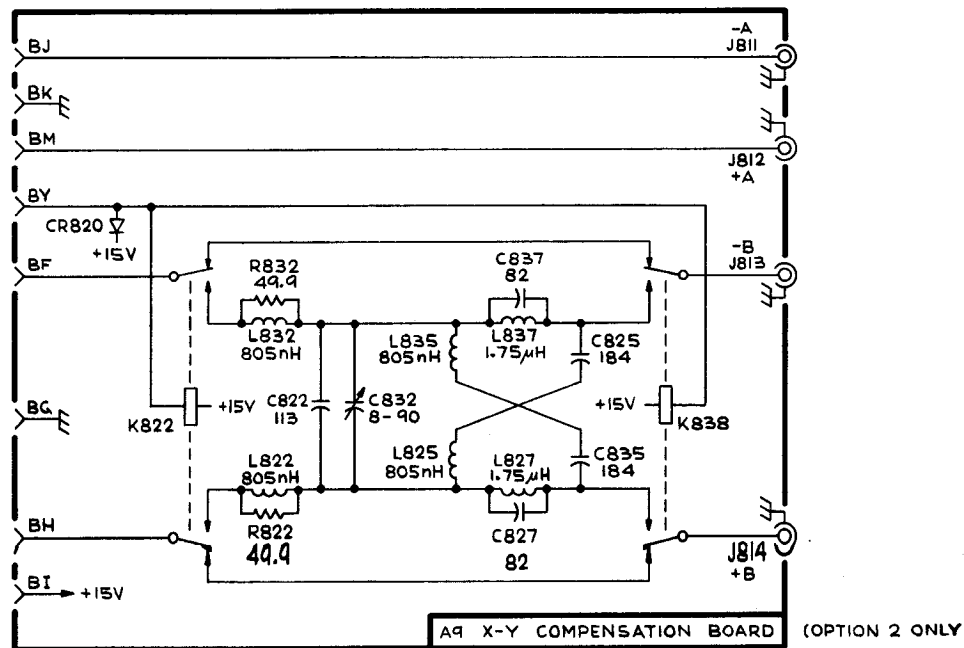
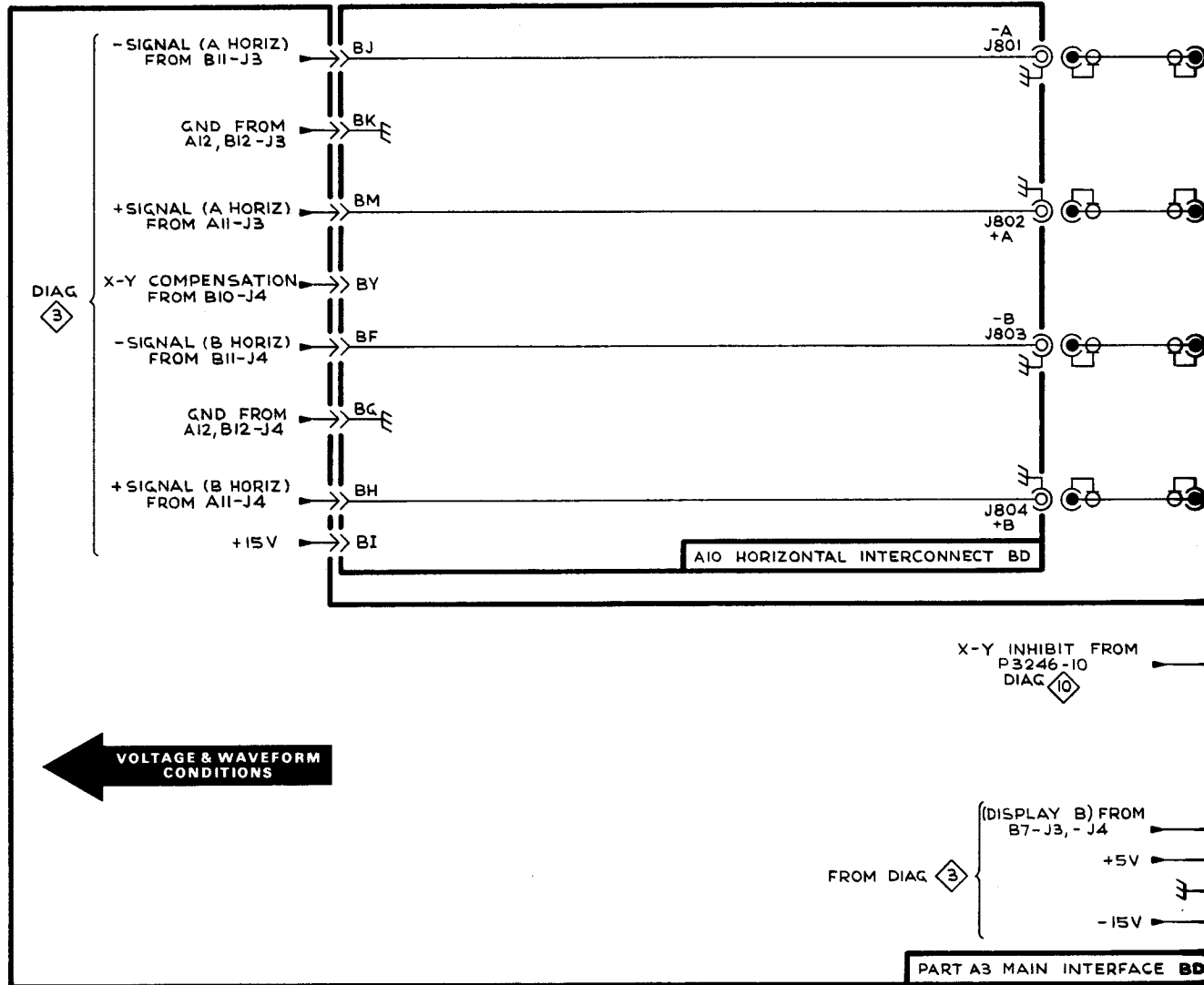
The voltages shown were obtained with the 7834 controls set as follows:

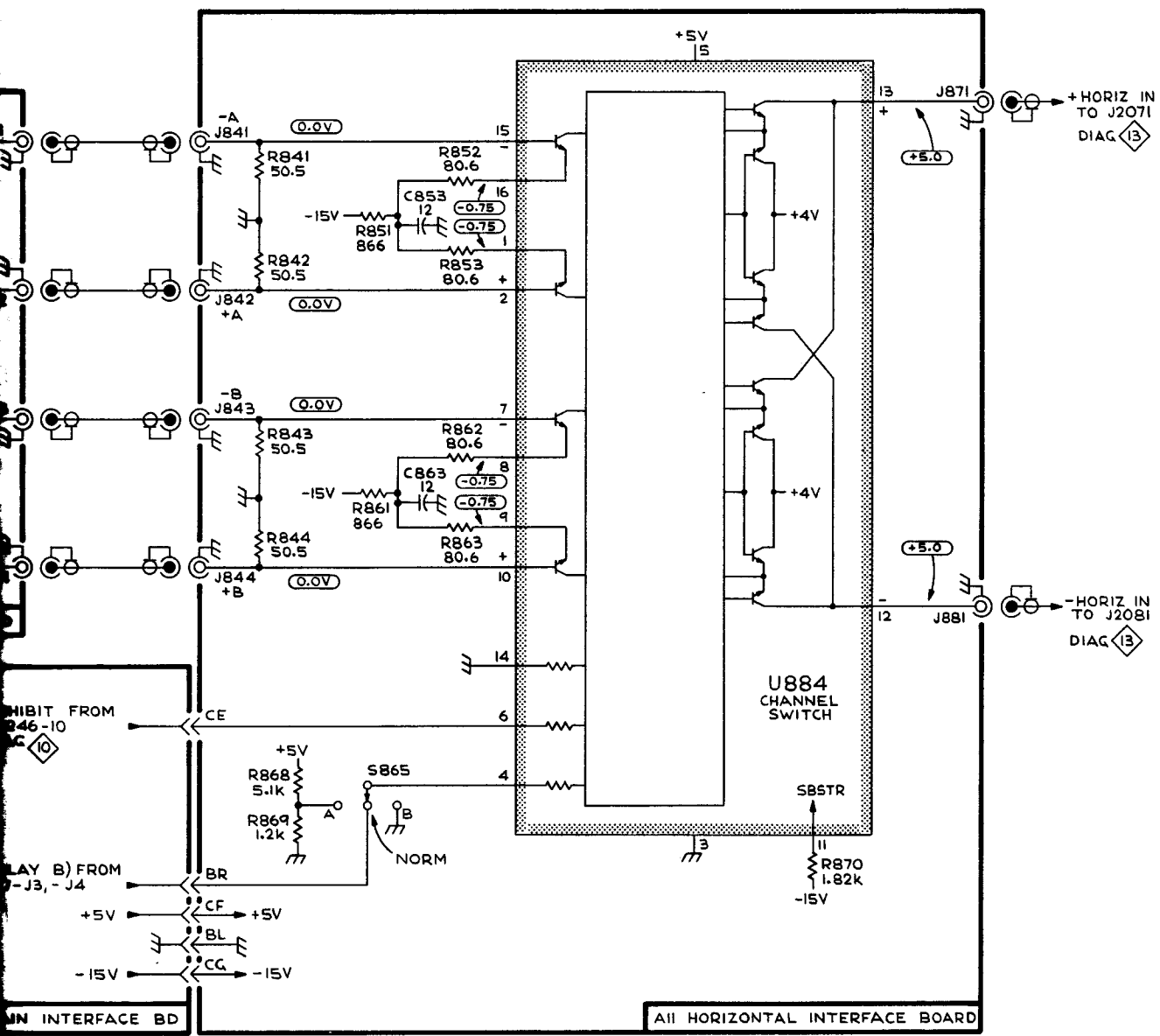
Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

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INHIBIT FROM
246-10

LAY B) FROM
-J3, -J4

+5V

-15V

MIN INTERFACE BD

ALL HORIZONTAL INTERFACE BOARD

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

(OPTION 2 ONLY)

88-62
B, MAY 1979

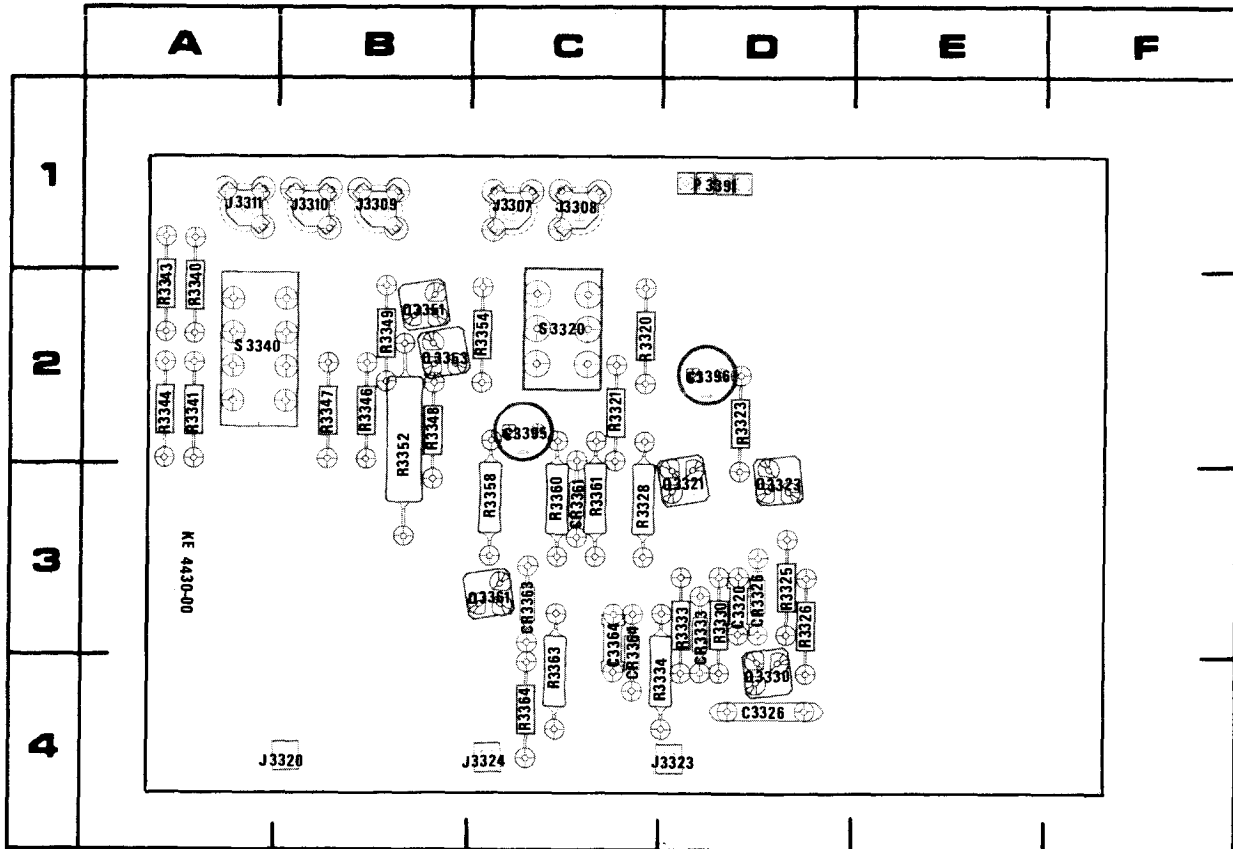
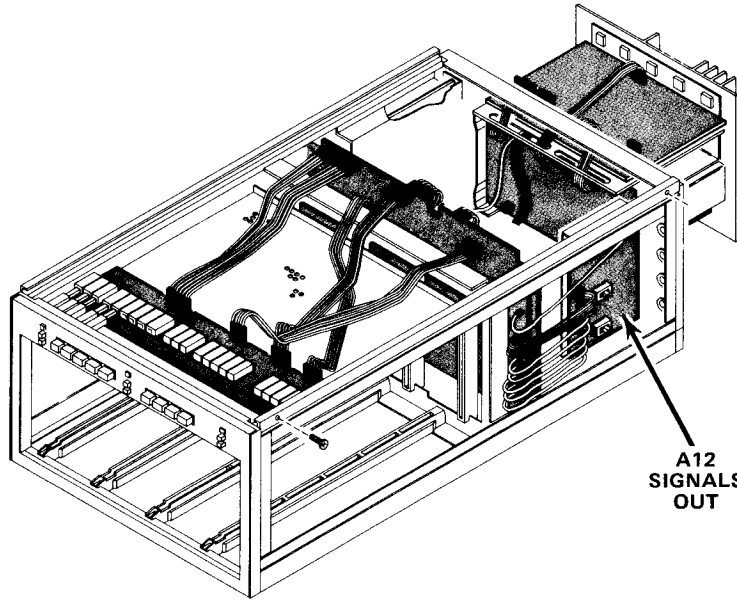


Figure 8-13. A12-Signal Out circuit board assembly.

1988-162

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C3320	3D	J3307	1C	Q3323	3D	R3330	3D	R3354	2C
C3326	4D	J3308	1C	Q3330	4D	R3333	3D	R3358	3C
C3364	3C	J3309	1B	Q3351	2B	R3334	4D	R3360	3C
C3395	2C	J3310	1B	Q3353	2B	R3340	2A	R3361	3C
C3396	2D	J3311	1A	Q3361	3C	R3341	2A	R3363	4C
		J3320	4B			R3343	2A	R3364	4C
		J3323	4D	R3320	2C	R3344	2A		
CR3326	3D	J3324	4C	R3321	2C	R3346	2B	S3320	2C
CR3333	3D			R3323	2D	R3347	2B	S3340	2A
CR3361	3C	P3391	1D	R3325	3D	R3348	2B		
CR3363	3C			R3326	3D	R3349	2B		
CR3364	3C	Q3321	3D	R3328	3C	R3352	2B		



A12
SIGNALS
OUT

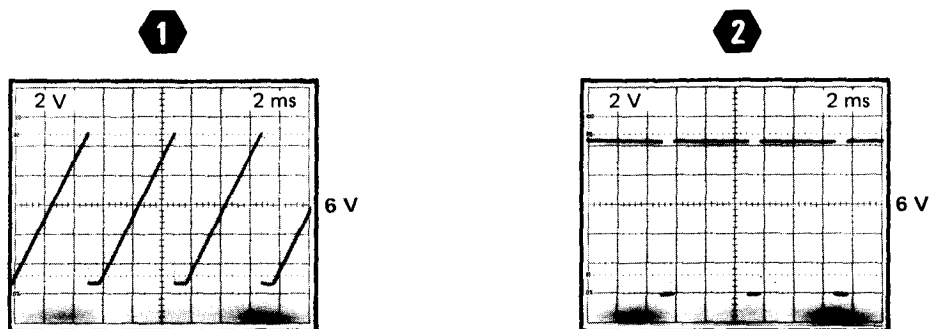
VOLTAGE AND WAVEFORM CONDITIONS

The voltages and waveforms shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a $10\text{ M}\Omega$ input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

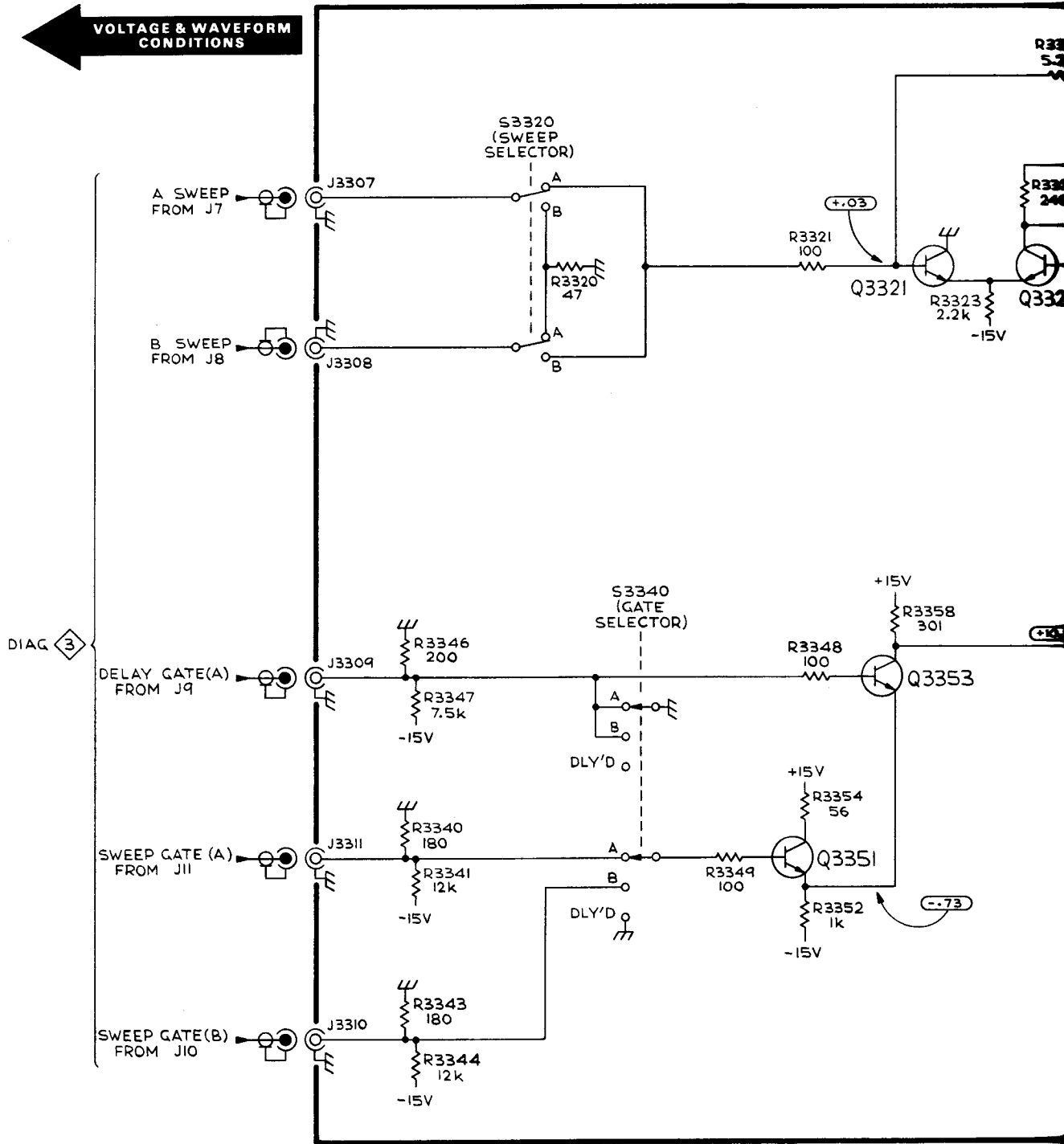
Waveform Conditions. The waveforms shown below were obtained using a test oscilloscope system with $10\text{ M}\Omega$ input impedance and at least 60 MHz bandwidth (Tektronix 7603 Oscilloscope, 7B53A Time Base, and 7A13 Differential Comparator equipped with a 10X probe). A 7B53A Time Base plug-in unit is installed in the mainframe A HORIZ compartment. The 7B53A is set for internal auto-trigger and 0.5 millisecond/division sweep rate.

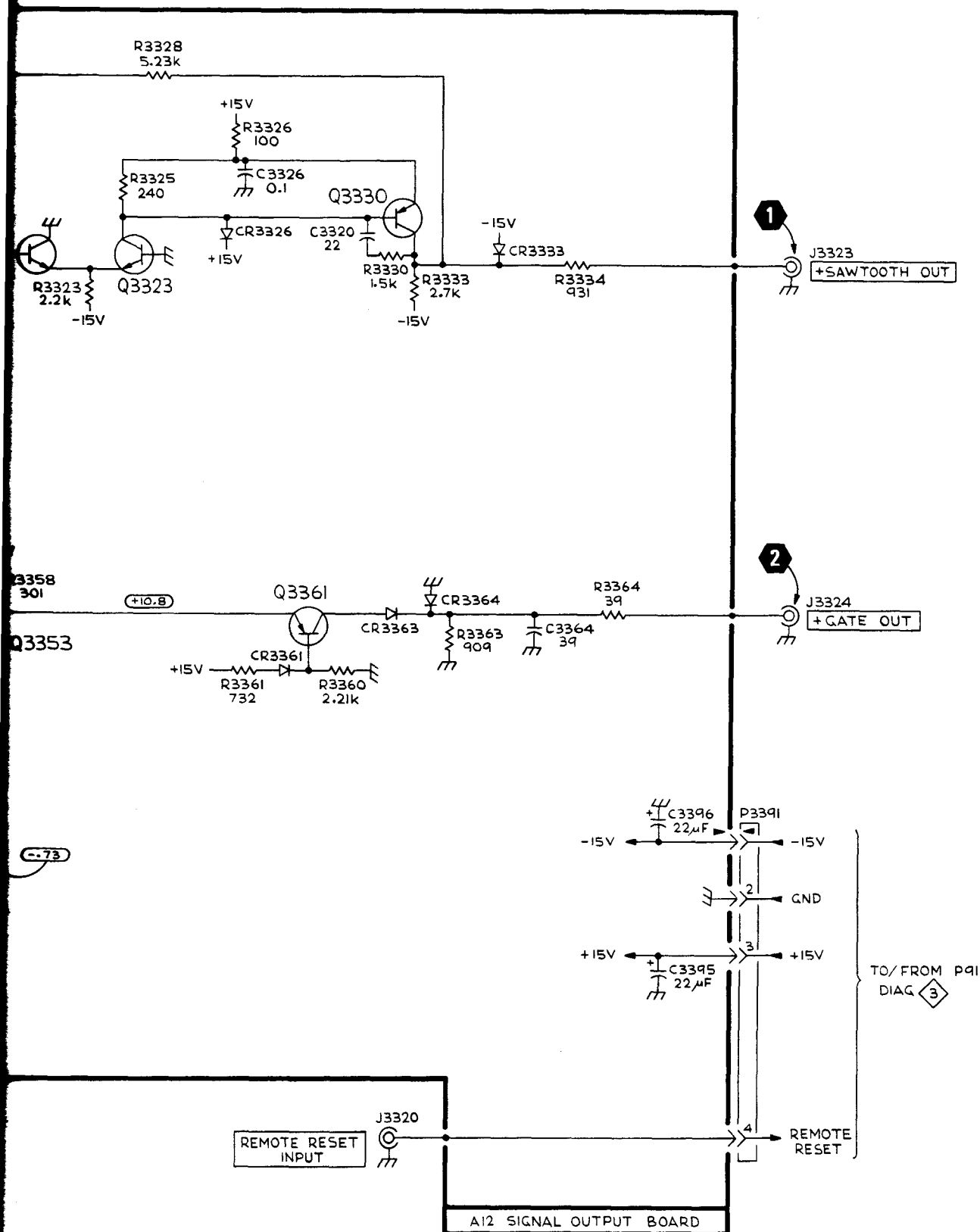


WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

VOLTAGE & WAVEFORM CONDITIONS

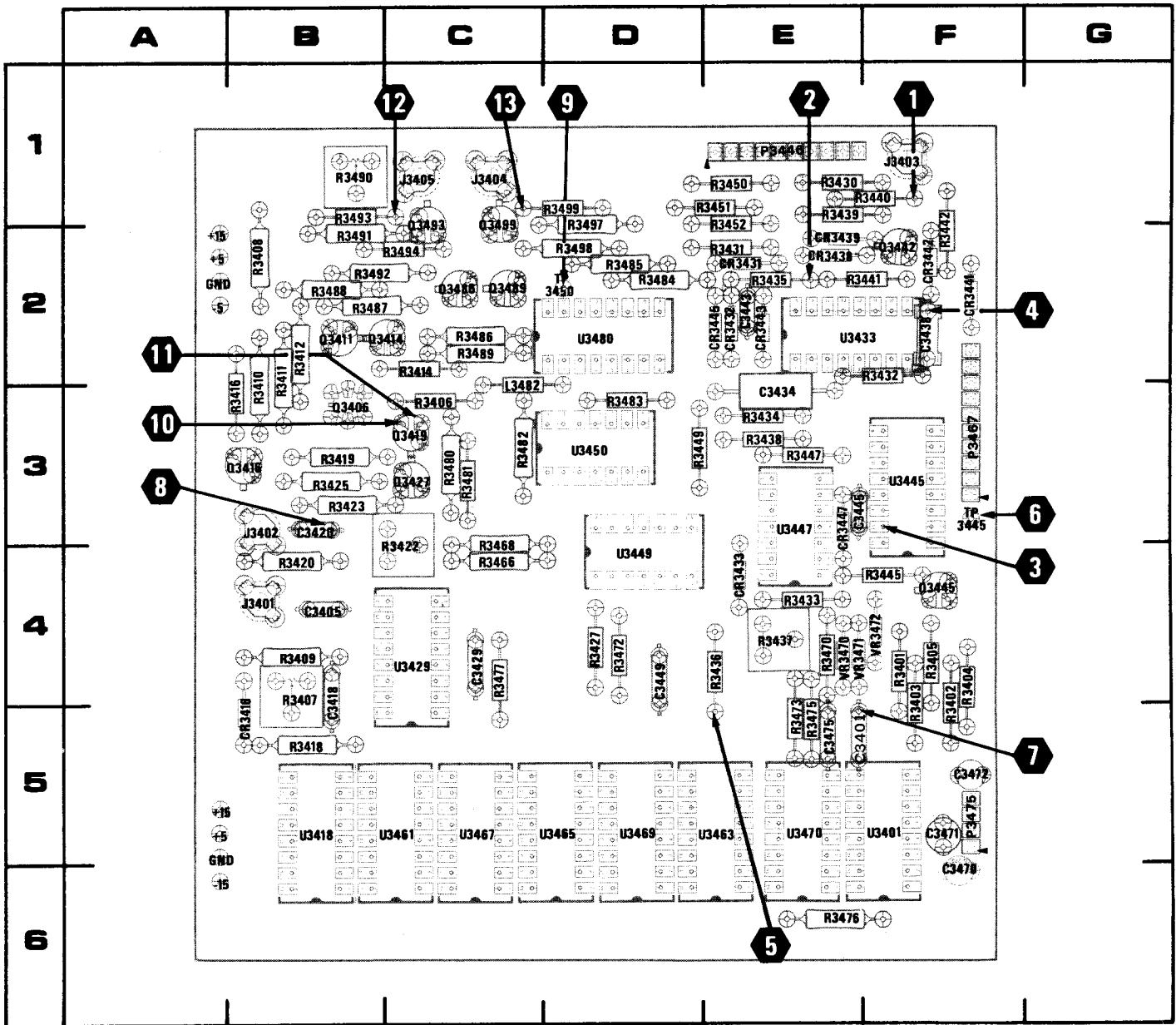




SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L.I.C.	
P24	P41

OUTPUT SIGNALS 9



1988-163A

Figure 8-14. A13-Readout circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C3401	5E	CR3439	2E	Q3414	2B	R3411	2B	R3440	1F	R3481	3C	U3401	5F
C3405	4B	CR3441	2F	Q3416	3B	R3412	2B	R3441	2F	R3482	3C	U3418	5B
C3407	☆	CR3442	2F	Q3419	3C	R3414	2C	R3442	2F	R3483	3D	U3429	4C
C3418	4B	CR3443	2E	Q3427	3C	R3416	3B	R3445	4F	R3484	2D	U3433	2F
C3420	3B	CR3445	2E	Q3442	2F	R3418	5B	R3447	3E	R3485	2D	U3445	3F
C3429	4C	CR3447	3E	Q3445	4F	R3419	3B	R3449	3D	R3486	2C	U3447	3E
C3434	3E			Q3486	2C	R3420	4B	R3450	1E	R3487	2B	U3449	4D
C3438	2F	J3401	4B	Q3489	2C	R3422	4C	R3451	1E	R3488	2B	U3450	3D
C3443	2E	J3402	3B	Q3493	1C	R3423	3B	R3452	1E	R3489	2C	U3461	5C
C3445	3E	J3403	1F	Q3499	1C	R3425	3B	R3466	4C	R3490	1B	U3463	5E
C3449	4D	J3404	1C			R3427	4D	R3468	4C	R3491	2B	U3465	5D
C3470	6F	J3405	1C	R3401	4F	R3430	1E	R3470	4E	R3492	2B	U3467	5C
C3471	5F			R3402	4F	R3431	2E	R3472	4D	R3493	1B	U3469	5D
C3472	5F	L3482	3C	R3403	4F	R3432	2F	R3473	5E	R3495	☆	U3470	5E
C3475	5E			R3404	4F	R3433	4E	R3474	☆	R3494	2C	U3480	2D
C3495	☆	P3446	1E	R3405	4F	R3434	3E	R3475	5E	R3497	1D		
		P3467	3F	R3406	3C	R3435	2E	R3476	6E	R3498	2D	VR3470	4E
		P3475	5F	R3407	4B	R3436	4E	R3477	4C	R3499	1D	VR3471	4E
CR3416	5B			R3408	2B	R3437	4E	R3478	☆			VR3472	4F
CR3431	2E			R3409	4B	R3438	3E	R3479	☆	TP3445	3F		
CR3432	2E	Q3406	3B	R3410	2B	R3439	1E	R3480	3C	TP3450	2D		
CR3433	4E	Q3411	2B										
CR3438	2E												

☆ on back of the board.

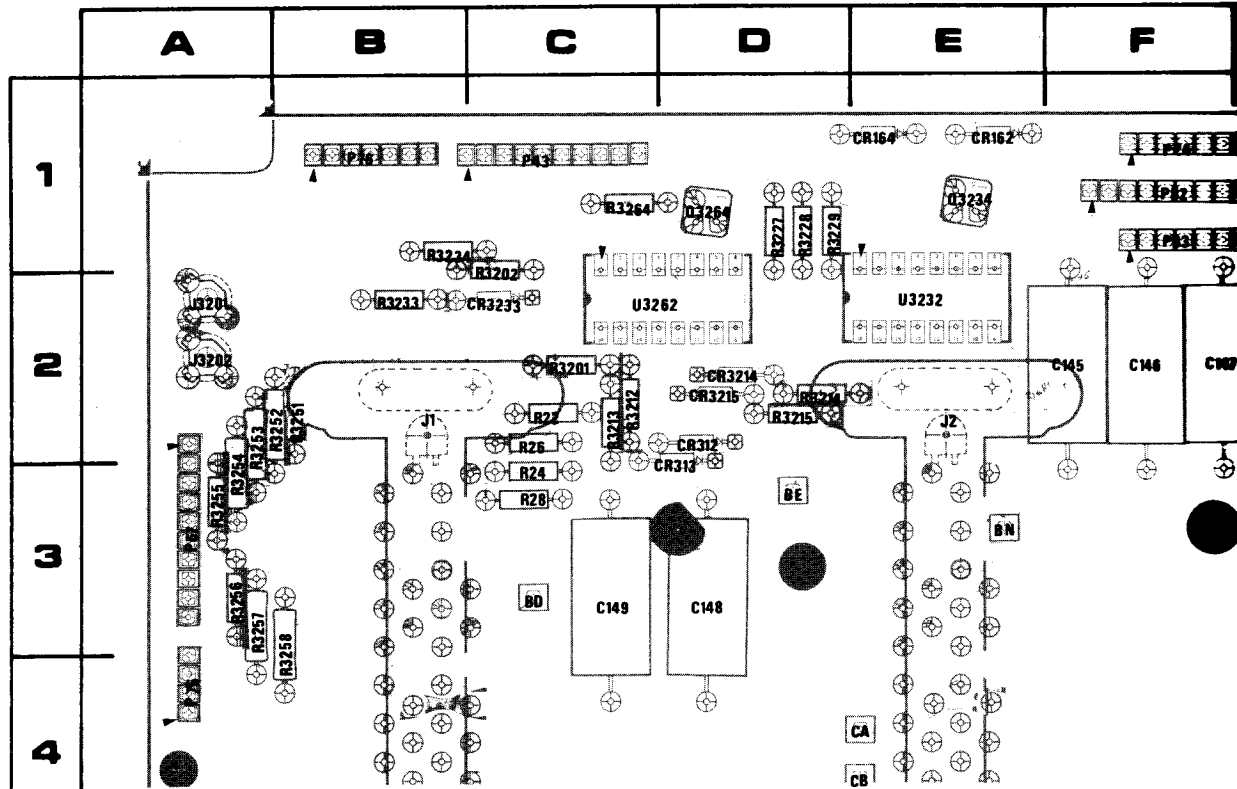
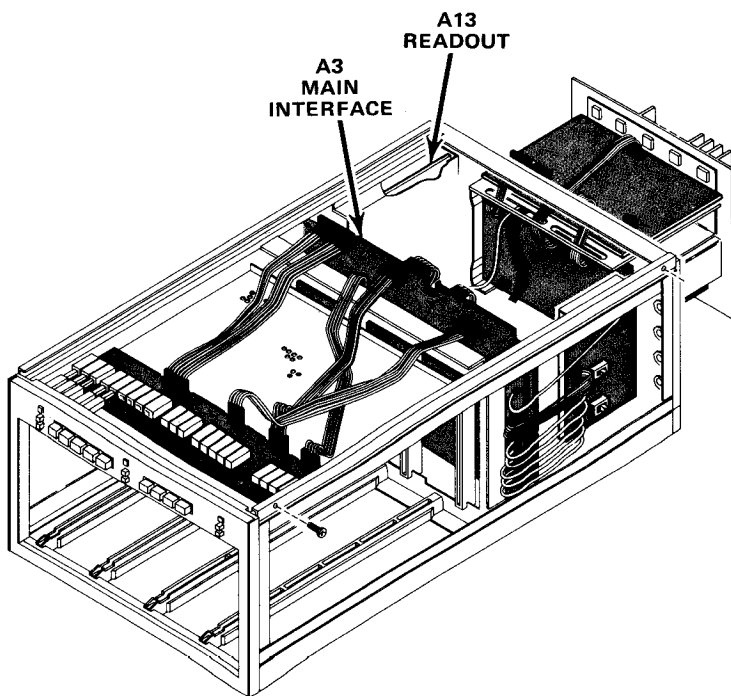
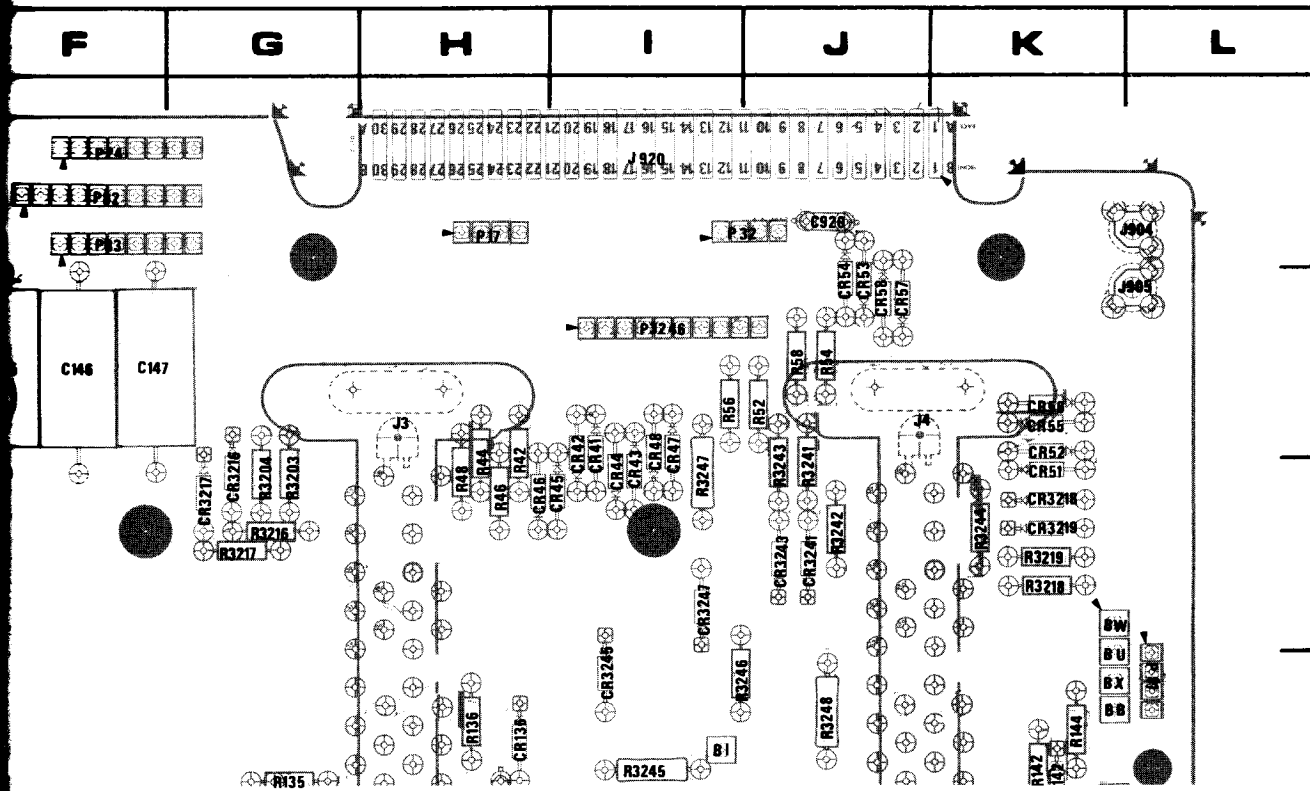


Figure 8-15. A3—Partial Main Interface



CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C29	6F	CR31	7D	CR58	2J
C117	5G	CR32	7D	CR114	6I
C135	4H	CR33	7E	CR124	6I
C142	5K	CR34	7E	CR128	6G
C145	2F	CR35	7D	CR136	4H
C146	2F	CR36	7D	CR138	5K
C147	2F	CR37	7D	CR142	4K
C148	3D	CR38	7D	CR152	7H
C149	3C	CR41	3I	CR156	7J
C172	7I	CR42	3I	CR162	1E
C173	7I	CR43	3I	CR164	1E
C178	5J	CR44	3I	CR172	6G
C920	1J	CR45	3I	CR180	7K
		CR46	3H	CR181	7K
CR18	7H	CR47	3I	CR184	7K
CR21	7C	CR48	3I	CR312	2D
CR22	7C	CR51	3K	CR313	3D
CR23	7C	CR52	2K	CR3214	2D
CR24	7C	CR53	2J	CR3215	2D
CR25	7C	CR54	2J	CR3216	4G
CR26	7C	CR55	2K	CR3217	3G
CR27	7C	CR56	2K	CR3218	3K
CR28	7D	CR57	2J	CR3219	3K



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Main Interface circuit board assembly.

GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
2J	CR3233	2C	P32	1J	R38	6D	R128	7G	R184	6K	R3233	2B
6I	CR3241	3J	P43	1C	R42	3H	R131	5J	R186	7K	R3234	1B
6I	CR3243	3J	P67	3A	R44	3H	R132	5K	R187	7K	R3241	3J
6G	CR3245	4I	P75	4A	R46	3H	R133	5K	R192	7G	R3242	3J
4H	CR3247	3I	P76	1B	R48	3H	R135	4G	R193	7K	R3243	3J
5K			P82	1F	R52	2J	R136	4H	R194	7H	R3244	3K
4K	J1	2B	P83	1F	R54	2J	R138	5H	R195	7H	R3245	4I
7H	J2	2E	P91	4L	R56	2I	R142	4K	R196	7J	R3246	4J
7J	J3	2H	P3246	2I	R58	2J	R144	4K	R3201	2C	R3247	3I
1E	J4	2J			R65	6K	R152	7H	R3202	2C	R3248	4J
1E	J7	5L	Q182	7K	R66	6K	R153	7H	R3203	3G	R3251	2B
6G	J8	5L	Q3234	1E	R67	6B	R156	7I	R3204	3G	R3252	2A
7K	J9	5L	Q3264	1D	R68	6C	R157	7I	R3212	2C	R3253	3A
7K	J10	6L			R87	6E	R162	6G	R3213	2C	R3254	3A
7K	J11	6L	R18	7H	R88	6E	R164	6K	R3214	2D	R3255	3A
2D	J904	1L	R22	2C	R102	5I	R172	6G	R3215	2D	R3256	3A
3D	J905	2L	R24	3C	R112	5I	R173	6J	R3216	3G	R3257	3A
2D	J920	1I	R26	2C	R117	5G	R174	7J	R3217	3G	R3258	4A
2D	J3201	2A	R28	3C	R121	5I	R178	5J	R3218	3K	R3264	1C
4G	J3202	2A	R29	6E	R122	5G	R180	7K	R3219	3K		
3G			R32	6D	R123	5G	R181	7K	R3227	1D	U92	6I
3K	P17	1H	R34	6D	R126	6G	R182	7K	R3228	1D	U3232	2E
3K	P24	1F	R36	6D	R127	6G	R183	6K	R3229	1D	U3262	2C

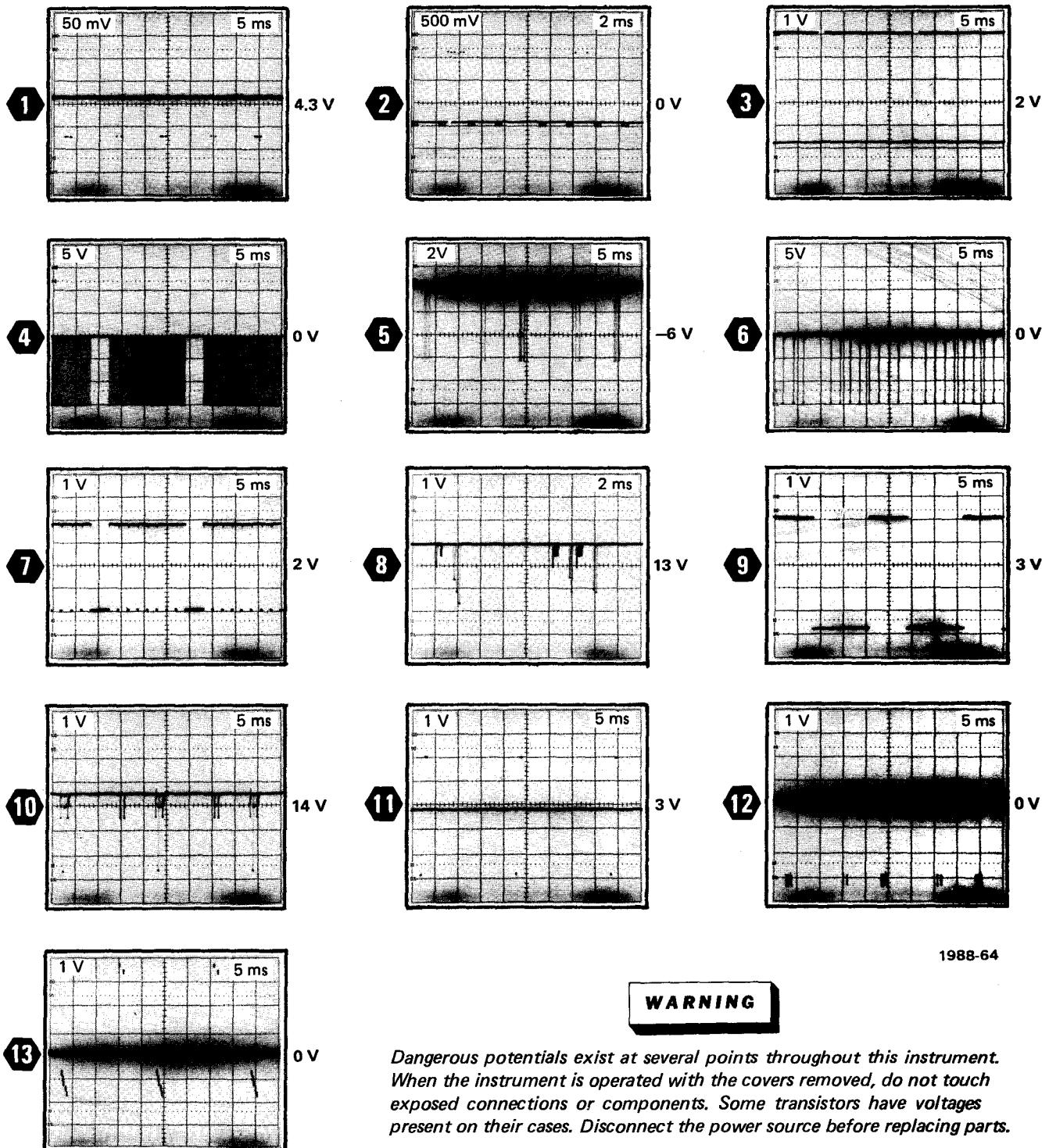
VOLTAGE AND WAVEFORM CONDITIONS

The voltages and waveforms shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 MΩ input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

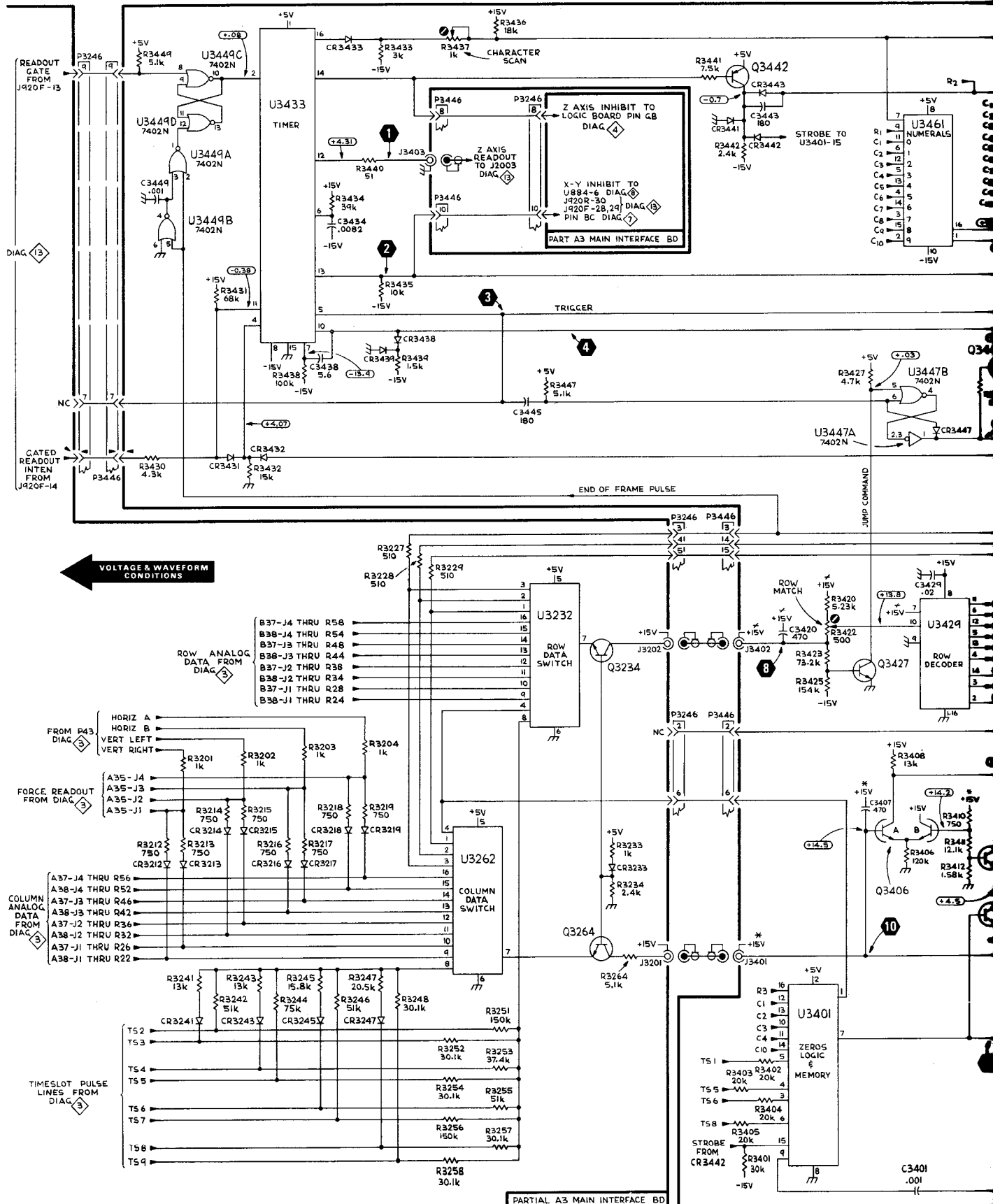
Waveform Conditions. The waveforms shown below were obtained using a test oscilloscope system with 10 MΩ input impedance and at least 60 MHz bandwidth. The test oscilloscope is externally triggered through a 1X probe connected to TP3450 on the 7834 A13 Readout circuit board. (Tektronix 7603 Oscilloscope 7B53A Time Base, and 7A13 Differential Comparator equipped with a 10X probe.) The 7B53A Time Base plug-in unit is installed in the mainframe A HORIZ compartment. The 7B53A is set for internal auto-trigger and 0.5 millisecond/division sweep rate.

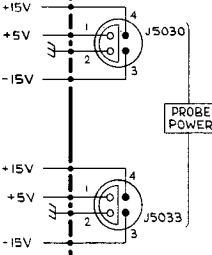
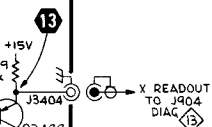
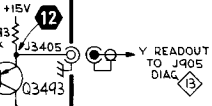
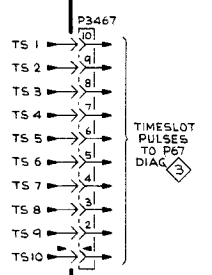
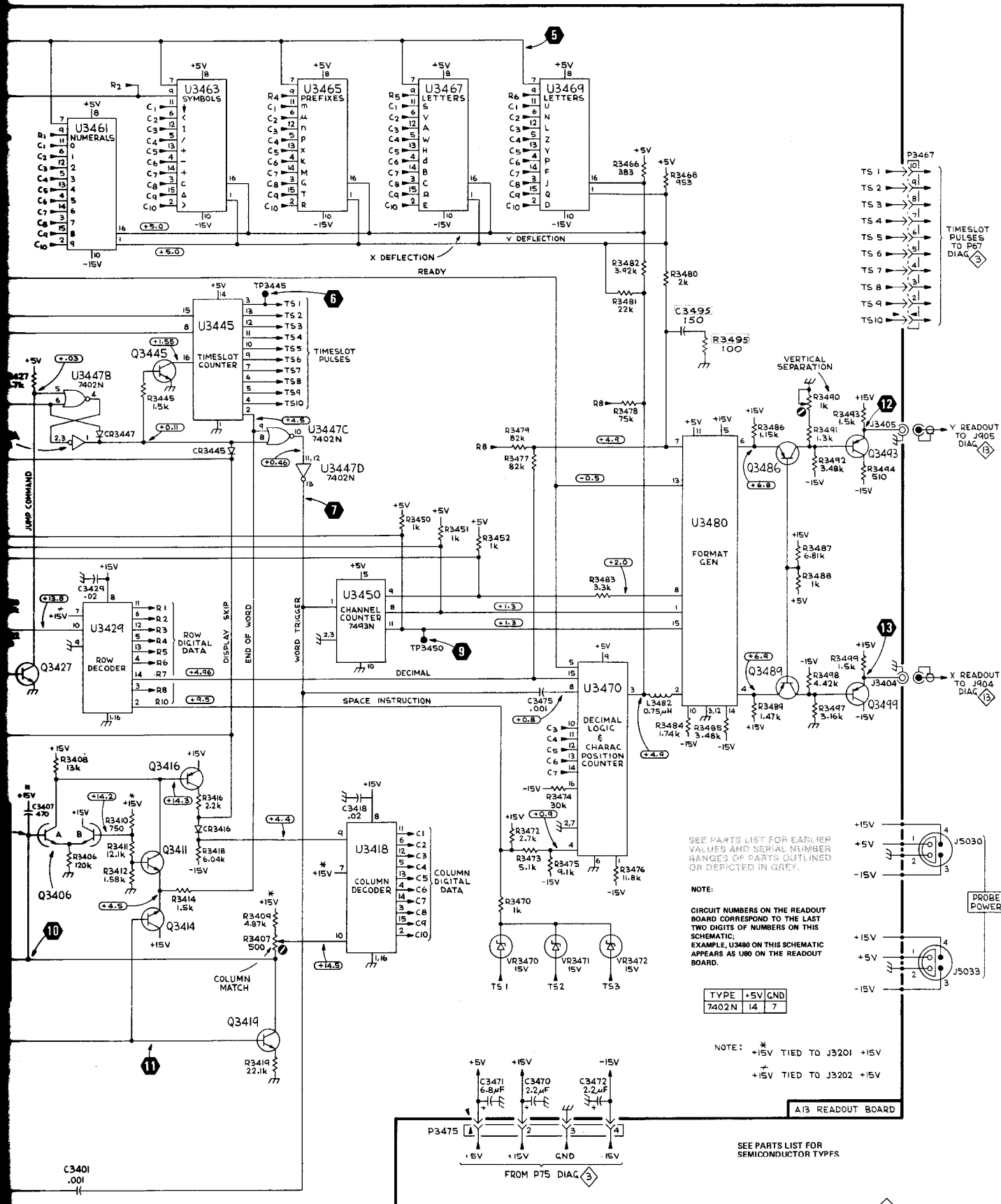


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WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.





SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

NOTE:
CIRCUIT NUMBERS ON THE READOUT BOARD CORRESPOND TO THE LAST TWO DIGITS OF NUMBERS ON THIS SCHEMATIC. EXAMPLE, U3480 ON THIS SCHEMATIC APPEARS AS U80 ON THE READOUT BOARD.

TYPE	+5V	GND
7402N	14	7

NOTE: * +15V TIED TO J3201 +15V
+5V TIED TO J3202 +15V

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

READOUT SYSTEM 10

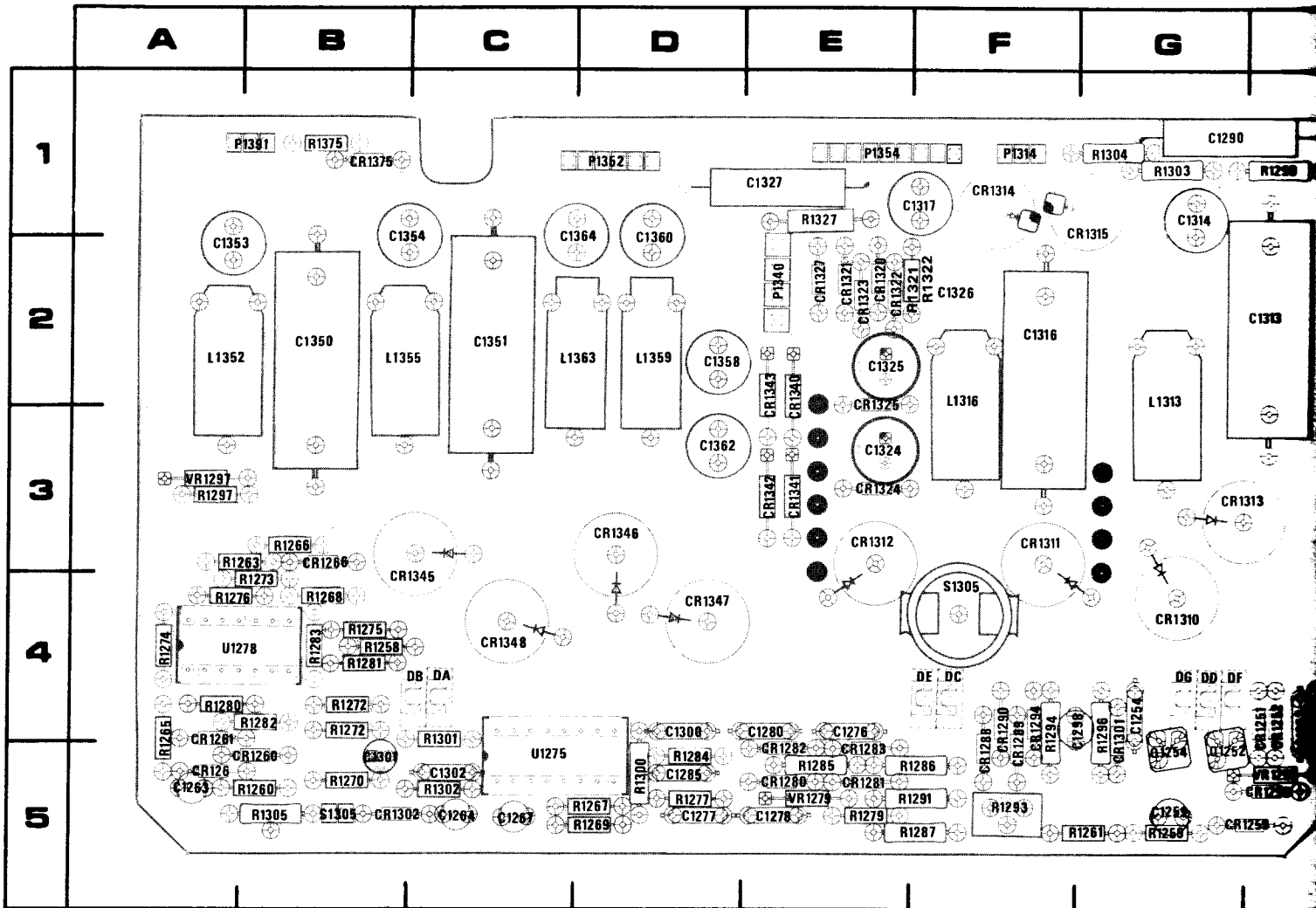
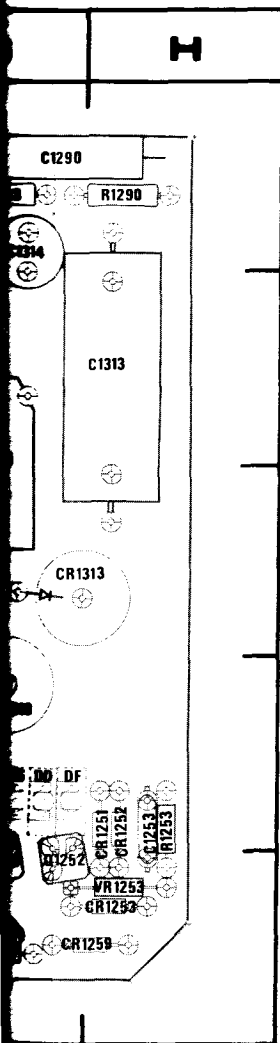
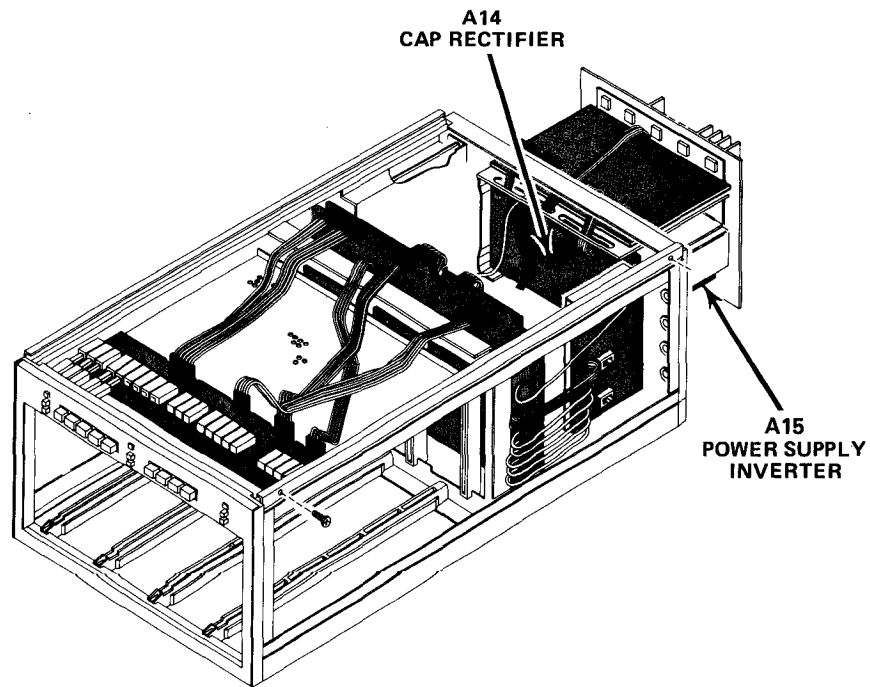
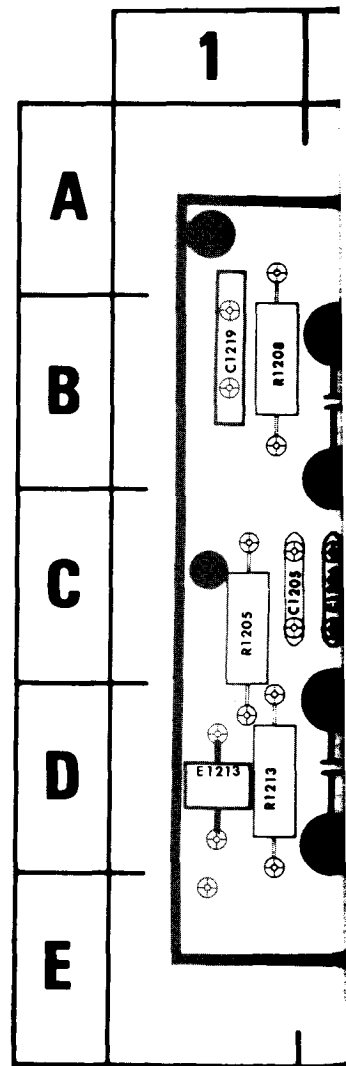


Figure 8-16. A14—Cap-Rectifier circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CIT NO	GRID COORD	CKT NO	GRID COORD
C1253	4H	C1316	2F	CR1259	5H	CR1314	1F	L1313	2G	R1259	5G	R1281	4B	R1305	1G
C1254	4G	C1317	1F	CR1260	5B	CR1315	1G	L1316	2F	R1260	5B	R1282	4B	R1321	2H
C1259	5G	C1324	3E	CR1261	4A	CR1320	2E	L1352	2A	R1261	5G	R1283	4B	R1322*	2H
C1263	5A	C1325	2E	CR1266	3B	CR1321	2E	L1355	2B	R1263	3B	R1284	5D	R1327	1H
C1264	5C	C1326	2F	CR1280	5E	CR1322	2E	L1359	2D	R1265	4A	R1285	5E	R1375	5H
C1267	5C	C1327	1E	CR1281	5E	CR1323	2E	L1363	2D	R1266	3B	R1286	5F		
C1276	4E	C1350	2B	CR1282	5E	CR1324	3E			R1267	5D	R1287	5F		
C1277	5D	C1351	2C	CR1283	5E	CR1325	2E			R1268	4B	R1290	1H	S1305	4D
C1278	5E	C1353	2A	CR1288	4F	CR1327	2E	P1314	1F	R1269	5D	R1291	5F	S1305	5H
C1280	4E	C1354	1B	CR1289	4F	CR1340	2E	P1352	1D	R1270	5B	R1293	5F		
C1285	5D	C1358	2D	CR1290	4F	CR1341	3E	P1354	1E	R1272	4B	R1294	4F	U1275	5C
C1290	1G	C1360	2D	CR1294	4F	CR1342	3E	P1391	1B	R1273	4B	R1296	4G	U1278	4A
C1298	4G	C1362	3D	CR1301	4G	CR1343	2E			R1274	4A	R1297	3A		
C1300	4D	C1364	1C	CR1302	5B	CR1345	4C	Q1252	5G	R1275	4B	R1300	5D	VR1253	5H
C1301	5B			CR1310	4G	CR1346	3D	Q1254	5G	R1276	4A	R1301	4C	VR1279	5H
C1302	5C	CR1251	4H	CR1311	3F	CR1347	4D			R1277	5D	R1302	5C	VR1297	3A
C1313	2H	CR1252	4H	CR1312	3E	CR1348	4C	R1253	4H	R1279	5E	R1303	1G		
C1314	1G	CR1253	5H	CR1313	3H	CR1375	1B	R1258	4B	R1280	4A	R1304	1G		



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CKT NO	GRID COORD
R1305	5B
R1321	2E
R1322*	2F
R1327	1E
R1375	1B
S1305	4F
S1305	5B
U1275	5C
U1278	4A
VR1253	5H
VR1279	5E
VR1297	3A

*See Parts List for serial number ranges.

1 2 3 4 5 6 7 8

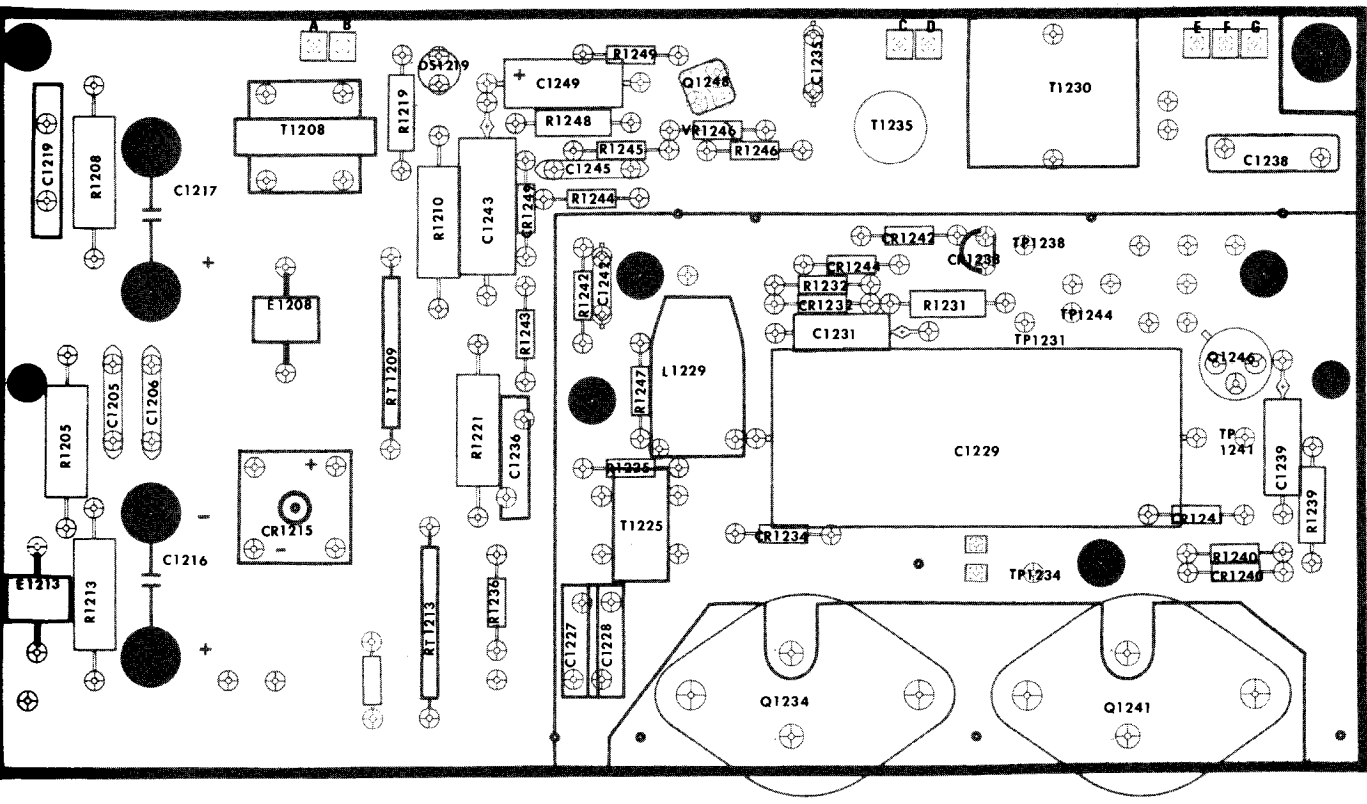


Figure 8-17. A15—Power Supply Inverter circuit board assembly.

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CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C1205	1C	CR1234	5D	R1205	1C	R1249	4A
C1206	1C	CR1238	6B	R1208	1B		
C1216	2D	CR1240	7D	R1210	3B	RT1209	3C
C1217	2B	CR1241	7D	R1213	2D	RT1213	3D
C1219	1B	CR1242	6B	R1219	3A		
C1227	4D	CR1244	5B	R1221	3C		
C1228	4D	CR1249	4B	R1225	4C		
C1229	6C			R1231	6C	T1208	2B
C1231	5C	DS1219	3A	R1232	5B	T1225	4D
C1235	5A			R1236	3D	T1230	6A
C1236	4C	E1208	2C	R1239	8D	T1235	6B
C1238	7B	E1213	1D	R1240	7D		
C1239	8C			R1242	4B	TP1231	6C
C1242	4B	L1229	4C	R1243	4C	TP1234	6D
C1243	3B			R1244	4B	TP1238	6B
C1245	4B	Q1234	5E	R1245	4B	TP1241	7C
C1249	4A	Q1241	7E	R1246	5B	TP1244	7C
CR1215	2D	Q1246	7C	R1247	4C		
CR1232	5C	Q1248	5A	R1248	4B	VR1246	5B

VOLTAGE CONDITIONS

The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

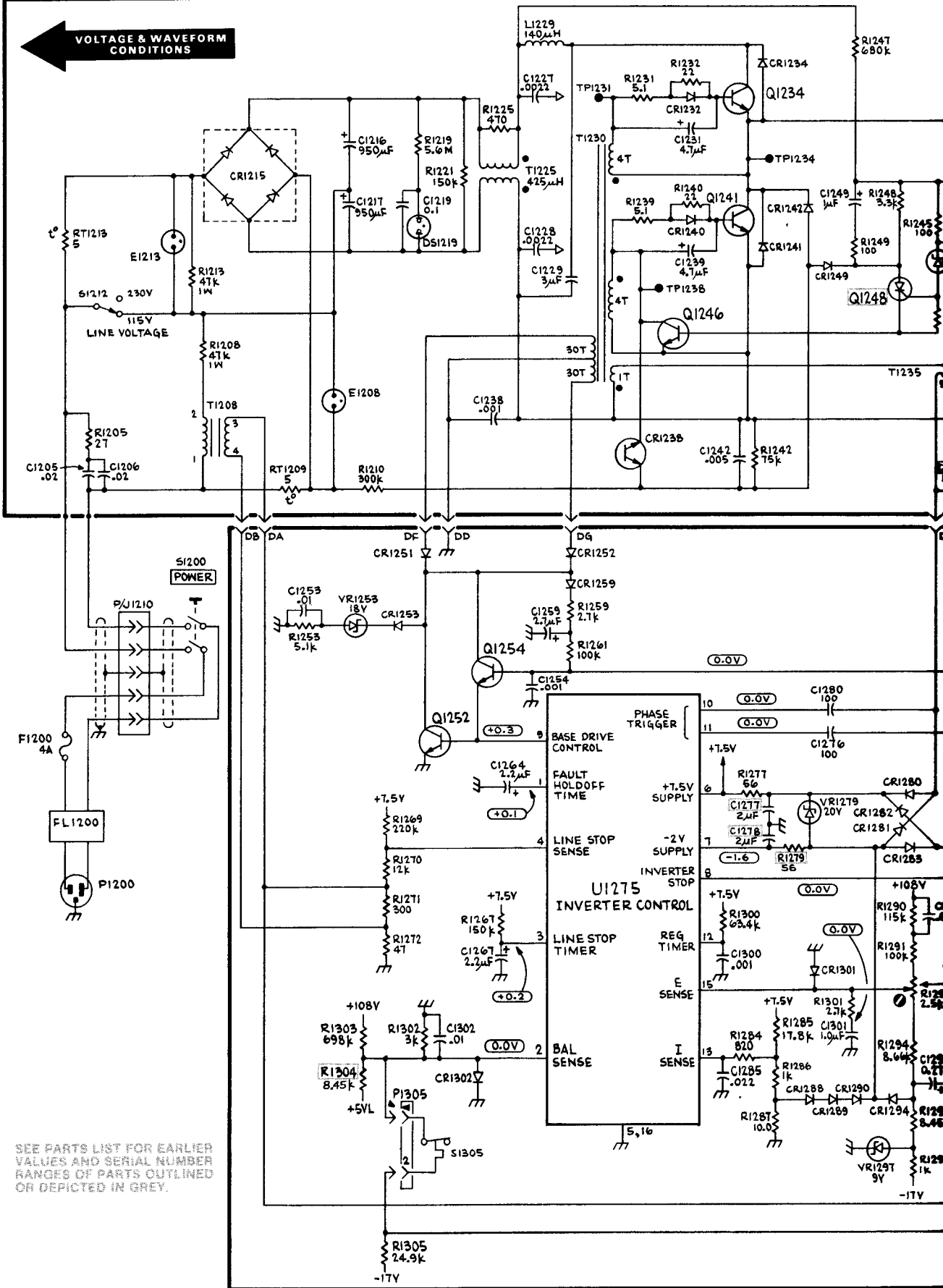
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

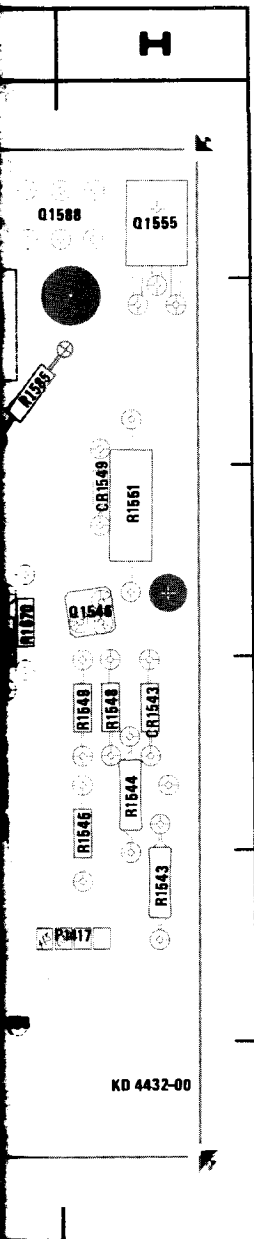
Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

A15 POWER SUPPLY INVERTER BD

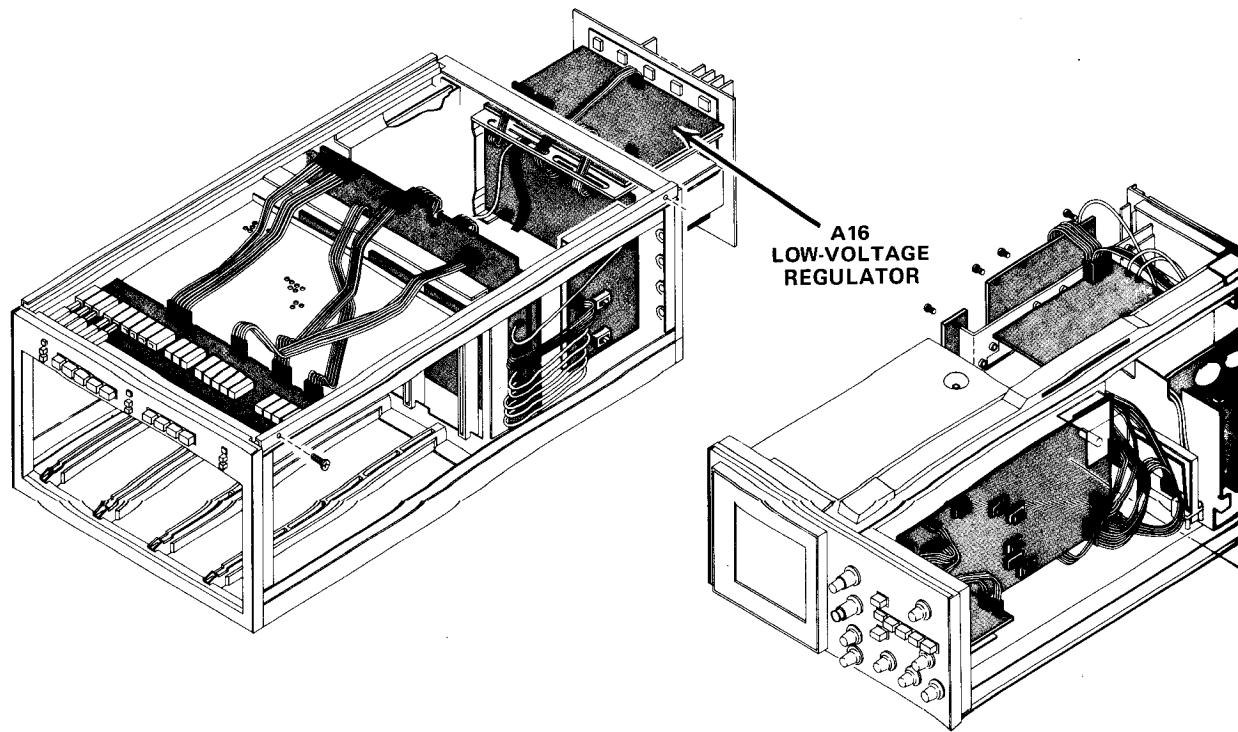
VOLTAGE & WAVEFORM CONDITIONS



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

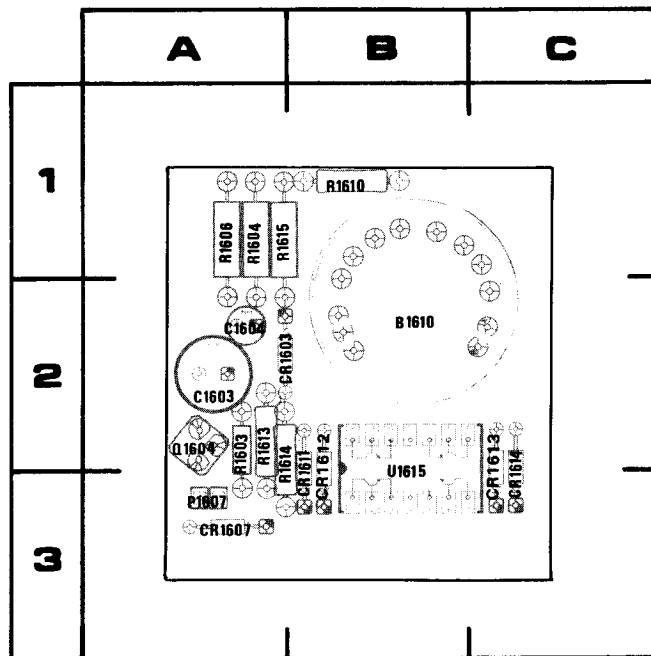


CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C1413	4E	CR1499	3C	Q1425	2F	R1402	4F	R1440	4A	R1498	2C	R1549	4H
C1416	2F	CR1502	3D	Q1428	1F	R1404	3E	R1441	4A	R1499	4C	R1551	3H
C1436	3A	CR1503	4D	Q1436	4B	R1406	4F	R1443	3A	R1502	3D	R1562	4G
C1481	3B	CR1506	4D	Q1445	3B	R1408	5E	R1444	3A	R1504	4D	R1564	4F
C1495	3B	CR1510	4D	Q1451	2B	R1412	4E	R1446	4B	R1506	4D	R1565	4F
C1506	3D	CR1521	3E	Q1455	2A	R1413	4E	R1448	3B	R1509	4D	R1566	3G
C1511	5E	CR1522	3E	Q1458	1A	R1414	4E	R1449	1B	R1511	4E	R1567	2F
C1518	3D	CR1523	3D	Q1485	2C	R1415	4F	R1451	3B	R1512	4E	R1568	2G
C1533	3D	CR1539	3E	Q1489	3C	R1416	3F	R1453	3A	R1513	5D	R1570	3G
C1571	5G	CR1543	4H	Q1496	2C	R1417	4B	R1456	2A	R1514	4E	R1571	4G
C1575	6A	CR1549	3H	Q1498	1C	R1418	3F	R1457	1B	R1517	4F	R1573	3F
C1591	5D	CR1576	3G	Q1508	4D	R1419	5B	R1459	4A	R1518	3D	R1574	4F
		CR1589	4G	Q1522	3D	R1420	2E	R1461	3E	R1522	2D	R1577	3G
CR1402	3F			Q1526	2E	R1421	3E	R1463	4B	R1524	2E	R1579	3G
CR1410	4F	P1417	5H	Q1534	2E	R1422	1E	R1464	4C	R1528	2E	R1580	3G
CR1429	2F	P1452	1D	Q1538	1D	R1424	2F	R1467	4C	R1529	3E	R1583	2F
CR1431	3B	P1454	5E	Q1546	3H	R1425	5A	R1480	2B	R1531	2E	R1585	2G
CR1439	4B	P1482	5B	Q1555	1H	R1426	5B	R1481	3C	R1533	3D	R1586	1G
CR1445	3B	P1483	5C	Q1560	4G	R1428	1F	R1485	2B	R1535	1E	R1587	2G
CR1459	3A	P1491	6B	Q1576	3G	R1429	3E	R1487	1B	R1537	2D	R1589	4F
CR1468	4C			Q1582	2G	R1431	5F	R1490	4B	R1539	4B	R1591	5D
CR1469	4C	Q1406	4C	Q1585	2F	R1432	2B	R1492	3C	R1543	5H	VR1401	3F
CR1482	3B	Q1409	4E	Q1588	1H	R1434	3A	R1493	2C	R1544	4H	VR1461	3E
CR1483	3B	Q1415	3F			R1436	3B	R1495	2B	R1545	4H	VR1501	2D
CR1489	3C	Q1418	3E	R1401	3F	R1437	4B	R1497	1C	R1548	4H	VR1505	3D



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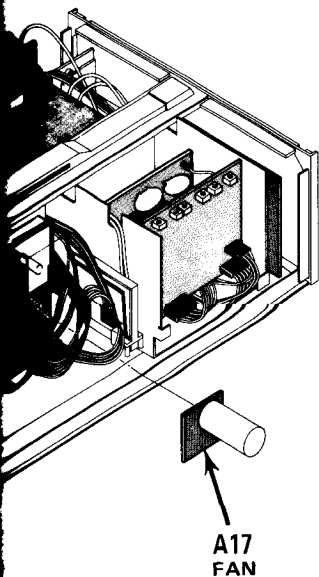
CKT NO	GRID COORD
R1549	4H
R1551	3H
R1562	4G
R1564	4F
R1565	4F
R1566	3G
R1567	2F
R1568	2G
R1570	3G
R1571	4G
R1573	3F
R1574	4F
R1577	3G
R1579	3G
R1580	3G
R1583	2F
R1585	2G
R1586	1G
R1587	2G
R1589	4F
R1591	5D
VR1401	3F
VR1461	3E
VR1501	2D
VR1505	3D



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Figure 8-19. A17—Fan Board circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
B1610	2B	CR1613	3C	R1606	1A
C1603	2A	CR1614	3C	R1610	1B
C1604	2A	P1607	3A	R1613	2A
CR1603	2B	Q1604	2A	R1614	2B
CR1607	3A			R1615	1A
CR1611	3B			U1615	3B
CR1612	3B	R1603	2A		
		R1604	1A		



A17
FAN

VOLTAGE CONDITIONS

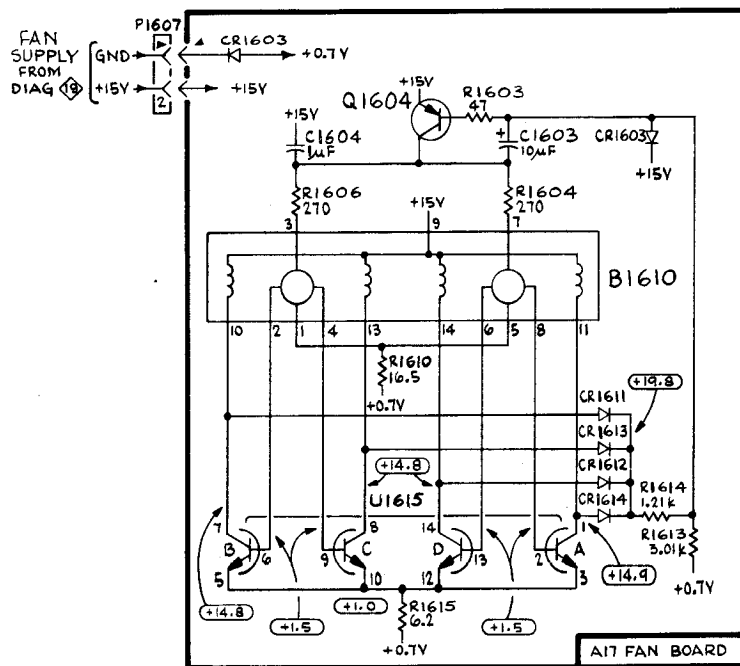
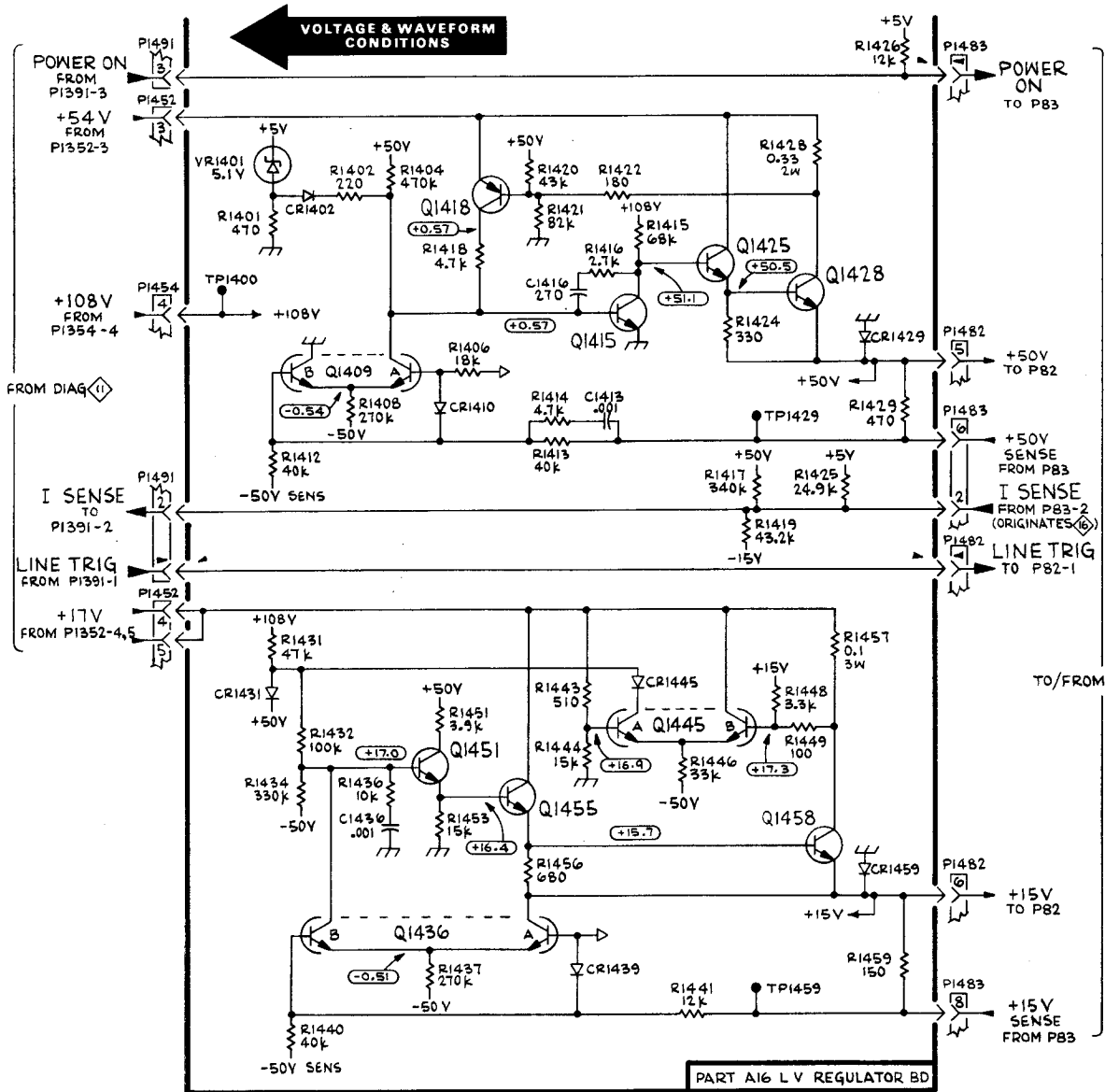
The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

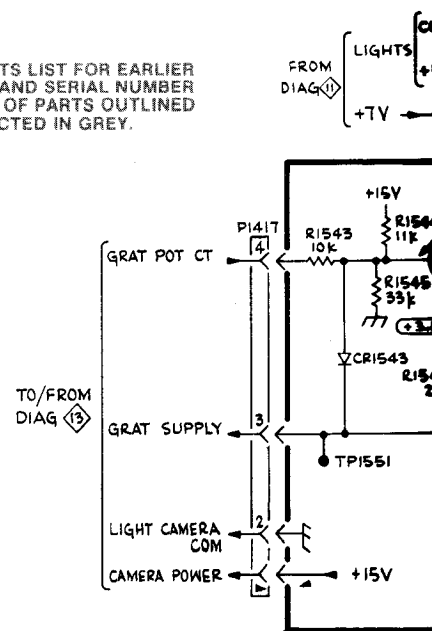
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

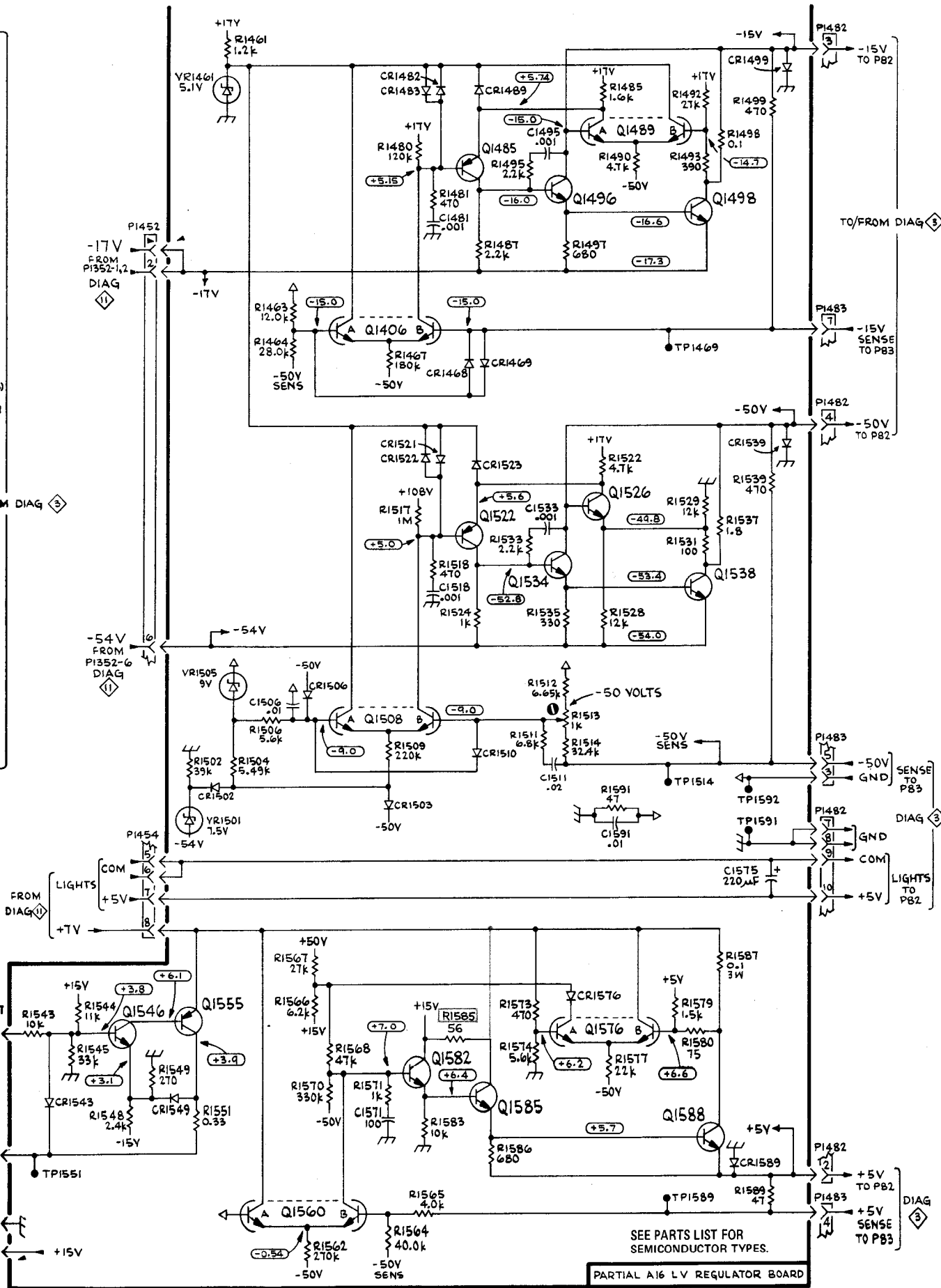
WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.





SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
 PARTIAL A16 LV REGULATOR BOARD

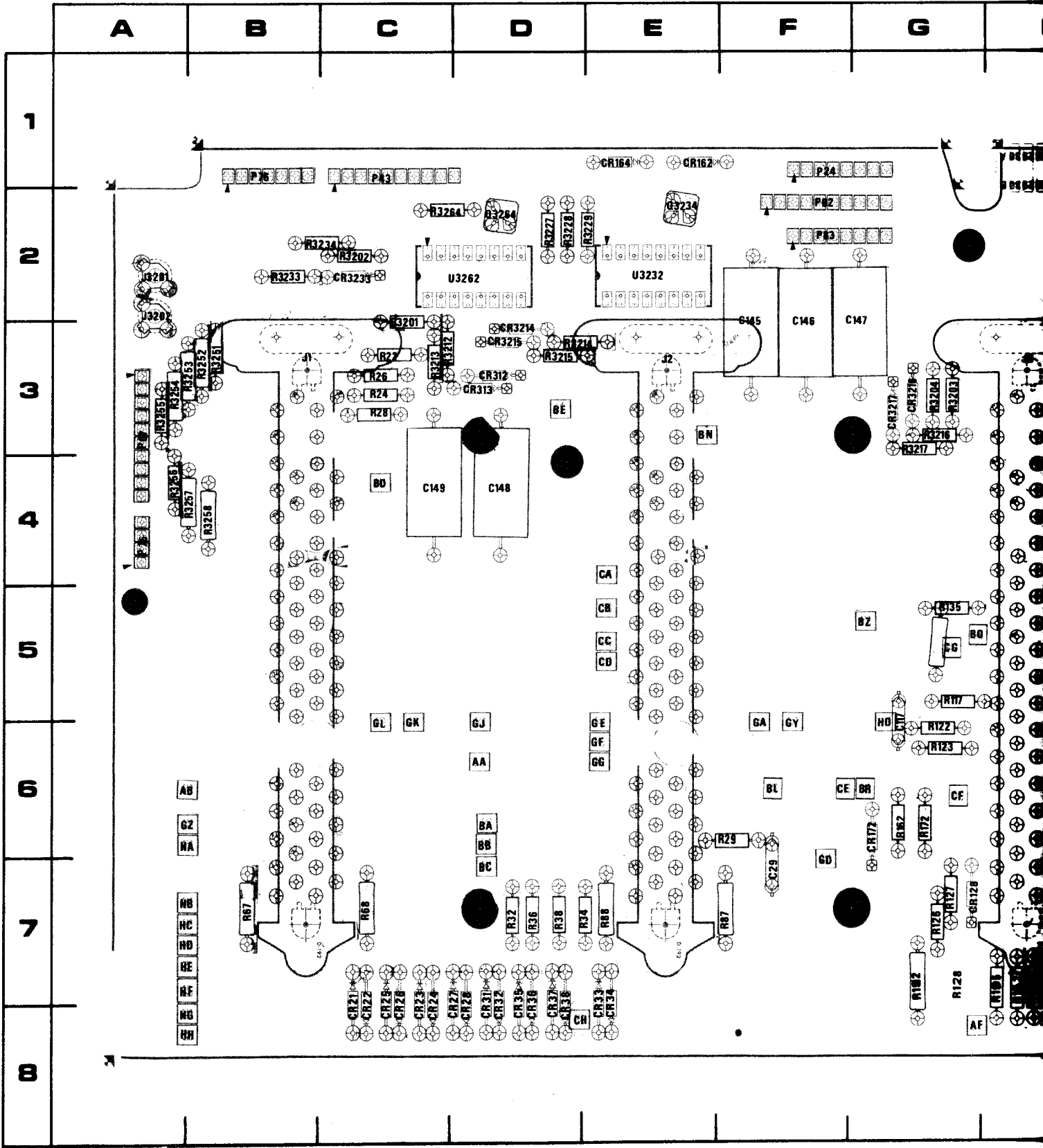
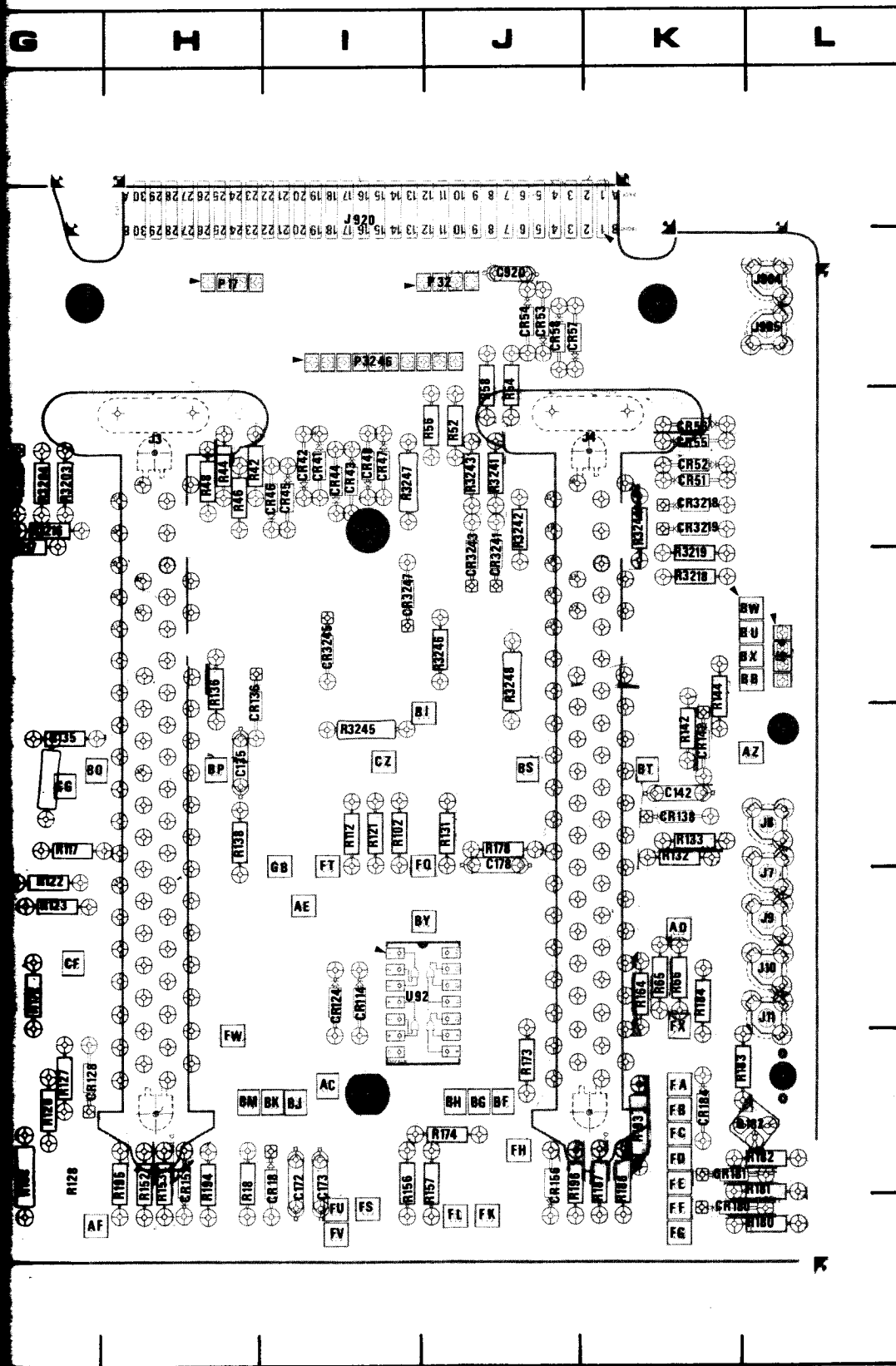
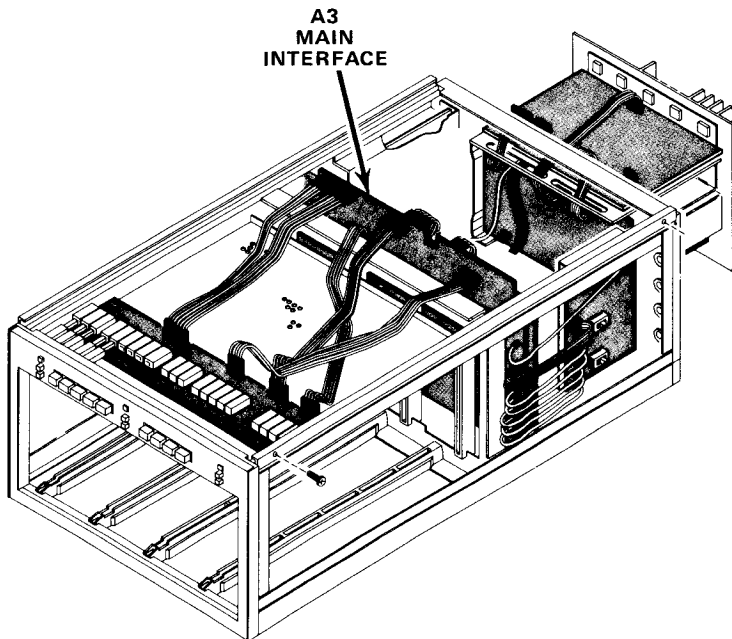


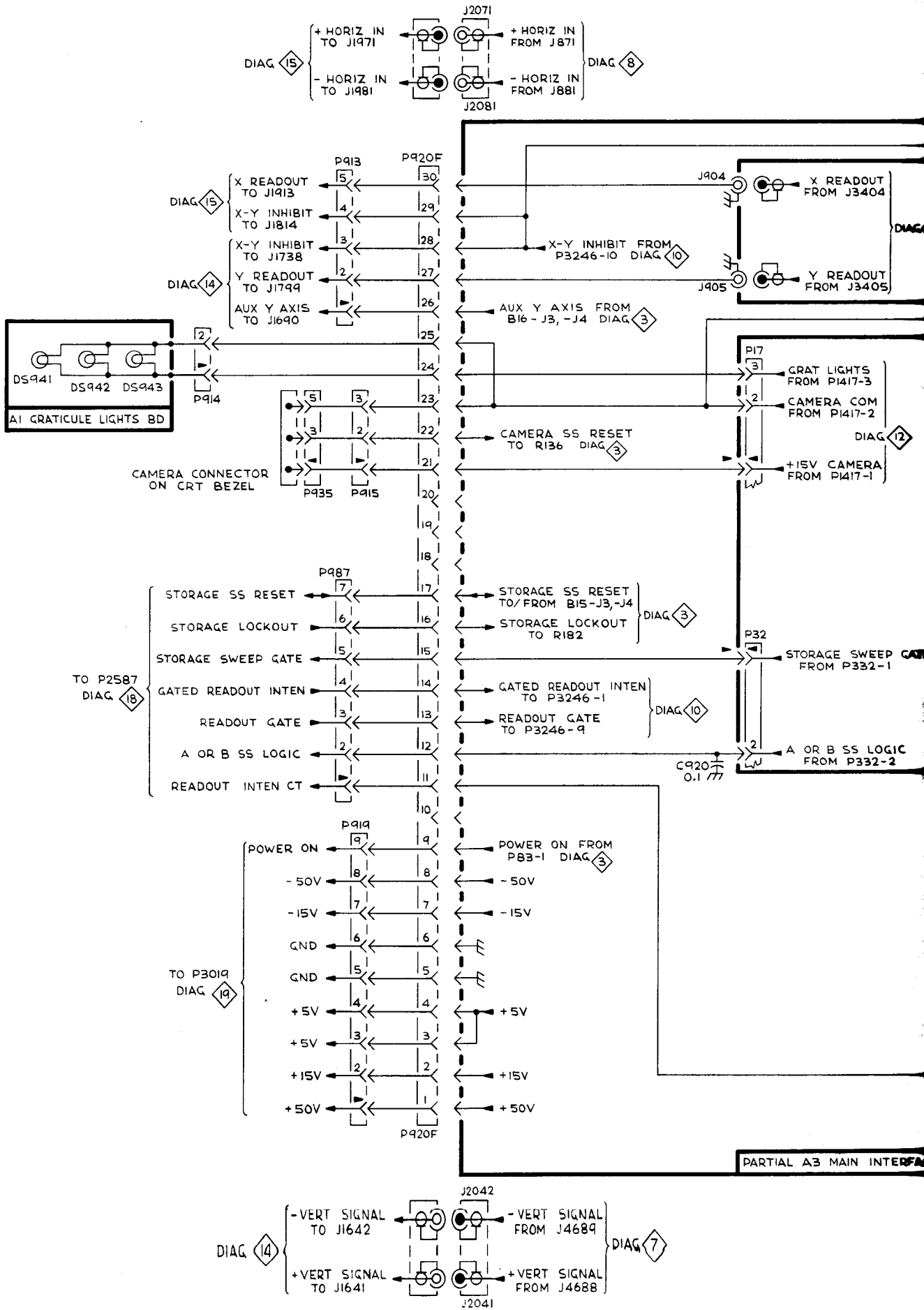
Figure 8-20. A3—Main Interface circuit board assembly.

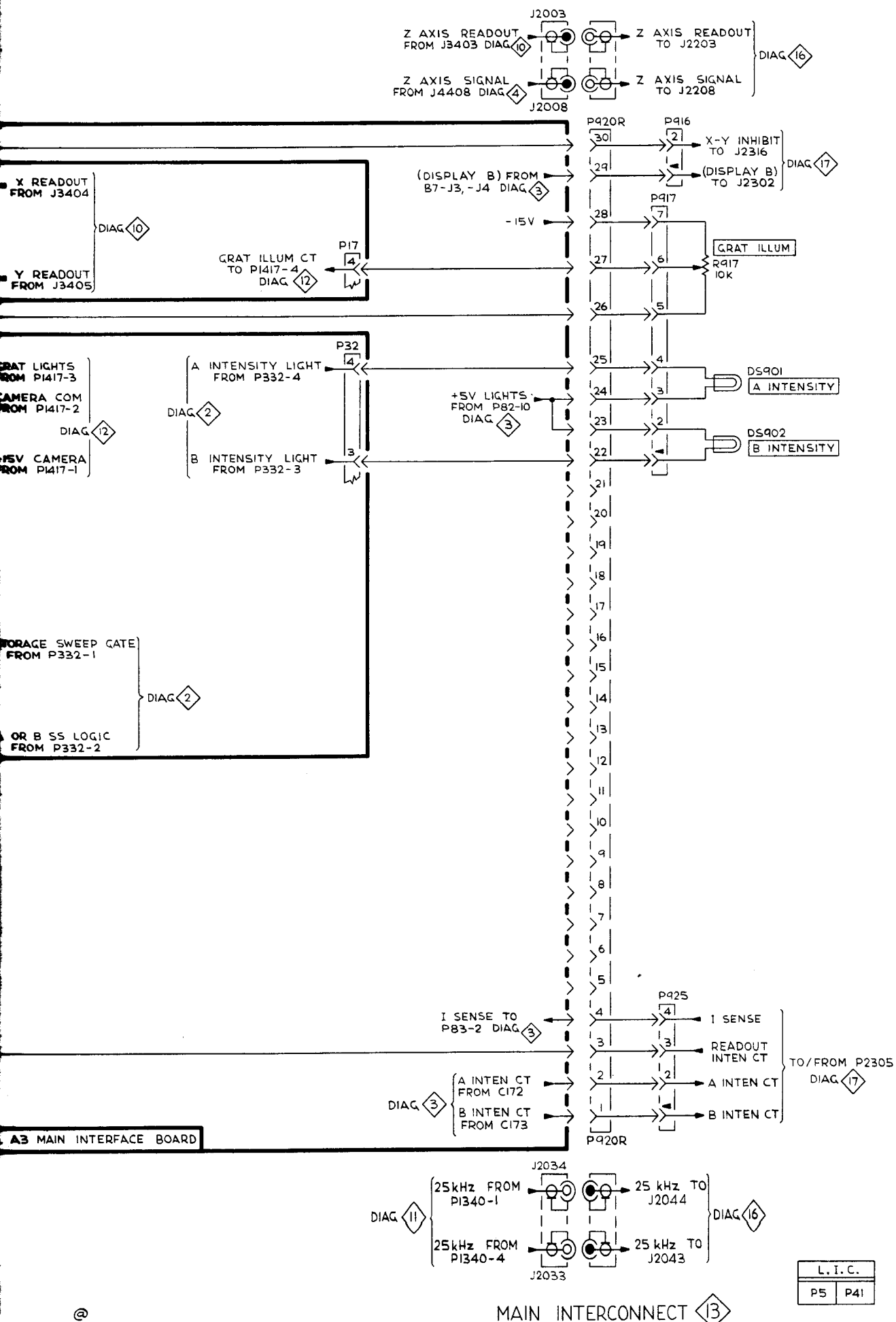


CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO
C29	6F	CR31	7D	CR32
C117	5G	CR32	7D	CR33
C135	4H	CR33	7E	CR34
C142	5K	CR34	7E	CR35
C145	2F	CR35	7D	CR36
C146	2F	CR36	7D	CR37
C147	2F	CR37	7D	CR38
C148	3D	CR38	7D	CR41
C149	3C	CR41	3I	CR42
C172	7I	CR42	3I	CR43
C173	7I	CR43	3I	CR44
C178	5J	CR44	3I	CR45
C920	1J	CR45	3I	CR46
		CR46	3H	CR47
CR18	7H	CR47	3I	CR48
CR21	7C	CR48	3I	CR51
CR22	7C	CR51	3K	CR52
CR23	7C	CR52	2K	CR53
CR24	7C	CR53	2J	CR54
CR25	7C	CR54	2J	CR55
CR26	7C	CR55	2K	CR56
CR27	7C	CR56	2K	CR57
CR28	7D	CR57	2J	

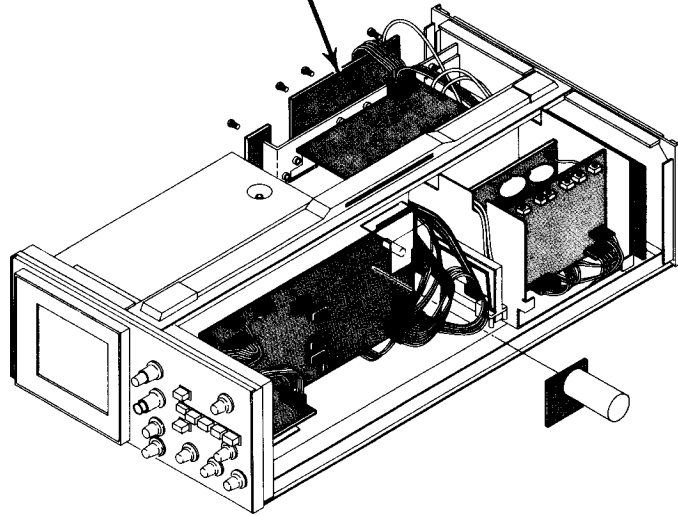
GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
	CR58	2J	CR3233	2C	P32	1J	R38	6D	R128	7G	R184	6K	R3233	2B
	CR114	6I	CR3241	3J	P43	1C	R42	3H	R131	5J	R186	7K	R3234	1B
	CR124	6I	CR3243	3J	P67	3A	R44	3H	R132	5K	R187	7K	R3241	3J
	CR128	6G	CR3245	4I	P75	4A	R46	3H	R133	5K	R192	7G	R3242	3J
	CR136	4H	CR3247	3I	P76	1B	R48	3H	R135	4G	R193	7K	R3243	3J
	CR138	5K			P82	1F	R52	2J	R136	4H	R194	7H	R3244	3K
	CR142	4K	J1	2B	P83	1F	R54	2J	R138	5H	R195	7H	R3245	4I
	CR152	7H	J2	2E	P91	4L	R56	2I	R142	4K	R196	7J	R3246	4J
	CR156	7J	J3	2H	P3246	2I	R58	2J	R144	4K	R3201	2C	R3247	3I
	CR162	1E	J4	2J			R65	6K	R152	7H	R3202	2C	R3248	4J
	CR164	1E	J7	5L	Q182	7K	R66	6K	R153	7H	R3203	3G	R3251	2B
	CR172	6G	J8	5L	Q3234	1E	R67	6B	R156	7I	R3204	3G	R3252	2A
	CR180	7K	J9	5L	Q3264	1D	R68	6C	R157	7I	R3212	2C	R3253	3A
	CR181	7K	J10	6L			R87	6E	R162	6G	R3213	2C	R3254	3A
	CR184	7K	J11	6L	R18	7H	R88	6E	R164	6K	R3214	2D	R3255	3A
	CR312	2D	J904	1L	R22	2C	R102	5I	R172	6G	R3215	2D	R3256	3A
	CR313	3D	J905	2L	R24	3C	R112	5I	R173	6J	R3216	3G	R3257	3A
	CR3214	2D	J920	1I	R26	2C	R117	5G	R174	7J	R3217	3G	R3258	4A
	CR3215	2D	J3201	2A	R28	3C	R121	5I	R178	5J	R3218	3K	R3264	1C
	CR3216	4G	J3202	2A	R29	6E	R122	5G	R180	7K	R3219	3K		
	CR3217	3G			R32	6D	R123	5G	R181	7K	R3227	1D	U92	6I
	CR3218	3K	P17	1H	R34	6D	R126	6G	R182	7K	R3228	1D	U3232	2E
	CR3219	3K	P24	1F	R36	6D	R127	6G	R183	6K	R3229	1D	U3262	2C







A19
VERTICAL
AMPLIFIER



170A

RD
DRD

board

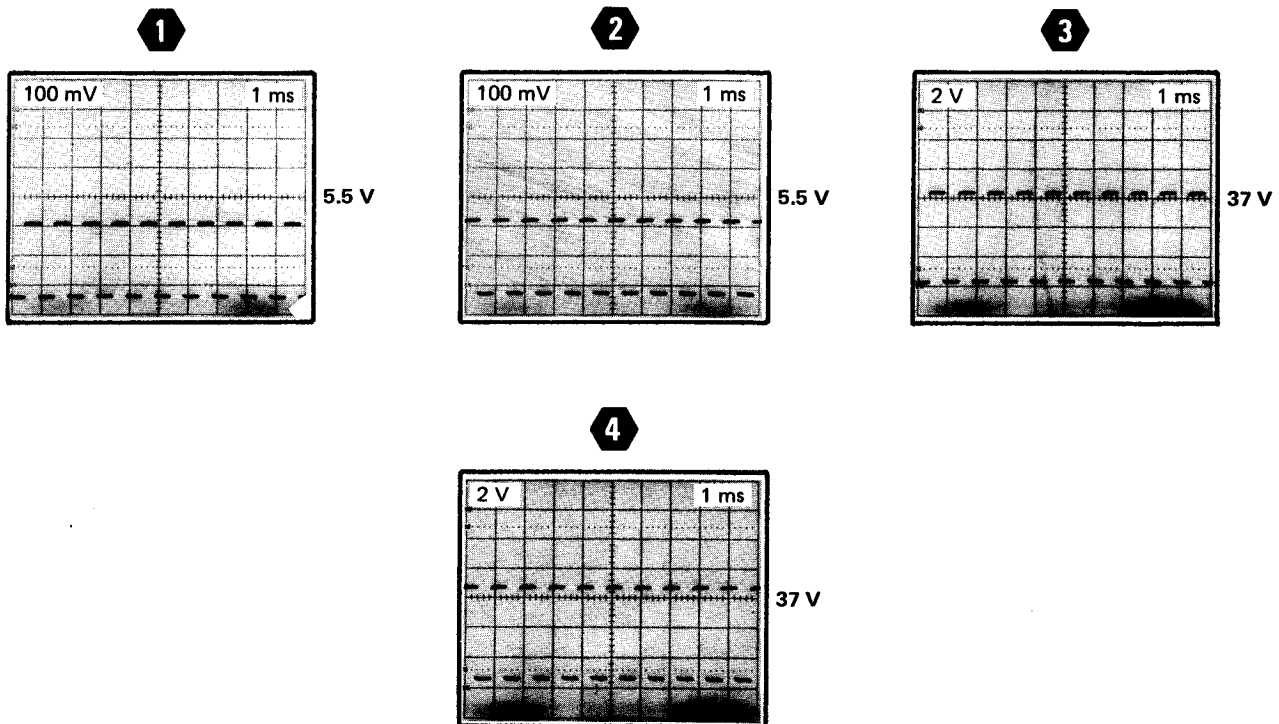
VOLTAGE AND WAVEFORM CONDITIONS

The voltages and waveforms shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A.

Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a $10\text{ M}\Omega$ input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

Waveform Conditions. The waveforms shown below were obtained using a test oscilloscope system with $10\text{ M}\Omega$ input impedance and at least 60 MHz bandwidth (Tektronix 7603 Oscilloscope, 7B53A Time Base, and 7A13 Differential Comparator equipped with a 10X probe). A 7A15A Amplifier plug-in unit is installed in the 7834 LEFT VERT compartment and a 7B80-series time base unit installed in the 7834 A HORIZ compartment. The test oscilloscope four volts calibrator signal is applied to the amplifier plug-in. The 7A15A is set for one volt/division deflection centered on the crt. A 7B53A Time Base plug-in unit is installed in the mainframe A HORIZ compartment. The 7B53A is set for internal auto-trigger and 0.5 millisecond/division sweep rate.



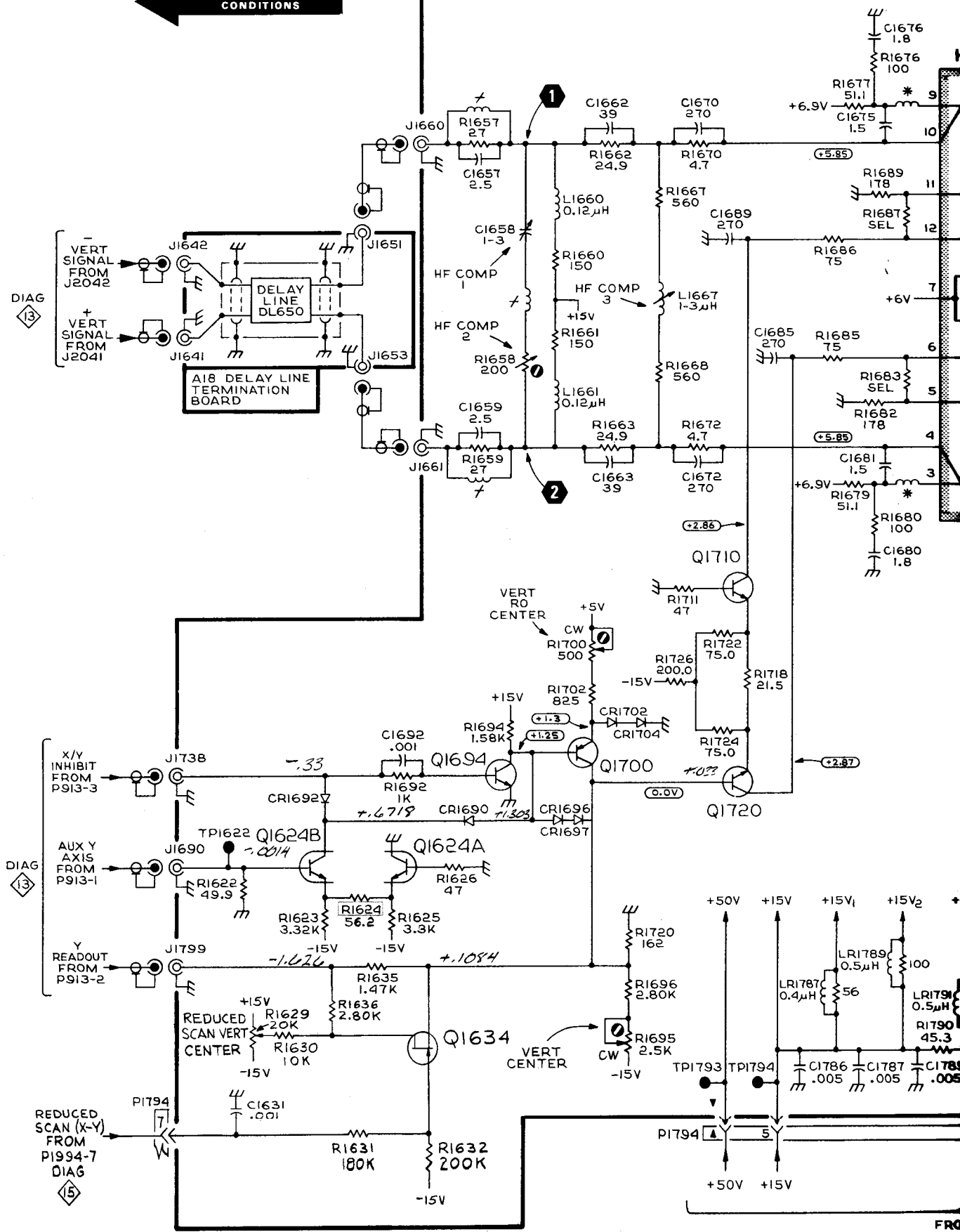
1988-81

WARNING

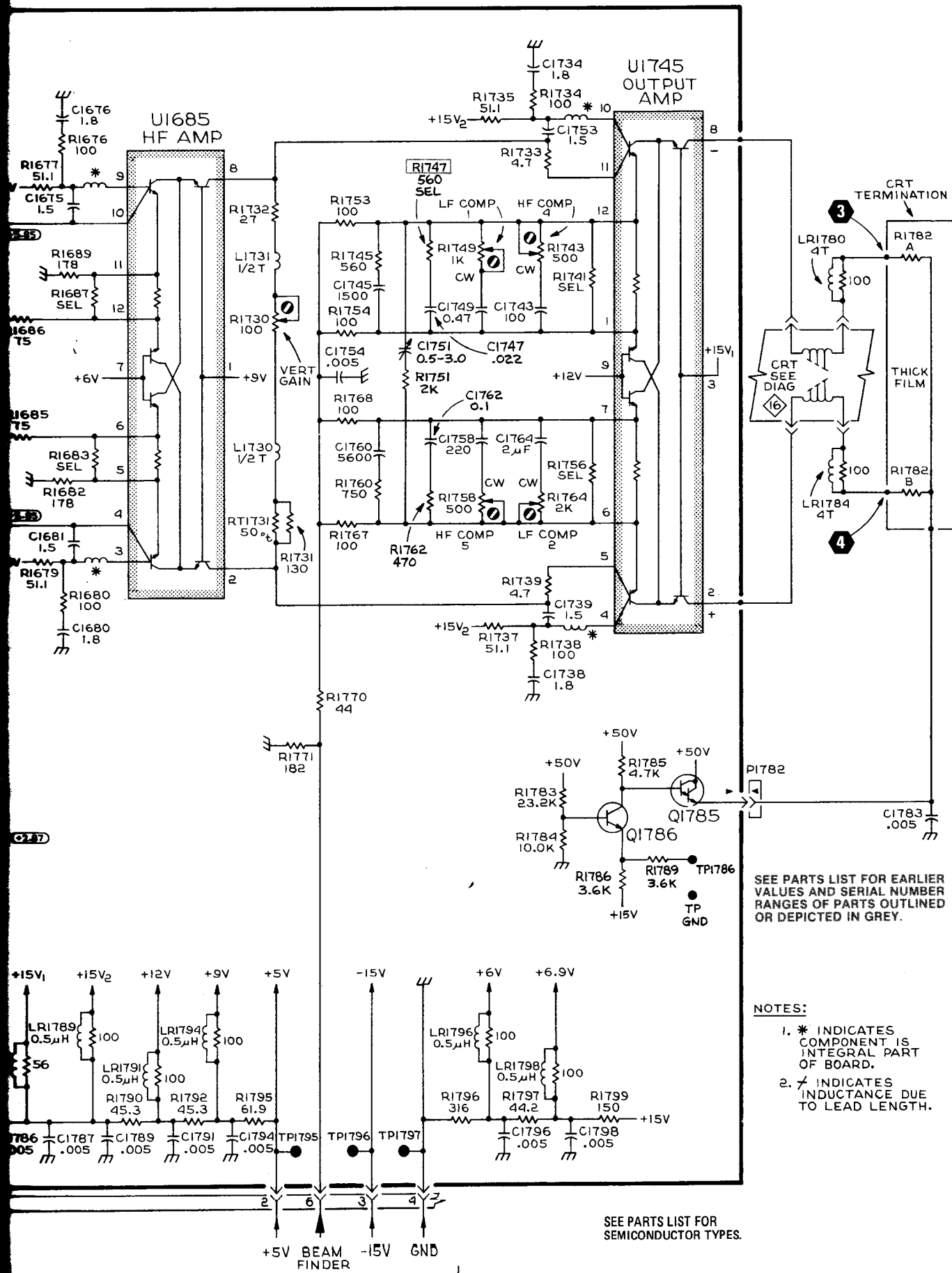
Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

A19 VERTICAL AMPLIFIER BOARD

VOLTAGE & WAVEFORM CONDITIONS



REV. B, AUG 1978
1988-82



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

NOTES:

1. * INDICATES COMPONENT IS INTEGRAL PART OF BOARD.
2. / INDICATES INDUCTANCE DUE TO LEAD LENGTH.

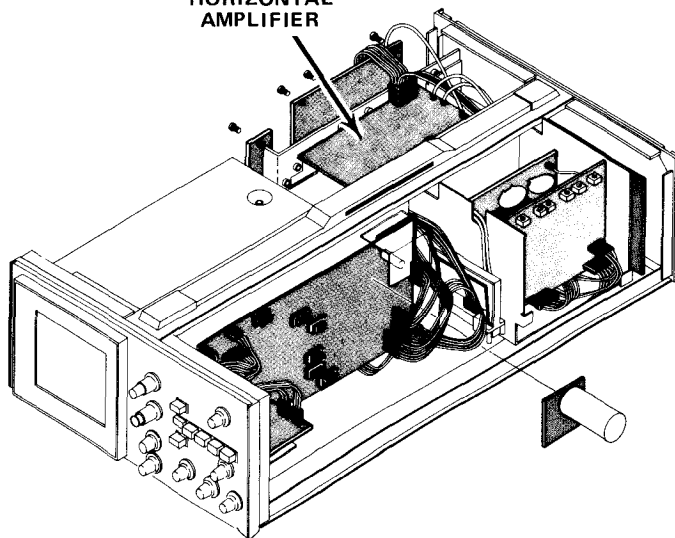
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

FROM PI994 DIAG 15

VERTICAL AMPLIFIER 14

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C1844	3C	CR1823	4B	Q1864	4E	R1838	2B	R1894	3F	R1958	1E
C1854	3C	CR1843	4B	Q1868	3E	R1842	4B	R1895	3F	R1961	2D
C1855	3D	CR1844	3B	Q1874	3D	R1843	3C	R1896	4E	R1962	2D
C1862	3E	CR1845	3C	Q1878	3E	R1844	3B	R1897	5F	R1963	2E
C1863	4E	CR1851	3D	Q1884	3F	R1849	3D	R1898	4F	R1964	1F
C1864	4E	CR1852	3D	Q1894	4F	R1851	3C	R1902	4D	R1965	2F
C1865	4F	CR1858	3D	Q1914	2B	R1852	4D	R1906	5C	R1968	2F
C1878	3E	CR1863	4E	Q1924	3B	R1854	4D	R1913	2B	R1969	2E
C1882	3F	CR1874	3D	Q1932	4C	R1855	3D	R1914	2B	R1971	2D
C1884	4F	CR1943	2C	Q1938	4C	R1857	3B	R1916	2C	R1972	2D
C1892	4F	CR1951	2D	Q1954	2C	R1858	4D	R1917	2C	R1973	3D
C1897	5E	CR1953	2D	Q1958	2D	R1861	4D	R1921	2B	R1974	3D
C1902	4D	CR1958	2D	Q1964	2F	R1862	4D	R1922	3A	R1981	2G
C1903	4C	CR1963	2E	Q1968	2F	R1863	4E	R1923	2B	R1982	2G
C1904	5C	CR1974	3D	Q1974	2D	R1864	4E	R1924	2B	R1983	2G
C1905	1C			Q1978	2D	R1865	4F	R1930	4B	R1984	2F
C1906	5D	J1814	3A	Q1984	2F	R1868	3E	R1931	4B	R1991	3F
C1917	4A	J1821	4A	Q1994	3F	R1871	3D	R1932	4B	R1992	2E
C1944	2C	J1913	2A			R1873	3E	R1934	4C	R1993	2G
C1954	2C	J1931	2A	R1813	3A	R1874	3D	R1935	4C	R1994	3F
C1955	2D			R1814	3B	R1875	3E	R1936	4C		
C1962	2E	L1903	4B	R1815	3B	R1876	4E	R1938	4C	RT1833	3C
C1963	2E	L1904	4C	R1816	3A	R1877	5E	R1939	4C		
C1964	2E	L1905	2C	R1821	4B	R1878	3D	R1941	2B	TP1894	3G
C1965	2F			R1822	4A	R1879	3E	R1943	3C	TP1901	5E
C1968	2F	P1911	5B	R1823	4B	R1881	4F	R1944	2B	TP1906	5D
C1974	3E	P1994	5B	R1824	4B	R1882	4F	R1945	2C	TP1994	3G
C1975	3E			R1830	3D	R1883	3F	R1949	3D		
C1978	2E	Q1814	3B	R1832	3B	R1884	3F	R1951	2C	VR1848	3C
C1983	1F	Q1824	3B	R1834	3C	R1891	5E	R1952	2D	VR1948	2C
C1984	2E	Q1854	4C	R1835	3B	R1892	4F	R1954	1D	VR1968	2F
C1992	3F	Q1858	4D	R1836	3C	R1893	3F	R1955	2D		

A20
HORIZONTAL
AMPLIFIER



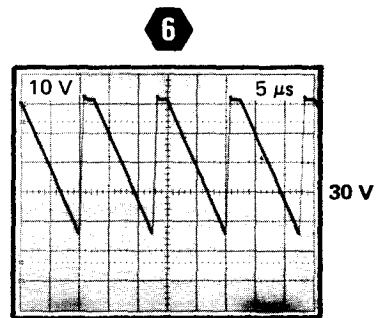
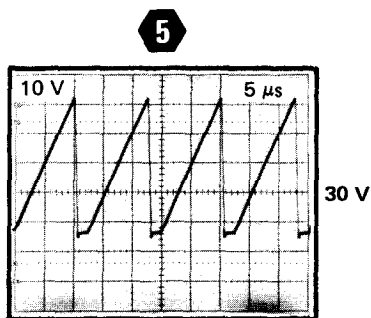
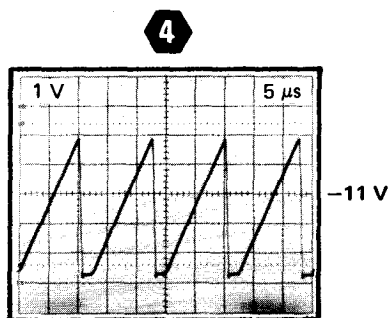
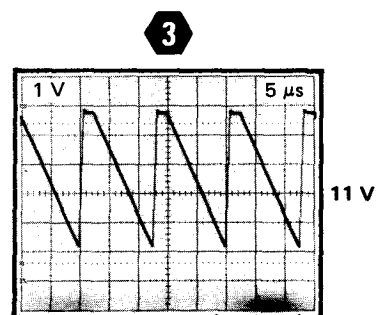
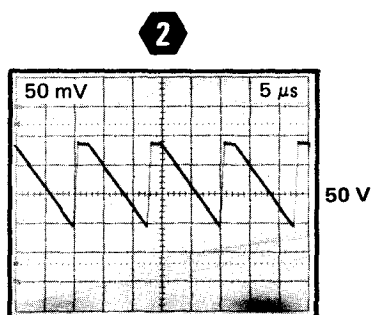
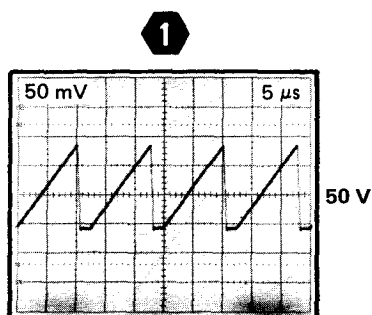
VOLTAGE AND WAVEFORM CONDITIONS

The voltages and waveforms shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in.

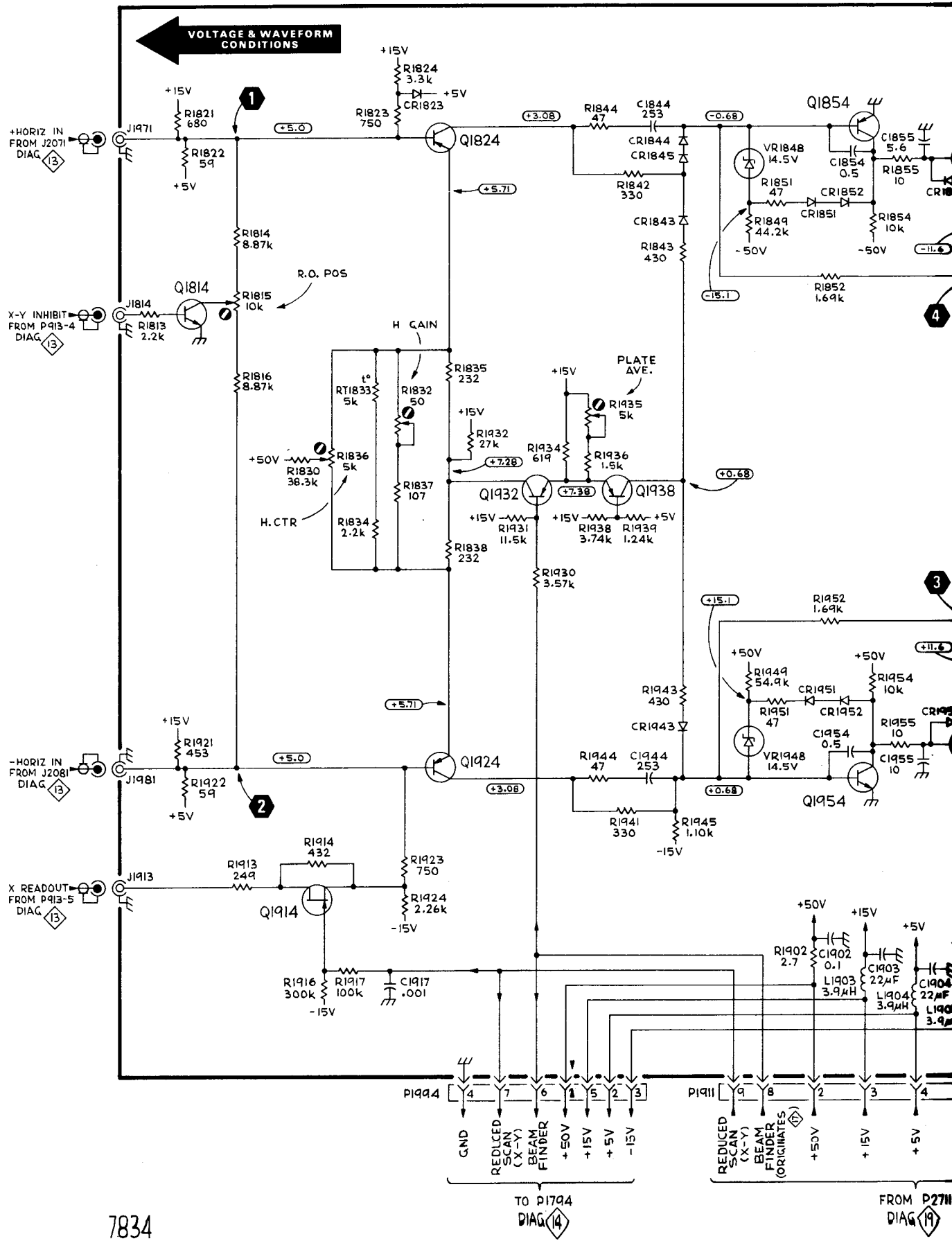
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a $10\text{ M}\Omega$ input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

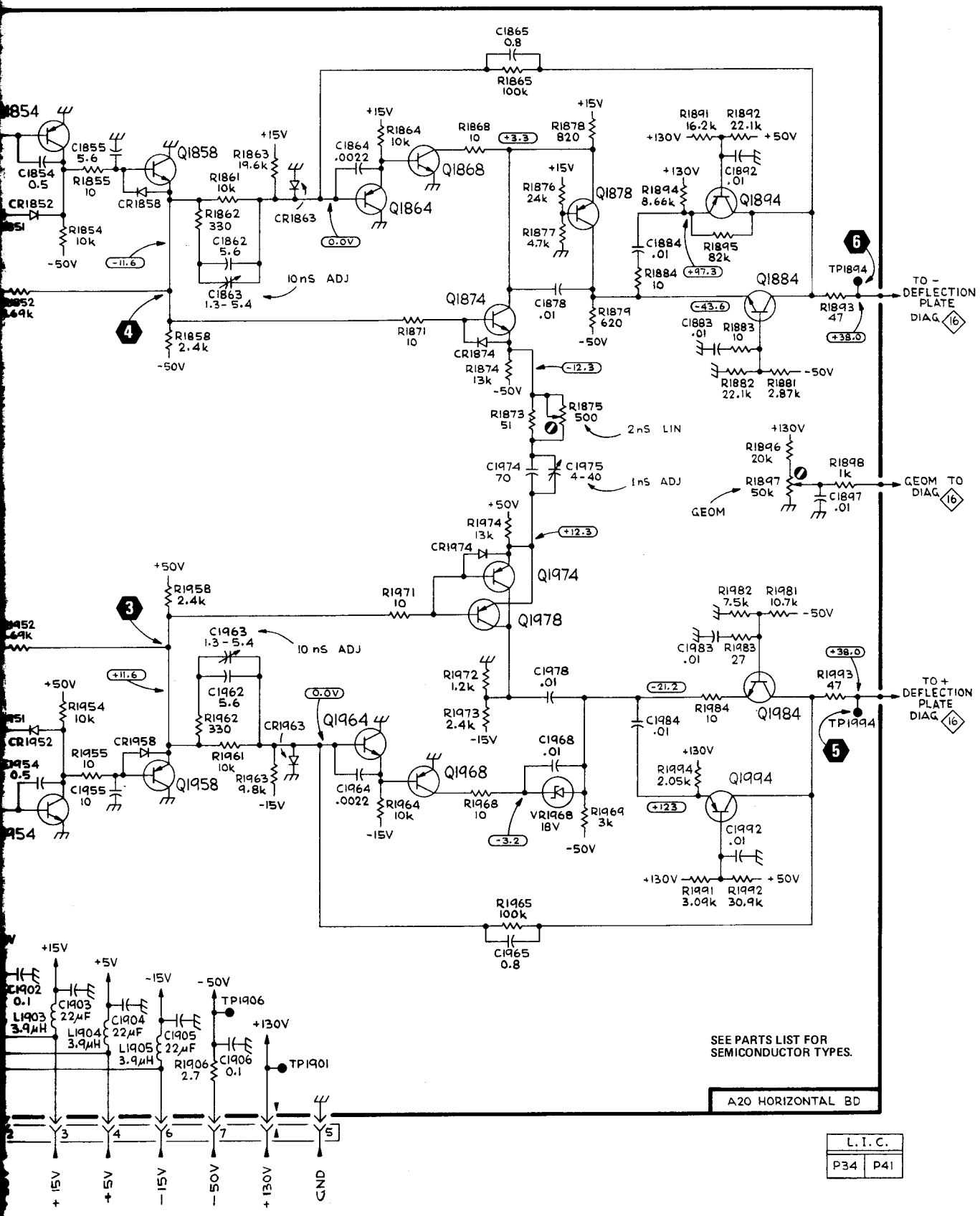
Waveform Conditions. The waveforms shown below were obtained using a test oscilloscope system with $10\text{ M}\Omega$ input impedance and at least 60 MHz bandwidth (Tektronix 7603 Oscilloscope, 7B53A Time Base, and 7A13 Differential Comparator equipped with a 10X probe). A 7B53A Time Base plug-in unit is installed in the mainframe A HORIZ compartment. The 7B53A is set for internal auto-trigger and 1 microsecond/division sweep rate.



WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

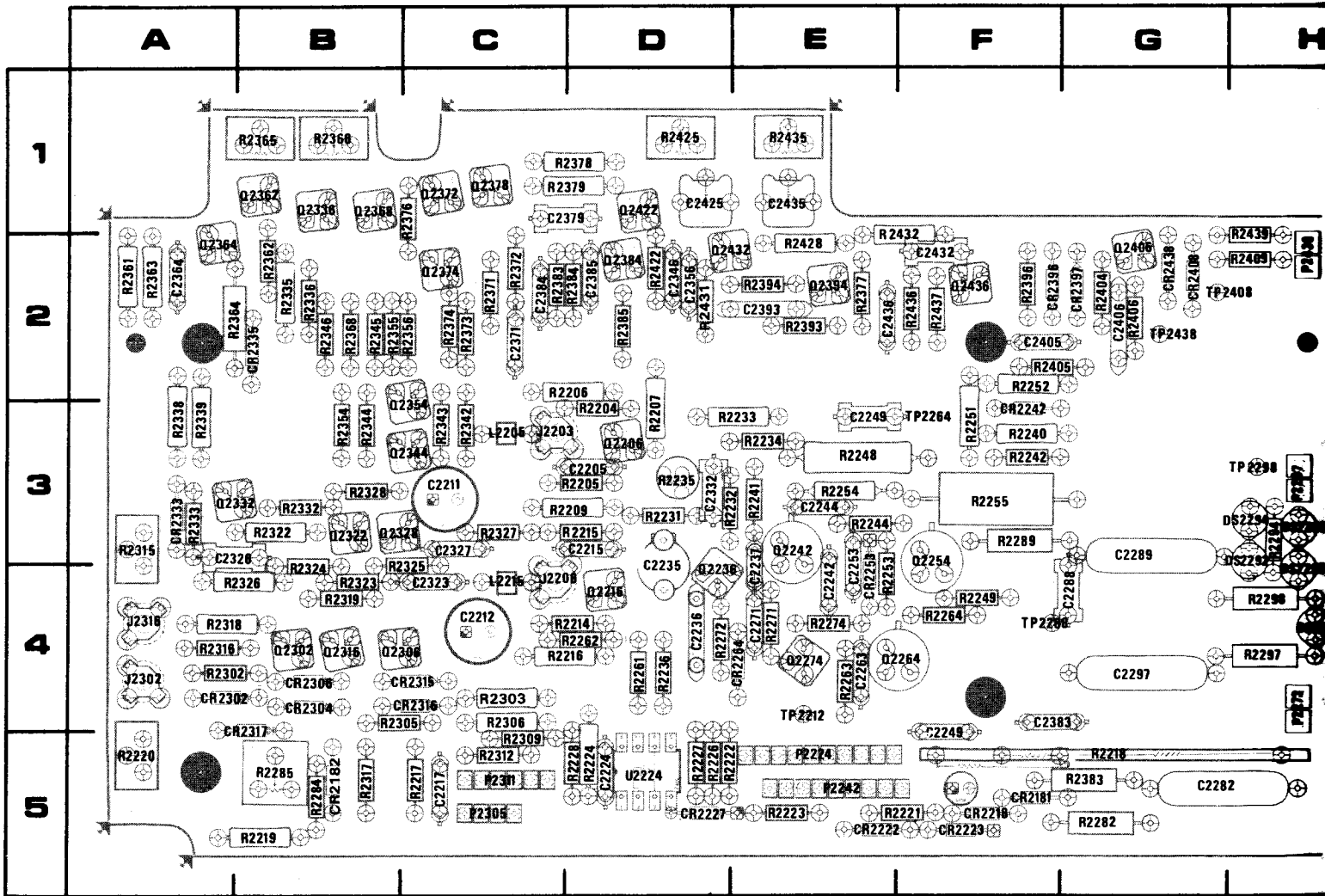




L. I. C.	
P34	P41

HORIZONTAL AMPLIFIER 15

HORIZONTAL AMPLIFIER

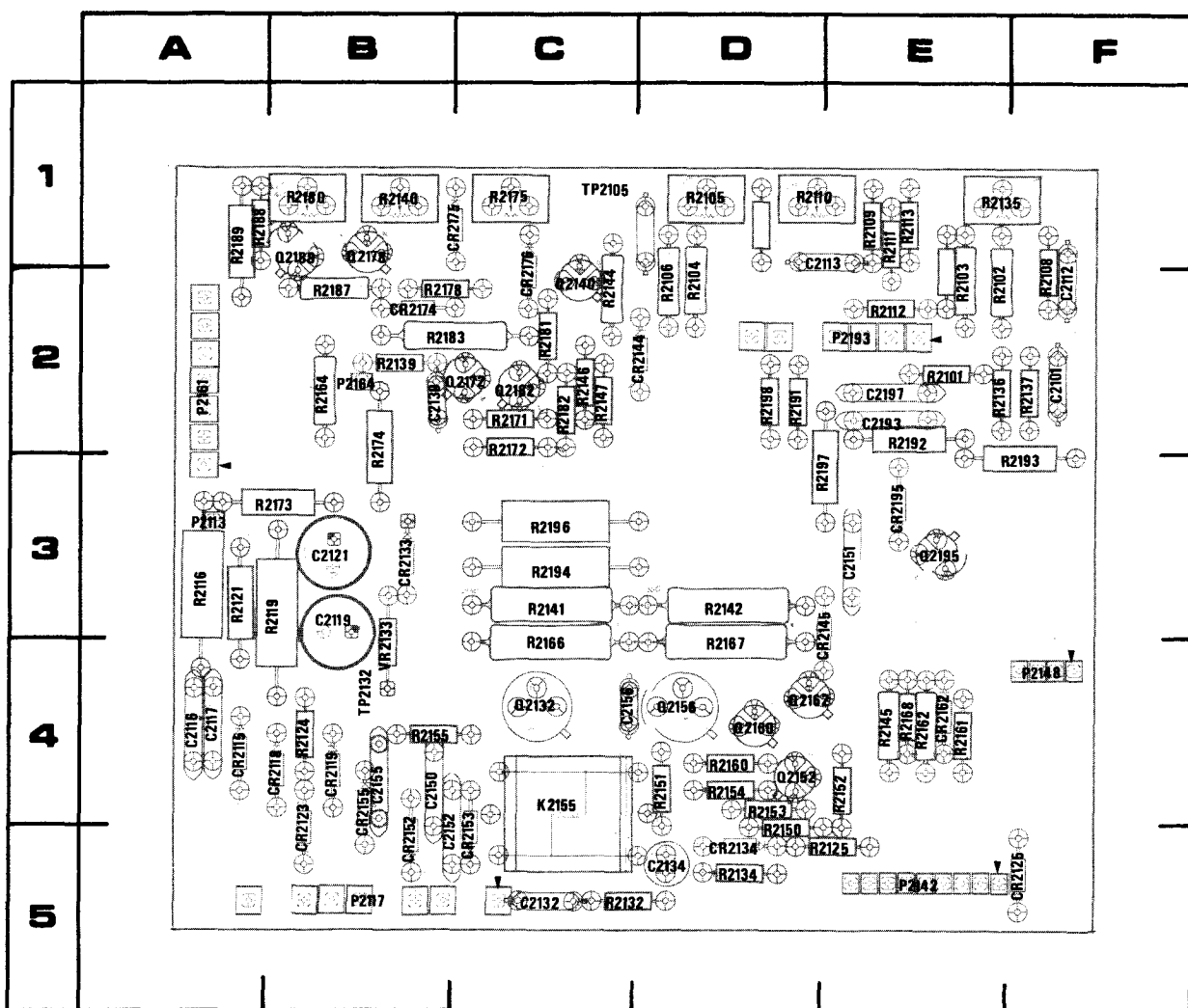
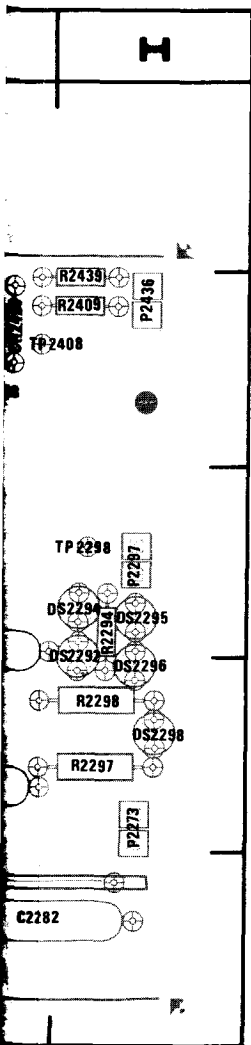


1988-1

Figure 8-23. A21-Z-Axis circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C2212	4C	C2383	4F	CR2316	4C	Q2216	4D	R2206	2C	R2254	3E	R2318	4A	R2376	1C
C2217	5C	C2384	2C	CR2317	4B	Q2236	4D	R2214	4D	R2255	3F	R2319	4B	R2377	2E
C2224	5D	C2385	2C	CR2335	2B	Q2242	3E	R2216	4D	R2261	4D	R2323	4B	R2378	1C
C2235	4D	C2393	2E	CR2396	2F	Q2254	3F	R2217	5C	R2262	4D	R2324	4B	R2379	1C
C2236	4D	C2405	2F	CR2397	2G	Q2264	4F	R2218	5G	R2264	4F	R2325	4B	R2383	2C
C2237	4E	C2425	1D	DS2292	3H	Q2302	4B	R2219	5B	R2271	4E	R2326	4B	R2384	2D
C2242	4E	C2432	2F	DS2294	3H	Q2306	4B	R2220	5A	R2272	4D	R2335	2B	R2385	2D
C2244	3E	C2435	1E	DS2295	3H	Q2316	4B	R2221	5F	R2282	5G	R2336	2B	R2393	2E
C2248	3E	C2436	2E	DS2296	4H	Q2336	1B	R2222	5D	R2283	5G	R2345	2B	R2394	2E
C2249	5F			DS2298	4H	Q2344	3B	R2223	5E	R2284	5B	R2346	2B	R2396	2F
C2253	4E	CR2181	5F			Q2354	3B	R2224	5D	R2285	5B	R2355	2B	R2422	2D
C2271	4E	CR2182	5B	J2208	4C	Q2362	1B	R2226	5D	R2289	3F	R2356	2C	R2425	1D
C2282	5G	CR2218	5F	J2302	4A	Q2364	2A	R2227	5D	R2294	3H	R2361	2A	R2428	2E
C2288	4G	CR2222	4F	J2316	4A	Q2368	1B	R2228	5D	R2297	4H	R2362	2B	R2431	2D
C2289	3G	CR2223	5F			Q2372	1C	R2236	4D	R2298	4H	R2363	2A	R2432	2F
C2297	4G	CR2227	4B	L2215	4C	Q2374	2C	R2240	3F	R2302	4A	R2364	2A	R2435	1E
C2323	4C	CR2242	3F	P2224	5E	Q2378	1C	R2241	3E	R2303	4C	R2365	1B	R2436	2F
C2332	3D	CR2253	4E	P2242	5E	Q2384	2D	R2242	3F	R2305	4B	R2366	1B	R2437	2F
C2346	2D	CR2264	4E	P2273	4H	Q2394	2E	R2244	3E	R2306	4C	R2368	2B		
C2356	2D	CR2302	4A	P2297	3H	Q2422	1D	R2248	3E	R2309	5C	R2371	2C	TP2264	3F
C2364	2A	CR2304	4B	P2305	5C	Q2432	2D	R2249	4F	R2312	5C	R2372	2C	TP2288	4F
C2371	2C	CR2306	4B	P2311	5C	Q2436	2F	R2251	3F	R2316	4A	R2373	2C	TP2298	3H
C2379	1C	CR2315	4C					R2253	4E	R2317	5B	R2374	2C	U2224	5D
				Q2206	3D										





1988-172A

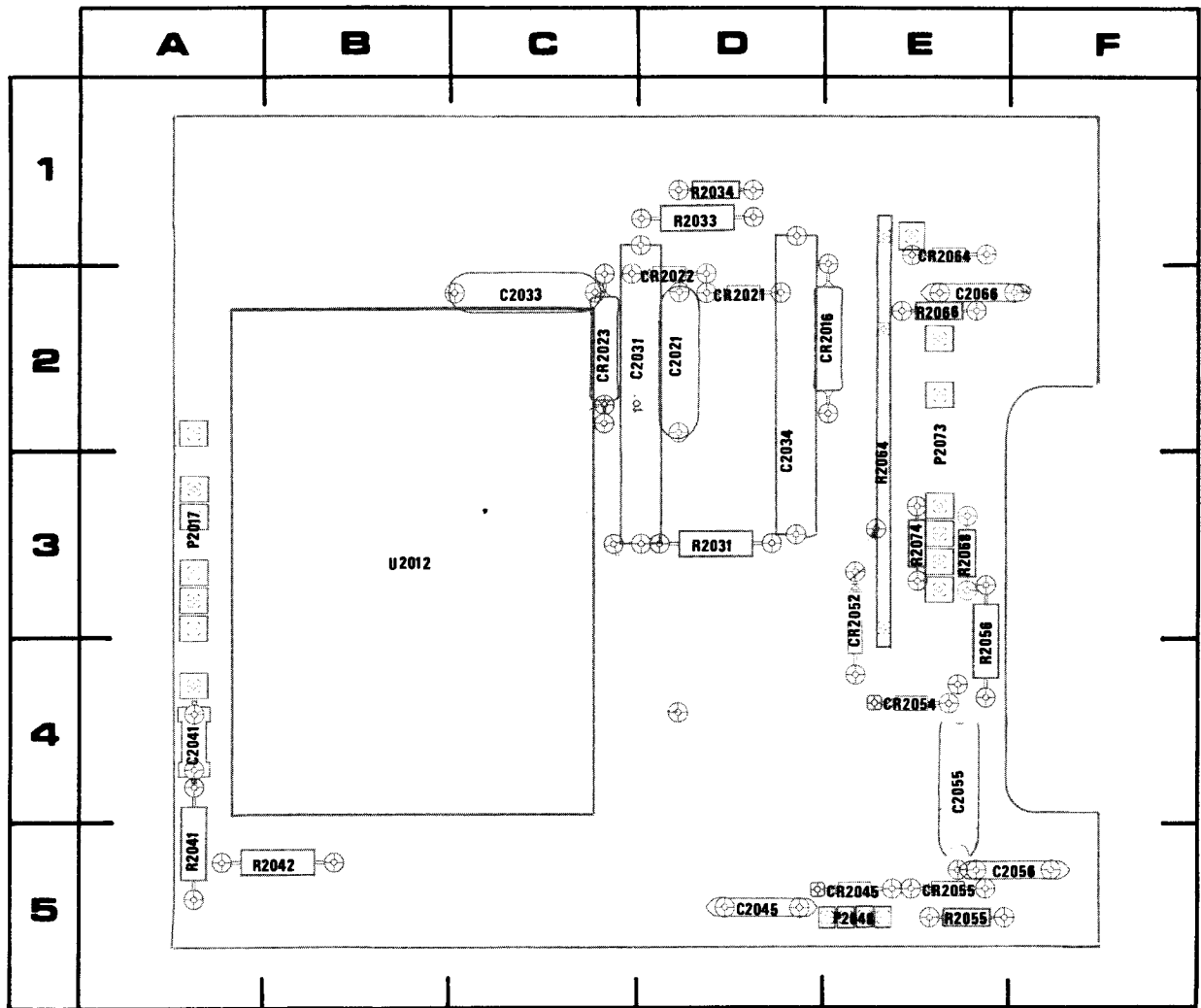
Figure 8-24. A23—Focus circuit board assembly.

1988-173A

CKT NO	GRID COORD
R2376	1C
R2377	2E
R2378	1C
R2379	1C
R2383	2C
R2384	2D
R2385	2D
R2393	2E
R2394	2E
R2396	2F
R2422	2D
R2425	1D
R2428	2E
R2431	2D
R2432	2F
R2435	1E
R2436	2F
R2437	2F
TP2264	3F
TP2288	4F
TP2298	3H
U2224	5D

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C2101	2F	CR2144	2C	Q2160	4D	R2125	5E	R2168	4E
C2112	2F	CR2145	3F	Q2162	4D	R2132	5C	R2171	2C
C2113	1D	CR2152	4B	Q2172	2C	R2134	5D	R2172	2C
C2116	4A	CR2153	5C	Q2178	1B	R2135	1E	R2173	3B
C2117	4A	CR2155	4B	Q2182	2C	R2136	2E	R2174	2B
C2119	3B	CR2162	4E	Q2188	1B	R2137	2F	R2175	1C
C2121	3B	CR2174	2B	Q2195	3E	R2139	2B	R2178	2B
C2132	5C	CR2175	1B	R2101	2E	R2140	1B	R2180	1B
C2134	5D	CR2176	1C	R2102	2E	R2141	3C	R2181	2C
C2139	2B	CR2195	3F	R2103	2E	R2142	3D	R2182	2C
C2150	4B	K2155	4C	R2104	2D	R2144	2C	R2183	2B
C2151	3F	K2155S1	4C	R2105	1D	R2145	4E	R2187	2B
C2152	5B	P2113	3A	R2106	2D	R2146	2C	R2188	1A
C2155	4B	P2117	5B	R2108	2F	R2147	2C	R2189	1A
C2156	4C	P2142	5E	R2109	1E	R2150	5D	R2191	2D
C2193	2E	P2148	4F	R2110	1D	R2151	4D	R2192	2E
C2197	2E	P2161	2A	R2111	1E	R2152	4E	R2193	3F
CR2115	4A	P2164	2B	R2112	2E	R2153	4D	R2194	3C
CR2118	4B	P2193	2E	R2113	1E	R2154	4D	R2196	3C
CR2119	4B	Q2108	☆	R2114	☆	R2155	4B	R2197	3D
CR2123	4B	Q2132	4C	R2116	3A	R2156	4D	R2198	2D
CR2125	5F	Q2133	4C	R2119	3B	R2160	4D	TP2105	1C
CR2133	3B	Q2140	2C	R2121	3A	R2161	4E	TP2132	4B
CR2134	5D	Q2152	4D	R2122	3A	R2162	4E	VR2133	4B
		Q2156	4D	R2124	4B	R2166	2B		
						R2167	4D		

☆ on back of board



1988-173A

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Figure 8-25. A22-High Voltage circuit board assembly.

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C2021	2D	C2066	2E	CR2054	4E	R2031	3D	R2066	2E
C2031	2C			CR2055	5E	R2033	1D	R2068	3E
C2033	2C	CR2016	2D	CR2064	1E	R2034	1D	R2074	3E
C2034	2D	CR2021	2D			R2041	5A		
C2041	4A	CR2022	2D			R2042	5B	U2012	3B
C2045	5D	CR2023	2C	P2017	3A	R2055	5E		
C2055	4E	CR2045	5E	P2073	2E	R2056	3E		
C2056	5F	CR2052	3E	P2148	5E	R2064	3E		

VOLTAGE CONDITIONS

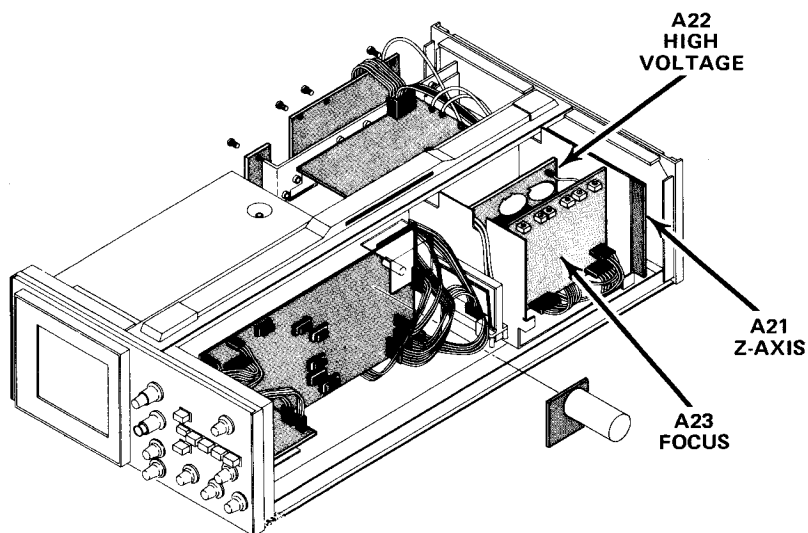
The voltages shown were obtained with the 7834 controls set as follows:

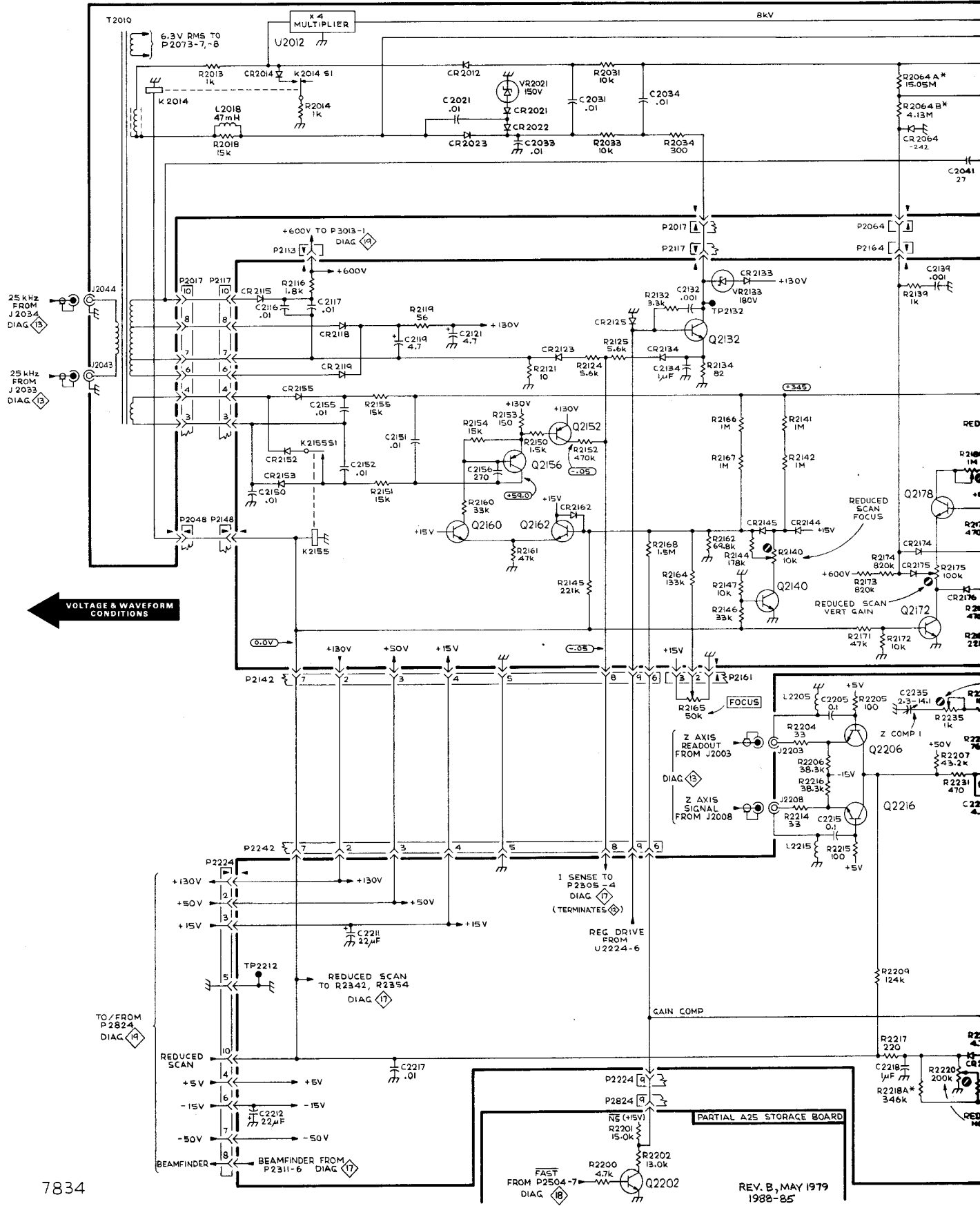
Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

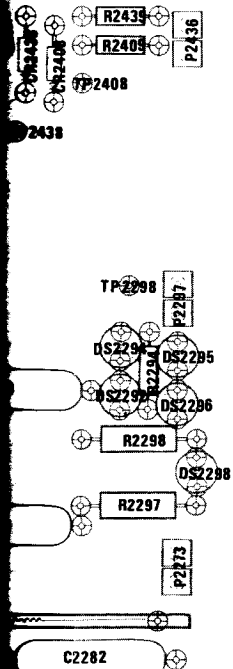
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.





H

1988-175A

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C2212	4C	CR2227	5D	Q2306	4B	R2254	3E	R2364	2A
C2217	5C	CR2242	3F	Q2316	4B	R2255	3F	R2365	1B
C2224	5D	CR2253	4E	Q2336	1B	R2261	4D	R2366	1B
C2235	4D	CR2264	4E	Q2344	3B	R2262	4D	R2368	2B
C2236	4D	CR2302	4A	Q2354	3B	R2264	4F	R2371	2C
C2237	4E	CR2304	4B	Q2362	1B	R2271	4E	R2372	2C
C2242	4E	CR2306	4B	Q2364	2A	R2272	4D	R2373	2C
C2244	3E	CR2315	4C	Q2368	1B	R2282	5G	R2374	2C
C2248	3E	CR2316	4C	Q2372	1C	R2283	5G	R2376	1C
C2249	5F	CR2317	4B	Q2374	2C	R2284	5B	R2377	2E
C2253	4E	CR2335	2B	Q2378	1C	R2285	5B	R2378	1C
C2271	4E	CR2396	2F	Q2384	2D	R2289	3F	R2379	1C
C2282	5G	CR2397	2G	Q2394	2E	R2294	3H	R2383	2C
C2288	4G			Q2422	1D	R2297	4H	R2384	2D
C2289	3G			Q2432	2D	R2298	4H	R2385	2D
C2297	4G	DS2292	3H	Q2436	2F	R2302	4A	R2393	2E
C2323	4C	DS2294	3H	R2206	2C	R2303	4C	R2394	2E
C2332	3D	DS2295	3H	R2214	4D	R2305	4B	R2396	2F
C2346	2D	DS2296	4H	R2216	4D	R2306	4C	R2422	2D
C2356	2D	DS2298	4H	R2217	5C	R2309	5C	R2425	1D
C2364	2A			R2218	5G	R2312	5C	R2428	2E
C2371	2C	J2208	4C	R2219	5B	R2316	4A	R2431	2D
C2379	1C	J2302	4A	R2220	5A	R2317	5B	R2432	2F
C2383	4F	J2316	4A	R2221	5F	R2318	4A	R2435	1E
C2384	2C			R2222	5D	R2319	4B	R2436	2F
C2385	2C	L2215	4C	R2223	5E	R2323	4B	R2437	2F
C2393	2E			R2224	5D	R2324	4B		
C2405	2F	P2224	5E	R2226	5D	R2325	4B	TP2264	3F
C2425	1D	P2242	5E	R2227	5D	R2326	4B	TP2288	4F
C2432	2F	P2273	4H	R2228	5D	R2335	2B	TP2298	3H
C2435	1E	P2297	3H	R2236	4D	R2336	2B		
C2436	2E	P2305	5C	R2240	3F	R2345	2B	U2224	5D
		P2311	5C	R2241	3E	R2346	2B		
CR2181	5F	Q2206	3D	R2242	3F	R2355	2B		
CR2182	5B	Q2216	4D	R2244	3E	R2356	2C		
CR2218	5F	Q2236	4D	R2248	3E	R2361	2A		
CR2222	5E	Q2242	3E	R2249	4F	R2362	2B		
CR2223	5F	Q2254	3F	R2251	3F	R2363	2A		
		Q2264	4F	R2253	4E				
		Q2302	4B						

VOLTAGE CONDITIONS

The voltages shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in HORIZONTAL MODE A. No plug-in units are installed.

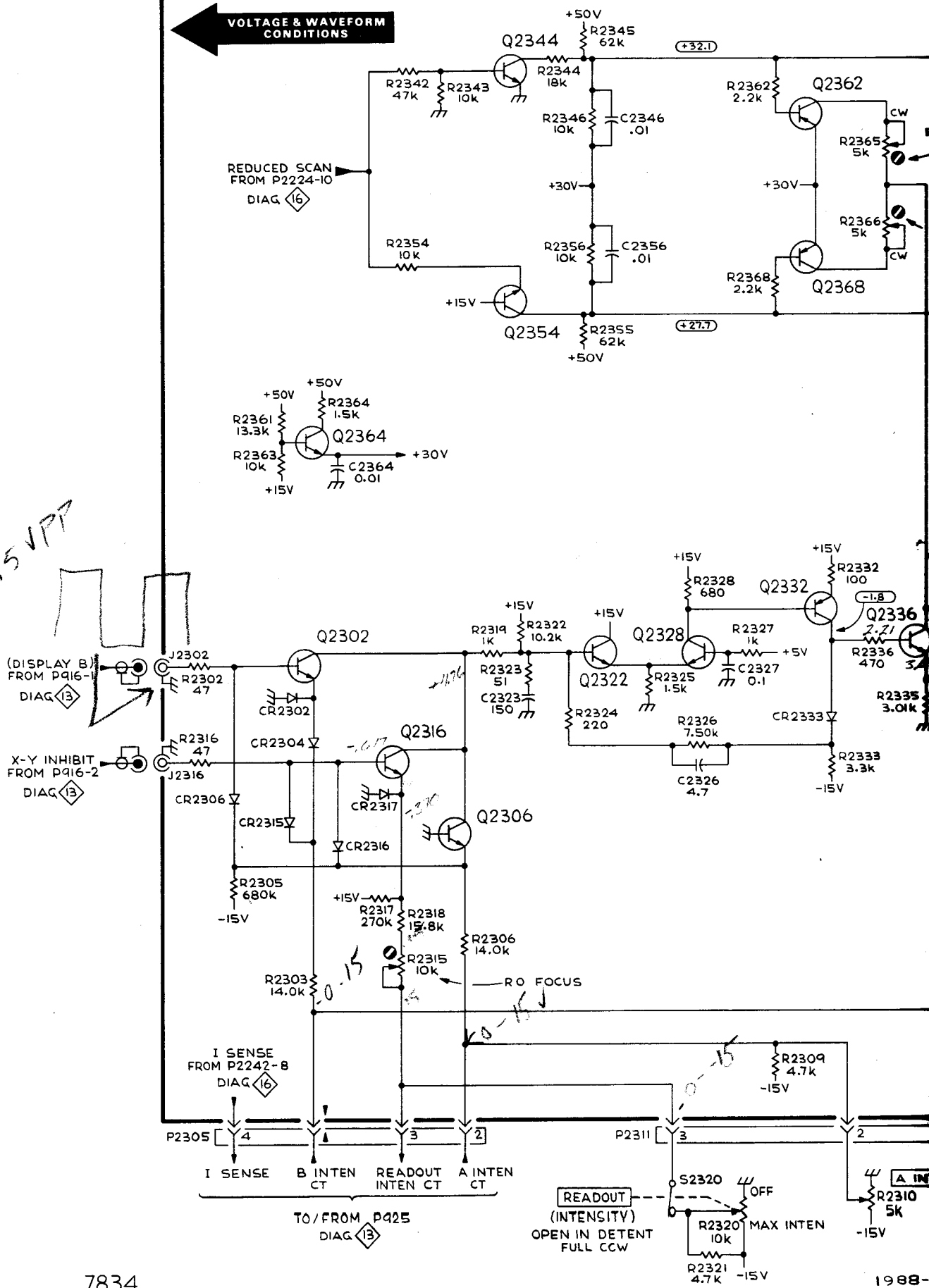
Voltage Conditions. The voltages shown on the diagram were obtained using a digital multimeter with a 10 M Ω input impedance (Tektronix DM501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

WARNING

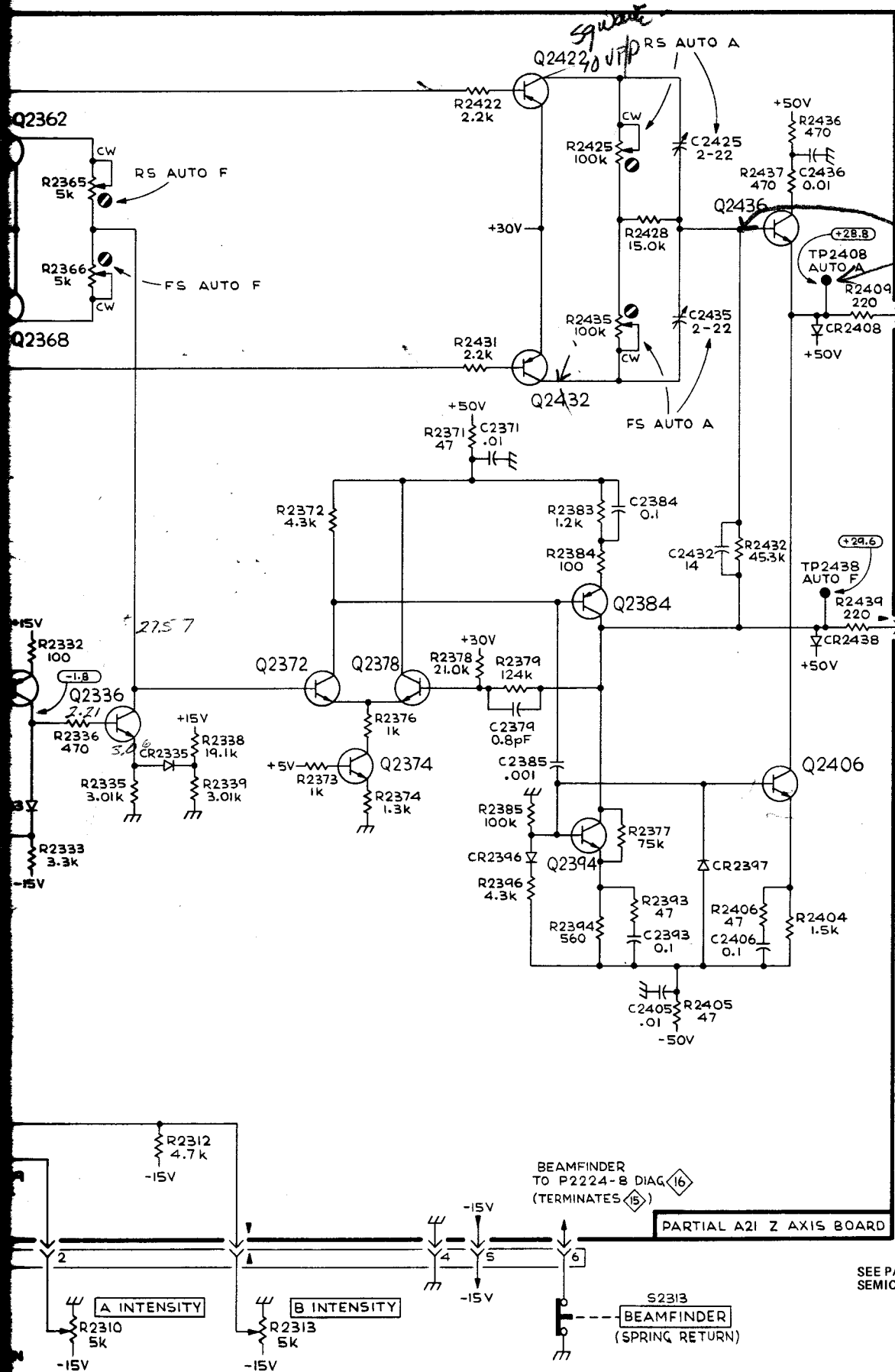
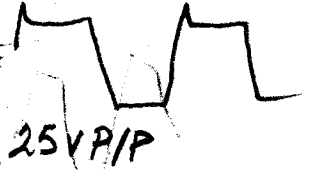
Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

VOLTAGE & WAVEFORM CONDITIONS

1.5 VPP



Not in Chop
 Vert Right
 A Just. CW
 B Just. CCW
 Auto A should
 be 10V 145



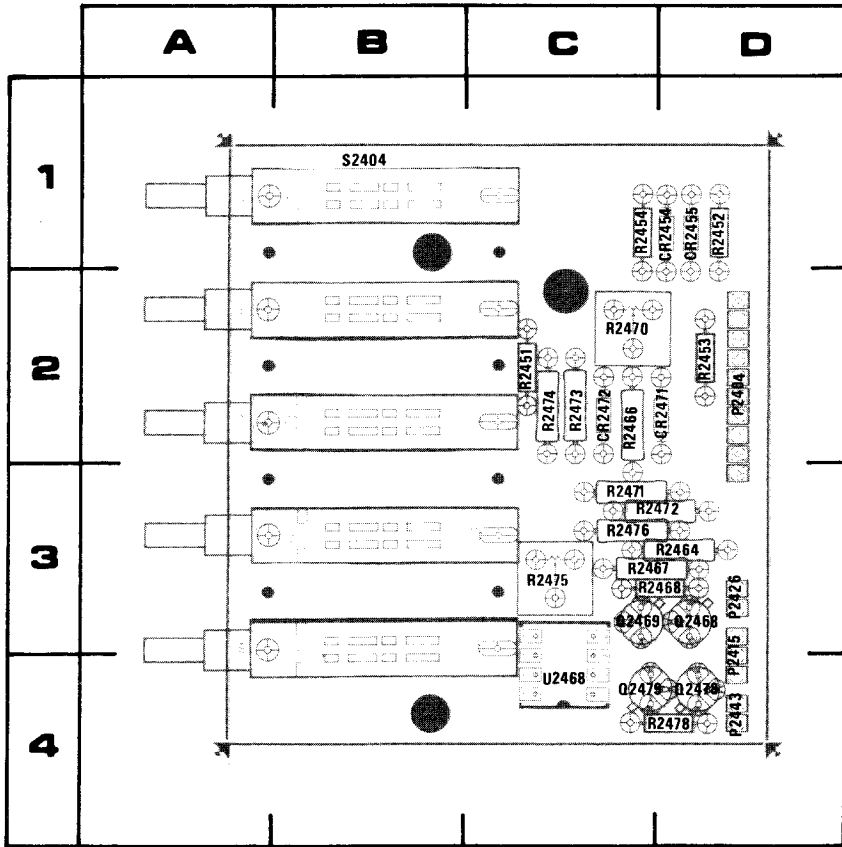
AUTO ASTIG TO V2200-10 DIAG

AUTO FOCUS TO V2200-4 DIAG

BEAMFINDER TO P2224-B DIAG (TERMINATES)

PARTIAL A21 Z AXIS BOARD

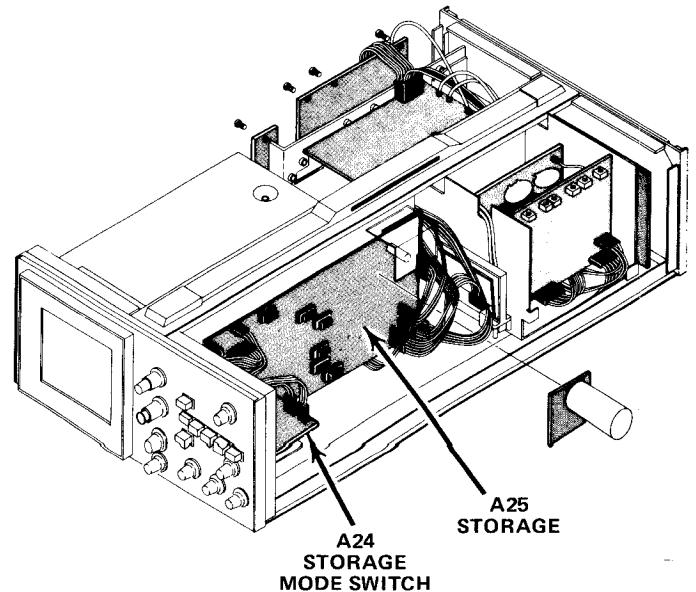
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.



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Figure 8-27. A24—Storage Mode Switch circuit board assembly.

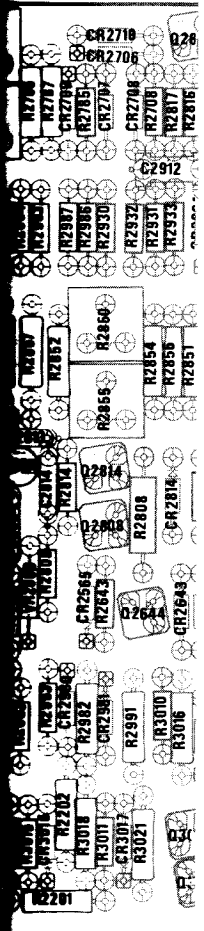
CKT NO	GRID COORD	CKT NO	GRID COORD
CR2454	1D	R2454	1C
CR2455	1D	R2464	3D
CR2471	2D	R2466	2C
CR2472	2C	R2467	3C
		R2468	3D
P2404	2D	R2470	2C
P2415	3D	R2471	3C
P2426	3D	R2472	3D
P2443	4D	R2473	2C
		R2474	2C
Q2468	3D	R2475	3C
Q2469	3C	R2476	3C
Q2478	4D	R2478	4D
Q2479	4C		
		S2404	1B
R2451	2C	U2468	4C
R2452	1D		



1
2
3
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6

I

CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
C2507	1C	CR2704	2G	Q2674	5B	R2571	3A	R2685	5G	R2786	2H
C2521	3C	CR2705	2G	Q2678	6E	R2572	2B	R2686	6C	R2787	2H
C2523	3C	CR2706	1H	Q2686	6B	R2576	2F	R2687	6C	R2788	1F
C2528	3C	CR2707	2H	Q2688	5B	R2577	2D	R2688	6C	R2789	1F
C2534	2D	CR2708	2H	Q2694	4G	R2578	2C	R2689	6B	R2802	3G
C2542	3E	CR2709	2H	Q2704	4G	R2581	5E	R2691	5H	R2804	4G
C2562	3E	CR2710	1H	Q2714	2G	R2582	5E	R2692	6G	R2805	4H
C2565	3F	CR2721	3E	Q2730	4E	R2584	5E	R2693	5H	R2808	4H
C2577	2D	CR2722	3E	Q2734	4C	R2585	5E	R2694	5G	R2809	4H
C2592	5E	CR2723	3C	Q2745	3F	R2586	5E	R2696	4F	R2812	3G
C2594	4E	CR2724	3C	Q2752	3E	R2587	4E	R2701	4G	R2813	3G
C2608	4E	CR2725	4C	Q2755	4E	R2588	4B	R2702	6G	R2814	4H
C2626	5C	CR2726	4D	Q2772	1D	R2593	1E	R2703	5G	R2815	3G
C2662	6D	CR2737	4C	Q2774	2D	R2594	4E	R2705	1G	R2817	2H
C2663	6C	CR2743	4G	Q2784	1F	R2595	4C	R2706	1G	R2841	2G
C2668	5B	CR2774	1F	Q2788	1F	R2604	5F	R2708	2H	R2844	2G
C2671	6B	CR2813	3H	Q2802	3G	R2605	6A	R2709	2F	R2845	2F
C2676	5E	CR2814	4H	Q2804	4G	R2606	4D	R2711	2G	R2846	2G
C2683	5D			Q2808	4H	R2607	5A	R2712	1D	R2847	2G
C2684	6G	J2514	3C	Q2814	3H	R2608	4D	R2713	3G	R2848	3E
C2685	5G	J2584	5D	Q2818	1H	R2609	4E	R2714	2G	R2849	1E
C2686	5C	J2626	4C	Q2842	2F	R2610	3B	R2715	2G	R2850	3H
C2696	4F			R2200	4G	R2611	2C	R2716	3G	R2851	3I
C2718	1G	P2504	3B	R2201	6H	R2612	2C	R2717	4G	R2852	3H
C2753	4F	P2512	1A	R2202	5H	R2613	4B	R2718	1G	R2853	3I
C2770	2F	P2531	2B	R2316	4A	R2614	4B	R2719	1G	R2854	3H
C2774	1D	P2572	2B	R2501	3A	R2622	4C	R2721	4C	R2855	3H
C2804	4H	P2587	5A	R2502	2B	R2623	4C	R2722	4C	R2856	3H
C2809	4G	P2613	2A	R2506	1C	R2624	5C	R2723	4G	R2857	3H
C2813	3H	P2615	5B	R2507	1C	R2626	4C	R2724	4D	R2930	2H
C2814	4H	P2722	1B	R2508	1C	R2631	3B	R2725	4D	R2931	2H
C2815	3G	P2848	3E	R2509	3A	R2632	4E	R2726	4D	R2932	2H
C2912	2H	P2849	2E	R2512	3C	R2634	4J	R2727	3E	R2933	2H
C3077	1E	Q2202	4G	R2513	3C	R2641	5D	R2728	2E	R2953	5H
		Q2372	1C	R2517	3B	R2642	5D	R2731	4D	R3010	5H
		Q2502	1B	R2518	3B	R2643	4H	R2732	4D	R3011	5H
CR2514	3D	Q2506	2C	R2521	3D	R2651	6C	R2734	4D	R3015	5H
CR2526	2D	Q2508	1C	R2522	3D	R2652	6B	R2735	3D	R3016	5H
CR2528	3D	Q2514	3D	R2523	3D	R2653	5B	R2736	4E	R3018	5H
CR2535	1B	Q2526	2D	R2526	3E	R2654	6B	R2741	4G	R3021	5H
CR2542	2D	Q2528	3D	R2527	3B	R2655	5C	R2742	4G		
CR2551	2F	Q2532	2A	R2528	3D	R2656	5C	R2743	4G	S2558	2B
CR2552	2F	Q2536	1A	R2529	4D	R2657	5C	R2744	4G	S2624	4B
CR2553	2E	Q2538	2D	R2531	3A	R2658	5B	R2745	4F		
CR2554	2F	Q2542	3D	R2532	2A	R2662	5D	R2746	4G	U2552	2E
CR2555	2E	Q2572	2B	R2533	2A	R2663	5C	R2747	4F	U2556	1C
CR2564	2F	Q2576	2C	R2534	2A	R2664	4B	R2748	1G	U2562	3F
CR2565	4H	Q2578	2C	R2535	1B	R2668	5A	R2751	3E	U2565	5D
CR2582	3D	Q2584	6E	R2536	1B	R2671	6B	R2752	3E	U2588	5F
CR2610	1B	Q2586	5E	R2538	2E	R2672	6B	R2753	4F	U2592	5E
CR2611	4B	Q2588	4C	R2539	3E	R2673	4B	R2754	4F	U2594	4F
CR2612	4B	Q2612	2C	R2540	3E	R2674	6F	R2755	3E	U2608	4D
CR2613	4B	Q2626	5C	R2542	3E	R2675	6G	R2770	1F	U2682	5G
CR2614	4B	Q2632	4C	R2556	1E	R2676	4B	R2772	1F	U2684	5F
CR2615	2C	Q2642	6D	R2558	3A	R2678	5D	R2774	1E		
CR2626	5C	Q2644	4H	R2562	3F	R2680	5G	R2775	1D	VR2808	4H
CR2643	4H	Q2654	5B	R2563	3B	R2681	4G	R2779	1E		
CR2663	6C	Q2658	5B	R2564	2F	R2682	5D	R2782	1E		
CR2686	6C	Q2664	5B	R2565	3G	R2683	5E	R2783	1E		
CR2687	6C	Q2668	5B	R2566	2G	R2684	5G	R2785	2H		

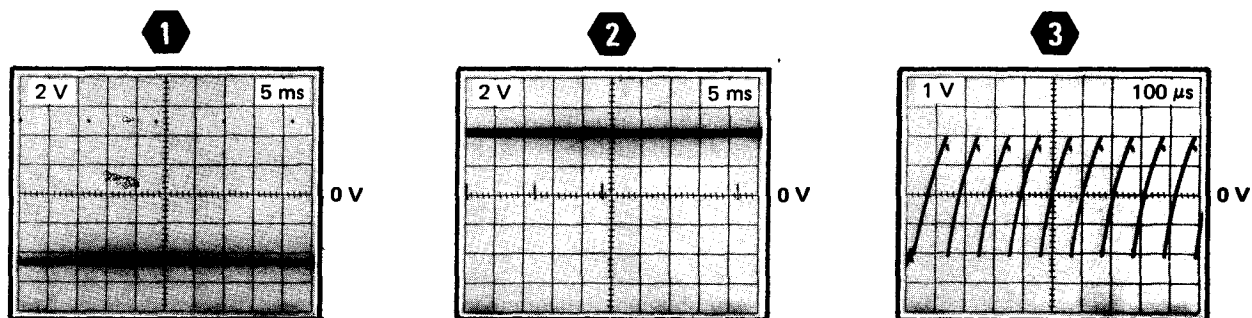


WAVEFORM CONDITIONS

The waveforms shown were obtained with the 7834 controls set as follows:

Front panel controls (knob type) at midrange; VERTICAL MODE, LEFT; TRIGGER SOURCE, VERT MODE; NON STORE button, in.

Waveform Conditions. The waveforms shown below were obtained using a test oscilloscope system with $10\text{ M}\Omega$ input impedance and at least 60 MHz bandwidth (Tektronix 7603 Oscilloscope, 7B53A Time Base, and 7A13 Differential Comparator equipped with a 10X probe. A 7B53A Time Base plug-in unit is installed in the mainframe A HORIZ compartment. The 7B53A is set for internal auto-trigger and 0.5 millisecond/division sweep rate.



1988-87

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD	CKT NO	GRID COORD
2F	CR3061	4I	Q2714	2G	R2526	3E	R2655	5C	R2745	4F	R2861	3I	R2992	5I
4H	CR3062	5J	Q2730	4E	R2527	3B	R2656	5C	R2746	4G	R2862	3I	R2996	5I
3D	CR3066	5K	Q2734	4C	R2528	3D	R2657	5C	R2747	4F	R2863	3J	R2997	5I
1B	CR3077	4J	Q2745	3F	R2529	4D	R2658	5B	R2748	1G	R2864	3J	R2998	5J
4B			Q2752	3E	R2531	3A	R2662	5D	R2751	3E	R2865	☆	R3010	5H
4B	J2514	3C	Q2755	4E	R2532	2A	R2663	5C	R2752	3E	R2867	3J	R3011	5H
4B	J2584	5D	Q2772	1D	R2533	2A	R2664	4B	R2753	4F	R2868	3K	R3012	6I
4B	J2626	4C	Q2774	2D	R2534	2A	R2668	5A	R2754	4F	R2869	3K	R3015	5H
2C			Q2784	1F	R2535	1B	R2671	6B	R2755	3E	R2874	3K	R3016	5H
5C	L3072	5K	Q2788	1F	R2536	1B	R2672	6B	R2770	1F	R2876	3L	R3018	5H
4H	L3074	5K	Q2802	3G	R2538	2E	R2673	4B	R2772	1F	R2900	2I	R3021	5H
4I	L3076	6J	Q2804	4G	R2539	3E	R2674	6F	R2774	1E	R2901	2J	R3022	6I
4I			Q2808	4H	R2540	3E	R2675	6G	R2775	1D	R2902	2J	R3026	5I
6C	P2504	3B	Q2814	3H	R2542	3E	R2676	4B	R2779	1E	R2903	2H	R3027	6J
6C	P2512	1A	Q2818	1H	R2556	1E	R2678	5D	R2782	1E	R2904	2H	R3044	5J
6C	P2531	2B	Q2822	2I	R2558	3A	R2680	5G	R2783	1E	R2906	2J	R3045	5I
2G	P2572	2B	Q2826	1J	R2562	3F	R2681	4G	R2785	2H	R2907	2I	R3046	5J
2G	P2587	5A	Q2828	1J	R2563	3B	R2682	5D	R2786	2H	R2911	2I	R3047	5J
1H	P2613	2A	Q2834	2K	R2564	2F	R2683	5E	R2787	2H	R2912	2J	R3048	4K
2H	P2615	5B	Q2838	1K	R2565	3G	R2684	5G	R2788	1F	R2913	2J	R3049	4L
2H	P2670	6J	Q2842	2F	R2566	2G	R2685	5G	R2789	1F	R2914	2K	R3052	5J
2H	P2711	5L	Q2852	3I	R2571	3A	R2686	6C	R2802	3G	R2915	2J	R3054	5J
1H	P2722	1B	Q2862	3I	R2572	2B	R2687	6C	R2804	4G	R2918	3K	R3055	5J
3E	P2824	5L	Q2864	3J	R2576	2F	R2688	6C	R2805	4H	R2919	2K	R3064	5K
3E	P2848	3E	Q2868	3J	R2577	2D	R2689	6B	R2808	4H	R2924	2K	R3066	5K
3C	P2849	2E	Q2873	4J	R2578	2C	R2691	5H	R2809	4H	R2926	2K	R3068	☆
3C	P2976	3L	Q2874	3K	R2581	5E	R2692	6G	R2812	3G	R2927	2L	R3077	4J
4C	P3013	1L	Q2904	2I	R2582	5E	R2693	5H	R2813	3G	R2930	2H	R3078	6J
4D	P3019	5K	Q2914	2K	R2584	5E	R2694	5G	R2814	4H	R2931	2H		
4C	P3068	4L	Q2918	2K	R2585	5E	R2696	4F	R2815	3G	R2932	2H	S2558	2B
4G			Q2924	3K	R2586	5E	R2701	4G	R2816	1I	R2933	2H	S2624	4B
1F	Q2202	4G	Q2942	4K	R2587	4E	R2702	6G	R2817	2H	R2937	4I		
3H	Q2502	1B	Q2946	3K	R2588	4B	R2703	5G	R2819	1I	R2940	4J	TP2839	3L
4H	Q2506	2C	Q2966	4J	R2593	1E	R2705	1G	R2821	2I	R2941	4K	TP2876	3L
1I	Q2508	1C	Q2972	4K	R2594	4E	R2706	1G	R2822	1I	R2942	4K	TP2924	3K
1J	Q2514	3D	Q2976	4K	R2595	4C	R2708	2H	R2825	1I	R2946	4K	TP2948	3L
1I	Q2526	2D	Q2988	2I	R2604	5F	R2709	2F	R2826	1I	R2947	4K	TP2978	3K
2K	Q2528	3D	Q2992	5I	R2605	6A	R2711	2G	R2827	1I	R2948	4L	TP2998	4L
2J	Q2532	2A	Q2996	5I	R2606	4D	R2712	1D	R2828	1I	R2951	4I	TP3027	5K
2K	Q2536	1A	Q3012	5I	R2607	5A	R2713	3G	R2831	2K	R2952	4J	TP3048	4L
2K	Q2538	2D	Q3016	6I	R2608	4D	R2714	2G	R2833	2J	R2953	5H	TP3064	5K
3I	Q2542	3D	Q3022	5I	R2609	4E	R2715	2G	R2835	2J	R2954	4I		
3I	Q2572	2B	Q3026	6I	R2610	3B	R2716	3G	R2836	1K	R2955	4J	U2552	2E
3K	Q2576	2C	Q3048	4L	R2611	2C	R2717	4G	R2837	1K	R2956	2I	U2556	1C
3K	Q2578	2C	Q3054	5K	R2612	2C	R2718	1G	R2838	1K	R2962	4I	U2562	3F
2J	Q2584	6E	Q3064	5J	R2613	4B	R2719	1G	R2839	4K	R2963	4I	U2565	5D
2I	Q2586	5E			R2614	4B	R2721	4C	R2841	2G	R2964	4J	U2588	5F
2I	Q2588	4C	R2200	4G	R2622	4C	R2722	4C	R2842	3H	R2966	4J	U2592	5E
3K	Q2612	2C	R2201	6H	R2623	4C	R2723	4G	R2843	4I	R2967	4I	U2594	4F
5I	Q2626	5C	R2202	5H	R2624	5C	R2724	4D	R2844	2G	R2970	4J	U2608	4D
4J	Q2632	4C	R2501	3A	R2626	4C	R2725	4D	R2845	2F	R2971	4K	U2682	5G
5I	Q2642	6D	R2502	2B	R2631	3B	R2726	4D	R2846	2G	R2972	4K	U2684	5F
4I	Q2644	4H	R2506	1C	R2632	4E	R2727	3E	R2847	2G	R2976	4K		
4I	Q2654	5B	R2507	1C	R2634	4J	R2728	2E	R2848	3E	R2977	4K	VR2808	4H
4J	Q2658	5B	R2508	1C	R2641	5D	R2731	4D	R2849	1E	R2978	4K	VR2867	3J
5H	Q2664	5B	R2509	3A	R2642	5D	R2732	4D	R2850	3H	R2980	5H	VR2927	2L
5H	Q2668	5B	R2512	3C	R2643	4H	R2734	4D	R2851	3I	R2981	5I		
5H	Q2674	5B	R2513	3C	R2644	4I	R2735	3D	R2852	3H	R2982	5H		
5H	Q2678	6E	R2517	3B	R2646	4I	R2736	4E	R2853	3I	R2983	4J		
5L	Q2686	6B	R2518	3B	R2651	6C	R2741	4G	R2854	3H	R2986	2H		
6J	Q2688	5B	R2521	3D	R2652	6B	R2742	4G	R2855	3H	R2987	2H		
5J	Q2694	4G	R2522	3D	R2653	5B	R2743	4G	R2856	3H	R2990	4J		
5J	Q2704	4G	R2523	3D	R2654	6B	R2744	4G	R2857	3H	R2991	5H		

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

STORAGE SYSTEM VOLTAGES AND WAVEFORMS FOR DIAGRAM 19

The following information is provided as an aid in understanding and troubleshooting the 7834 Storage System, refer to Figure 8-29 for test point locations.

Equipment Required:

1. Digital voltmeter (DVM)
2. 100X probe
3. Test Oscilloscope
4. Time-base unit

Control Settings:

READOUT INTENSITY . . . OFF (in detent)
 AUTO ERASE CCW (in detent, off)
 PERSISTENCE CCW (maximum)
 HORIZONTAL MODE . . . A
 SAVE INTENSITY CW
 STORAGE LEVEL CW
 MULTI TRACE DLY CCW (in detent)

1. CHECK NON-STORE VOLTAGE LEVELS

Use a Digital voltmeter to check dc levels at the following test points:

Storage Mesh -36 V within 3 V
 Fast Mesh 125 V within 3 V
 Collector 150 V within 3 V
 CE 4 85 V within 3 V
 CE 3 70 V within 3 V
 CE 2 55 V within 2 V
 CE 1 46 V within 2 V
 FGA 36 V within 2 V
 FGK 0 V +.3 V -0 V

2. CHECK BISTABLE VOLTAGE LEVELS

Press the BISTABLE and ERASE push button. Use the DVM to check dc levels on the following test points:

Fast Mesh 125 V within 4 V
 Collector 150 V within 4 V
 CE 4 85 V within 3 V
 CE 3 70 V within 3 V
 CE 2 55 V within 2 V
 CE 1 46 V within 2 V
 FGA 36 V within 2 V
 FGK 0 V +.3 V -0 V

Remove Q2678 on the A25 Storage Board, press ERASE, and check for the following voltages:

Collector 115 V within 4 V
 CE 4 65 V within 3 V
 CE 3 50 V within 2 V
 CE 2 40 V within 2 V
 CE 1 66 V within 3 V
 FGA 90 V within 4 V

Replace Q2678

3. CHECK VARIABLE PERSISTENCE VOLTAGE LEVELS

Press VAR PERSIST and ERASE push buttons and check for the following voltages:

Fast Mesh 100 V within 3 V
 Collector Mesh 100 V within 3 V
 CE 4 65 V within 3 V
 CE 3 44 V within 2 V
 CE 2 45 V within 2 V
 CE 1 40 V within 2 V
 FGA 20 V within 1.5 V
 FGK 0 V +.3 V -0 V

STORAGE SYSTEM VOLTAGES AND WAVEFORMS FOR DIAGRAM 19 (cont)

Remove Q2678, press ERASE and check for the following voltages:

Fast Mesh	125 V within 4 V
Collector Mesh	132 V within 4 V
CE 4	65 V within 3 V
CE 3	75 V within 3 V
CE 2	50 V within 2 V
CE 1	60 V within 3 V
FGA	74 V within 3 V
FGK	0 V +.3 V -0 V

Press the FAST VAR PERSIST push button and check for the following voltages:

Front Mesh	-35 V within 3 V
Collector	132 V within 4 V
CE 4	65 V within 3 V
CE 3	60 V within 3 V
CE 2	45 V within 2 V
CE 1	40 V within 2 V
FGA	20 V within 1.5 V

Replace Q2678

4. CHECK FAST MODE VOLTAGE LEVELS

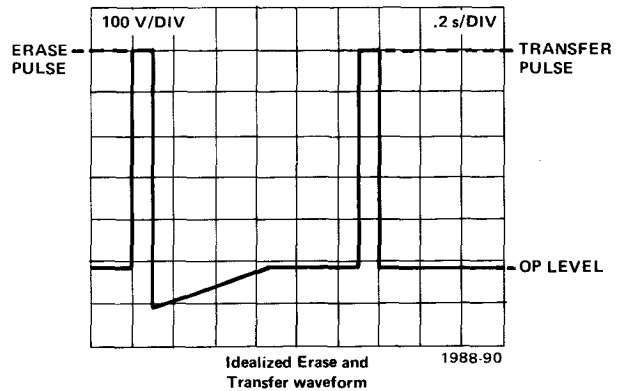
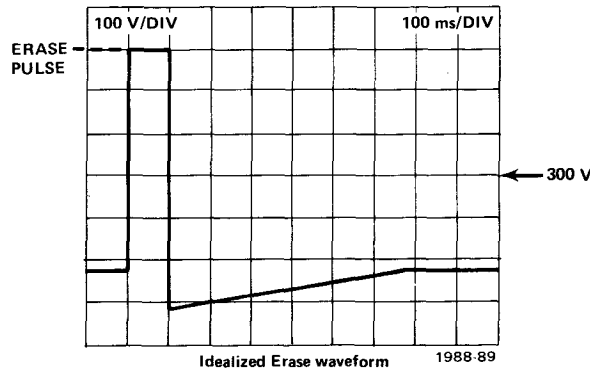
Remove all plug-in units from 7834. Press the BISTABLE FAST and ERASE push buttons and check for the following voltages:

Collector	132 V within 4 V
CE 4	65 V within 3 V
CE 3	50 V within 2 V
CE 2	45 V within 2 V
CE 1	40 V within 2 V
FGA	20 V within 1.5 V

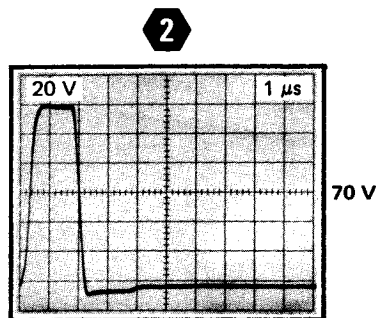
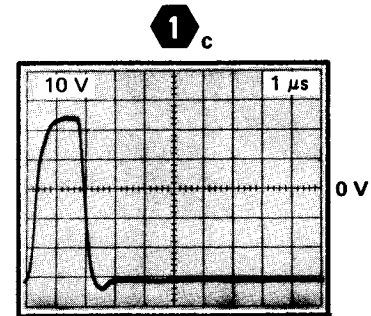
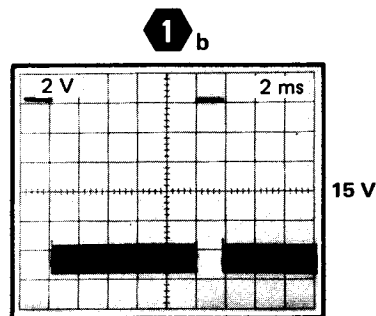
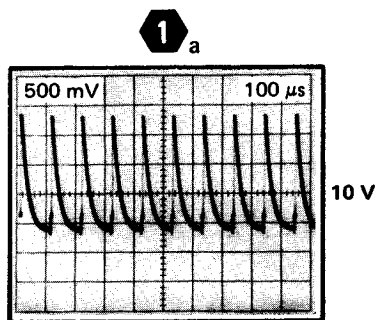
5. CHECK BISTABLE ERASE WAVEFORMS

Connect a 100X probe from the test oscilloscope to the Storage Mesh test point. Adjust the test oscilloscope for a sweep rate of 100 milliseconds/division and a vertical deflection of one volt/division (100 volts/division at probe tip). Press the BISTABLE and ERASE push buttons and check for a 100-millisecond, 600 volt (approximately) erase pulse; see Idealized Erase waveform illustration.

Install a time-base unit in the 7834 A HORIZ compartment. Press the BISTABLE FAST and ERASE push buttons. Set the time-base unit for 1 microsecond/division free-running sweep. Check for 100-millisecond, 600-volt erase and transfer pulses (see Idealized Erase and Transfer waveform illustration).



6. These waveforms were obtained with no plug-ins in the 7834 and controls set as follows: 1a) VAR PERSIST button in and PERSISTENCE control fully CW; 1b) same settings as 1a; 1c) FAST VAR PERSIST button in and PERSISTENCE control fully CW; 2) same settings as 1c.

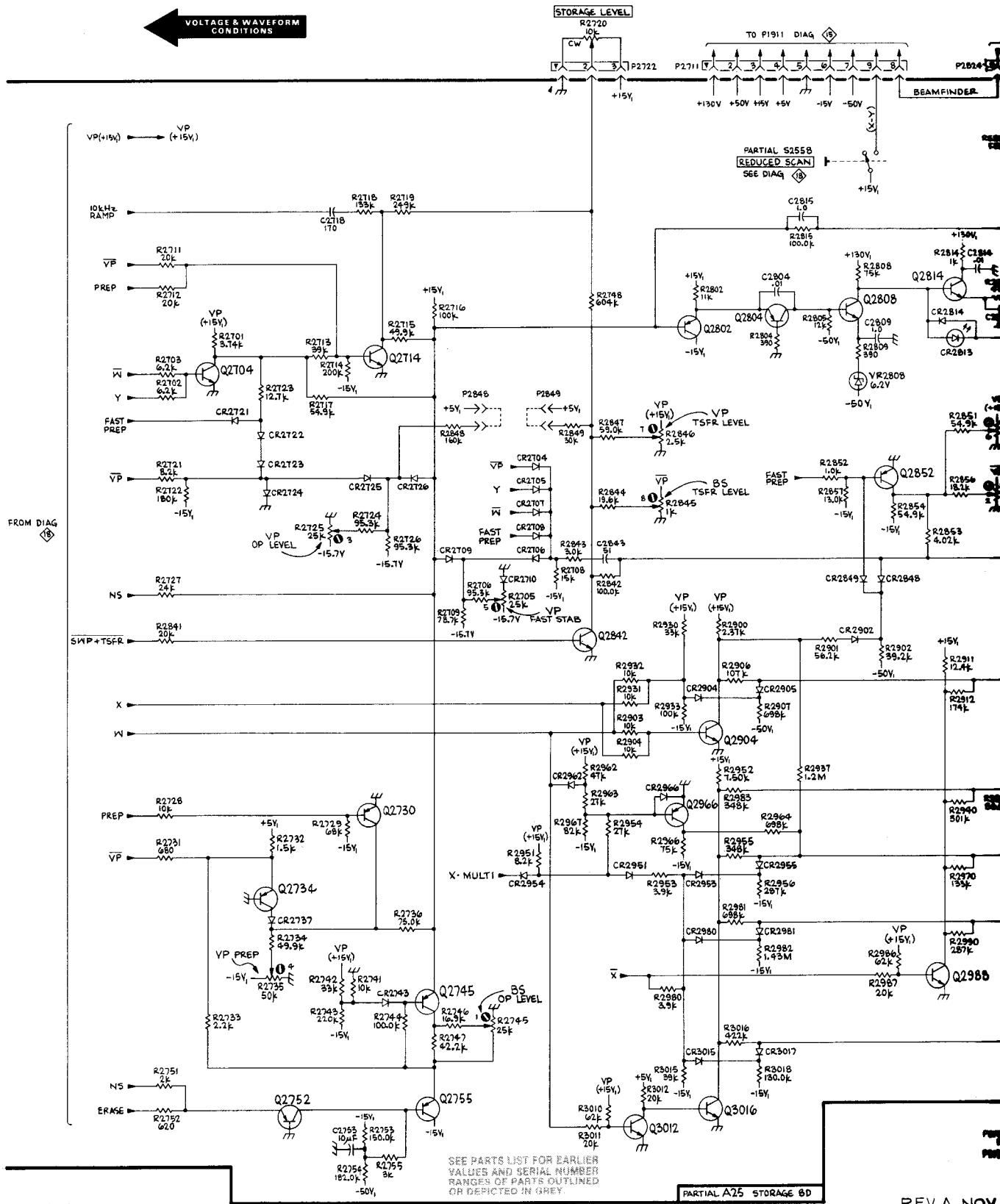


1988-91

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.

← VOLTAGE & WAVEFORM CONDITIONS



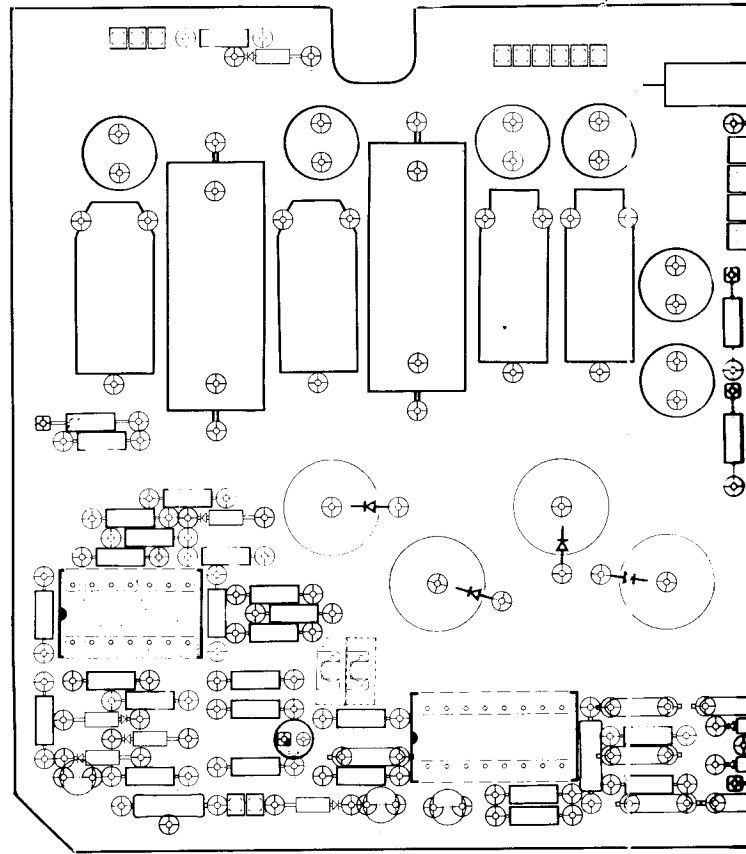
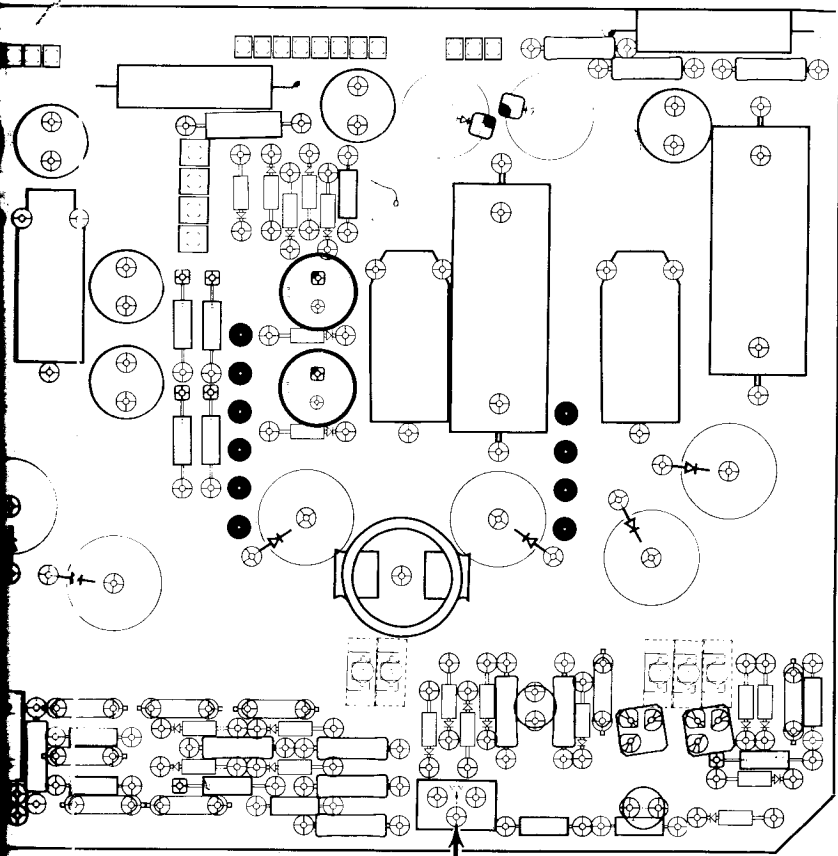


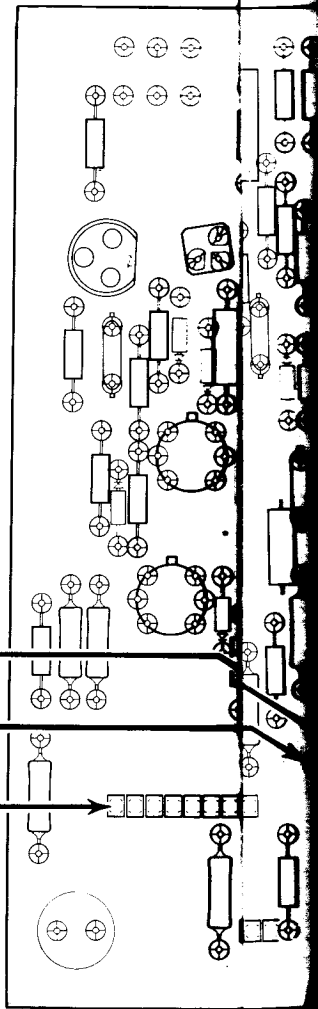
Figure 8-30. A14—Locator of +108 V



1988-5

+108 V ADJ
R1293

Location of +108 Volt test point and adjustment.

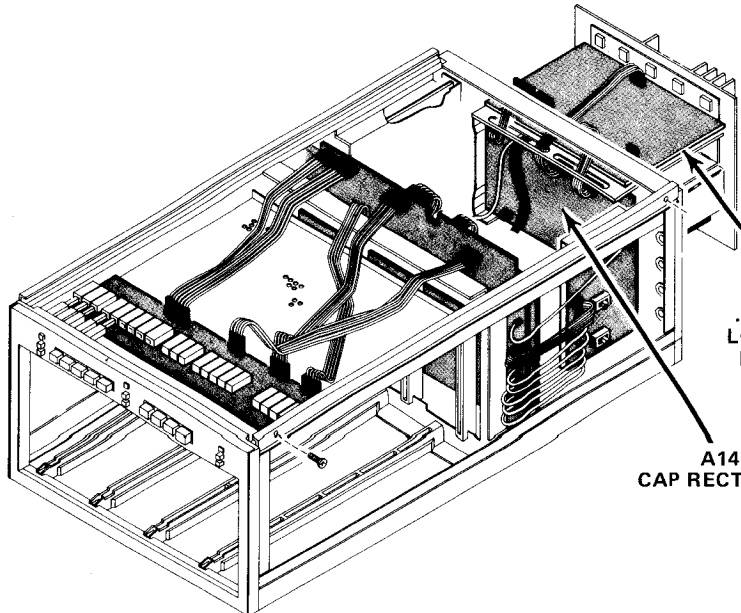


TP +15 V
SENSE

TP GND
SENSE

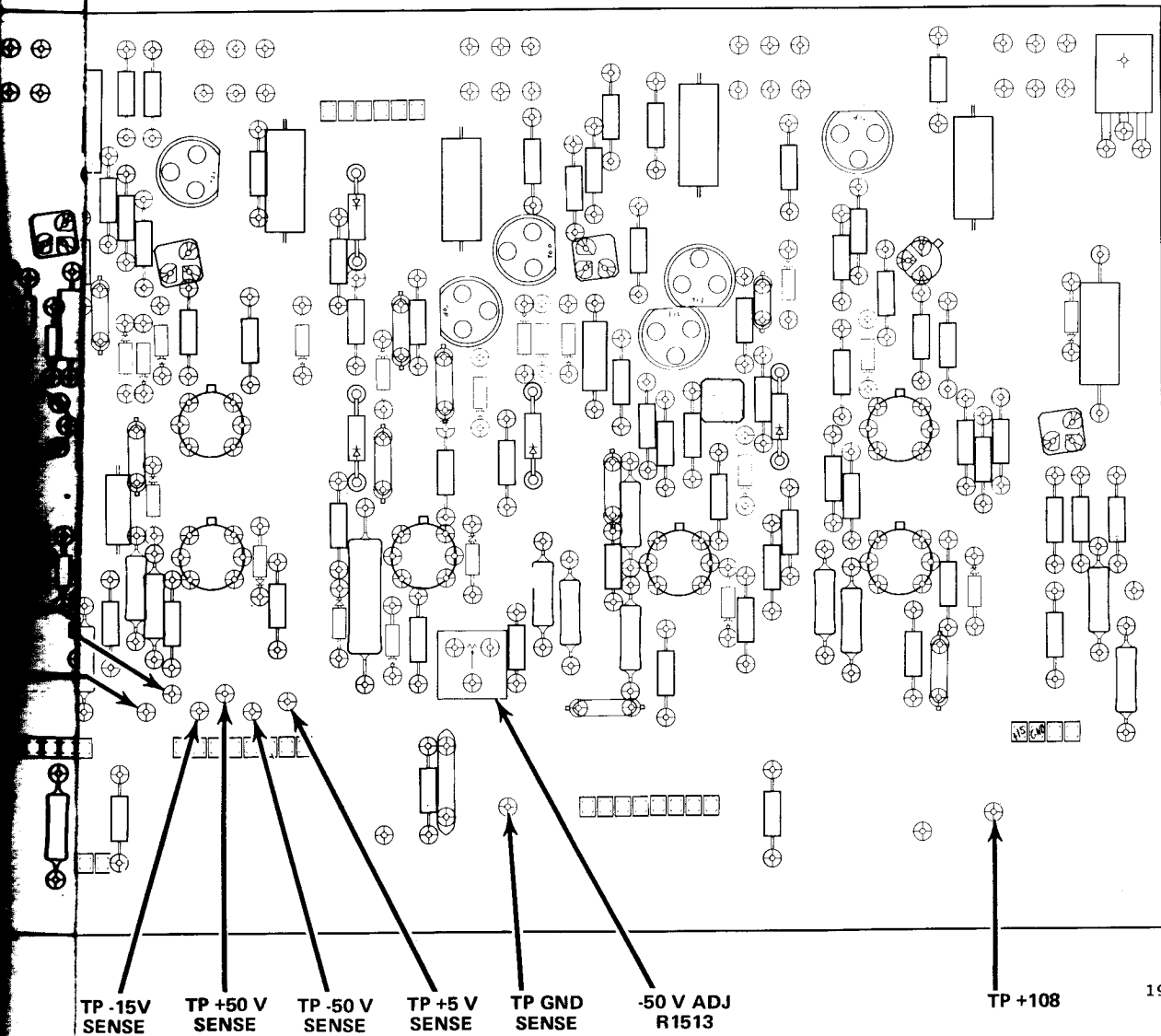
+5 V LIGHTS
CONTROL
ILLUMINATION

TP -
SENSE



A16
LOW-VOLTAGE
REGULATOR

A14
CAP RECTIFIER



1988-4

Figure 8-31. A16—Location of Low-Voltage power supply test points and adjustment.

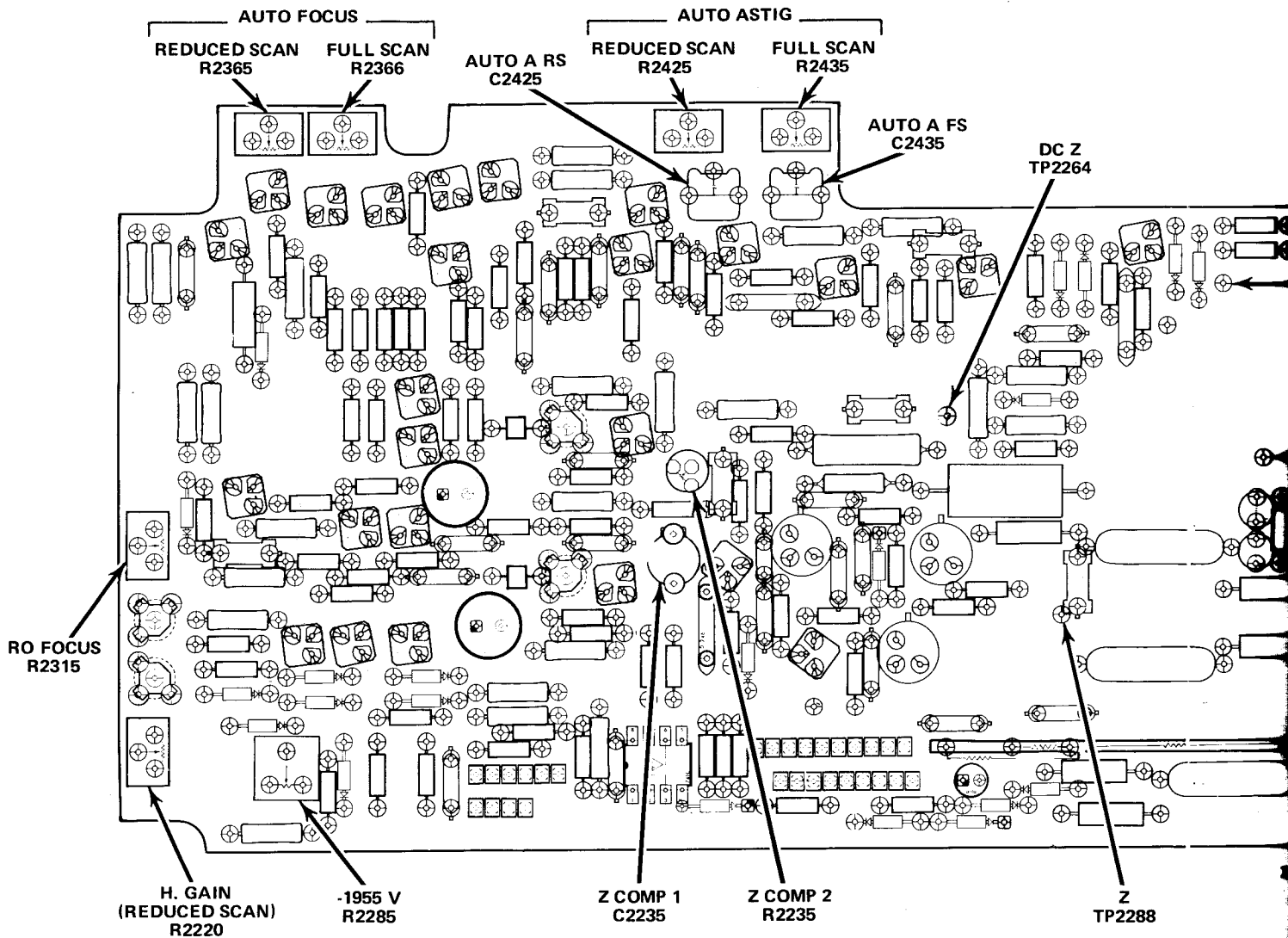


Figure 8-32. A21—Location of Z-Axis and Display test points and adjustments.

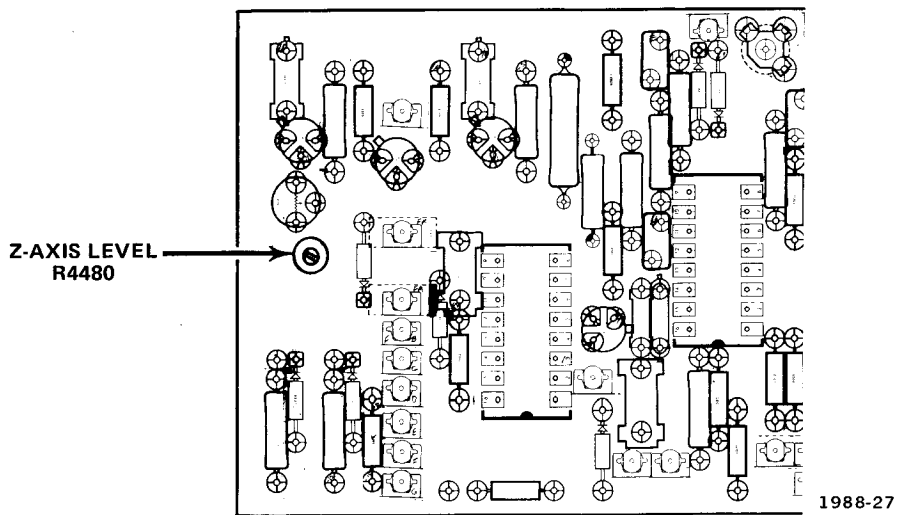
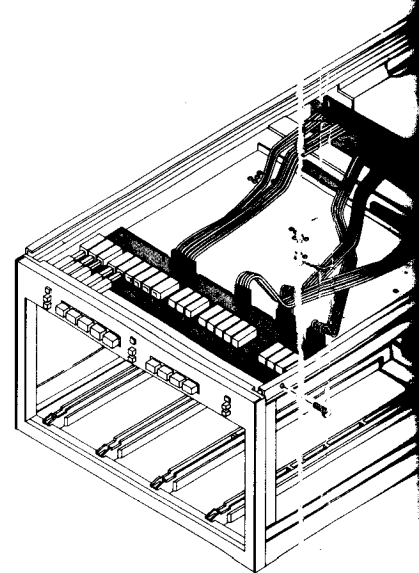
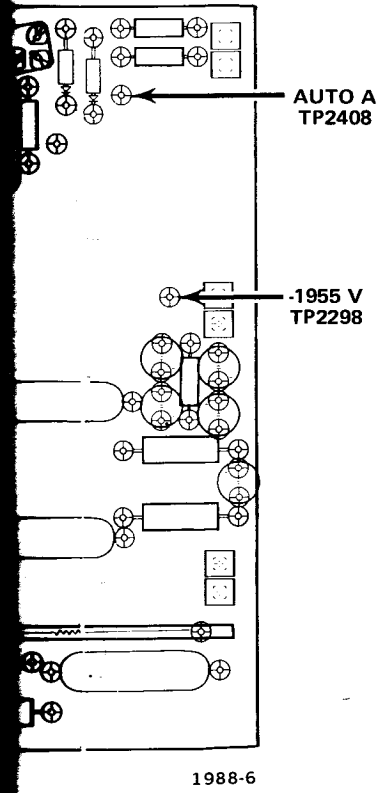


Figure 8-33. A6 (partial)—Location of Z-Axis Level adjustment.

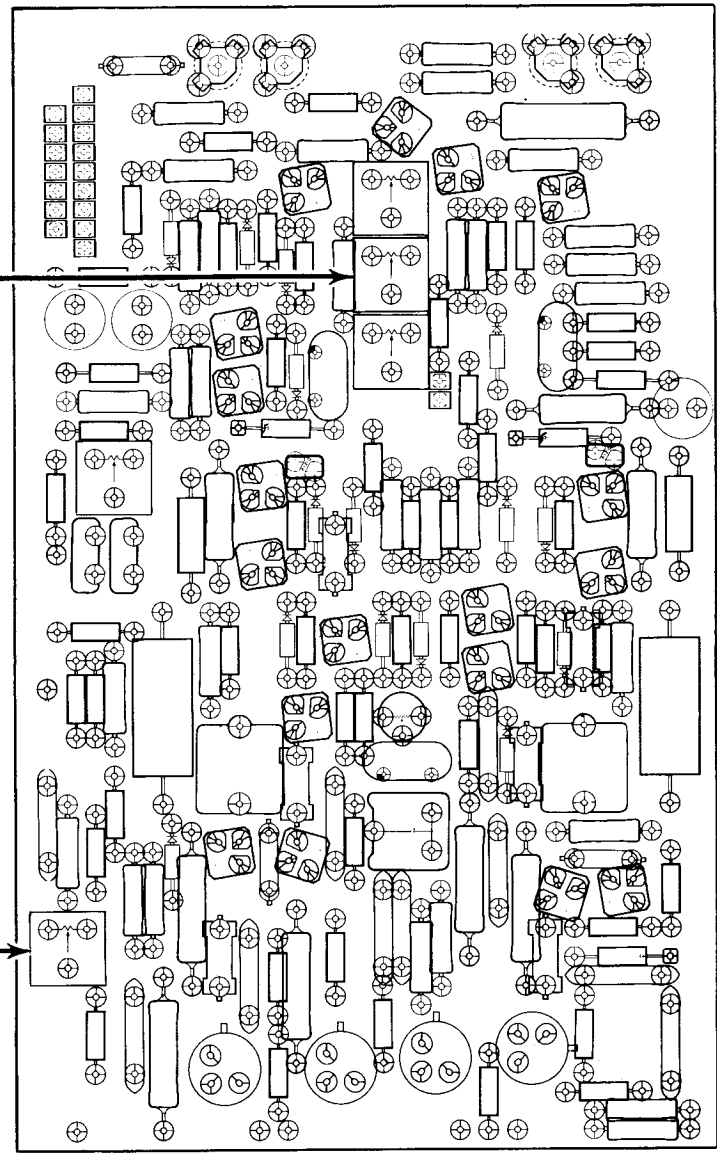




1988-6

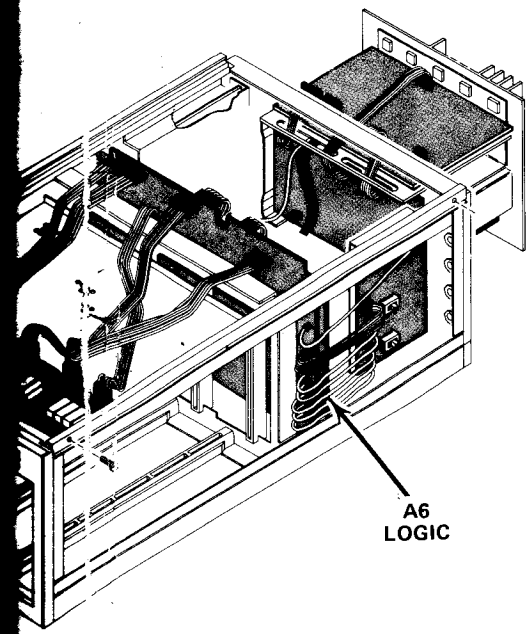
H GAIN
(FULL SCAN)
R1832

GEOM
R1897

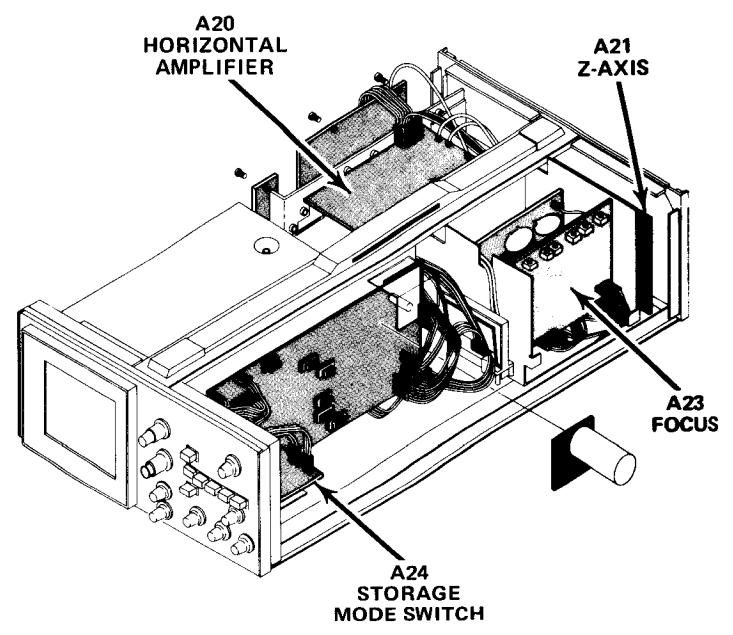


1988-9

Figure 8-34. A20—Location of Geometry and Horizontal Gain adjustment.



A6
LOGIC

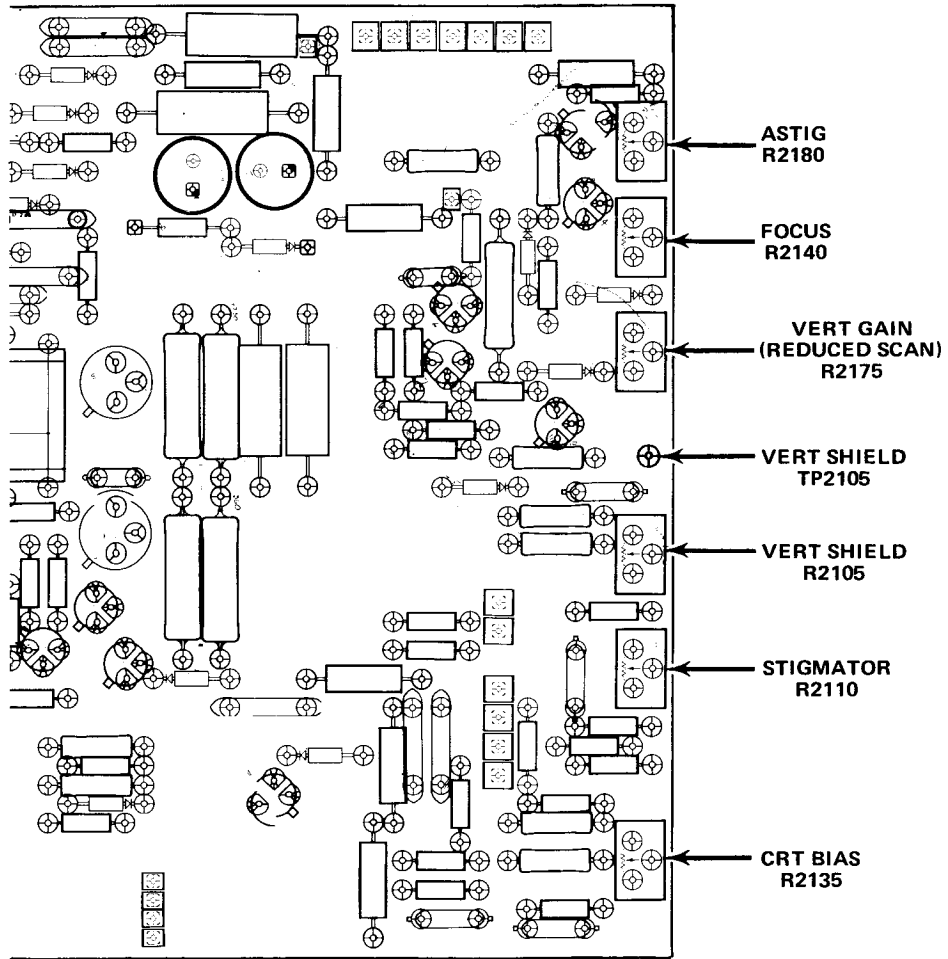


A20
HORIZONTAL
AMPLIFIER

A21
Z-AXIS

A23
FOCUS

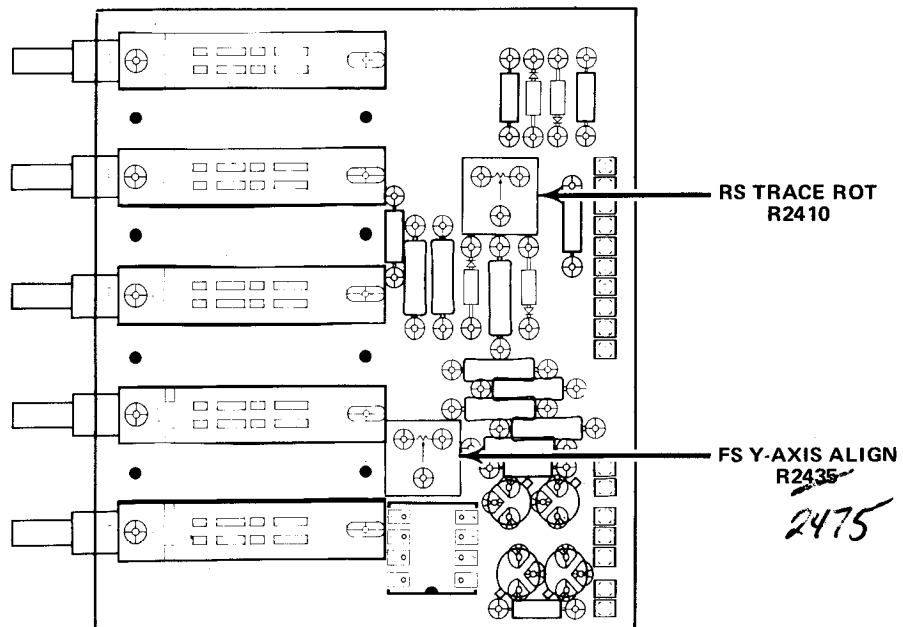
A24
STORAGE
MODE SWITCH



1988-7

Figure 8-35. A23 (partial)—Location of CRT Circuit test point and adjustments.

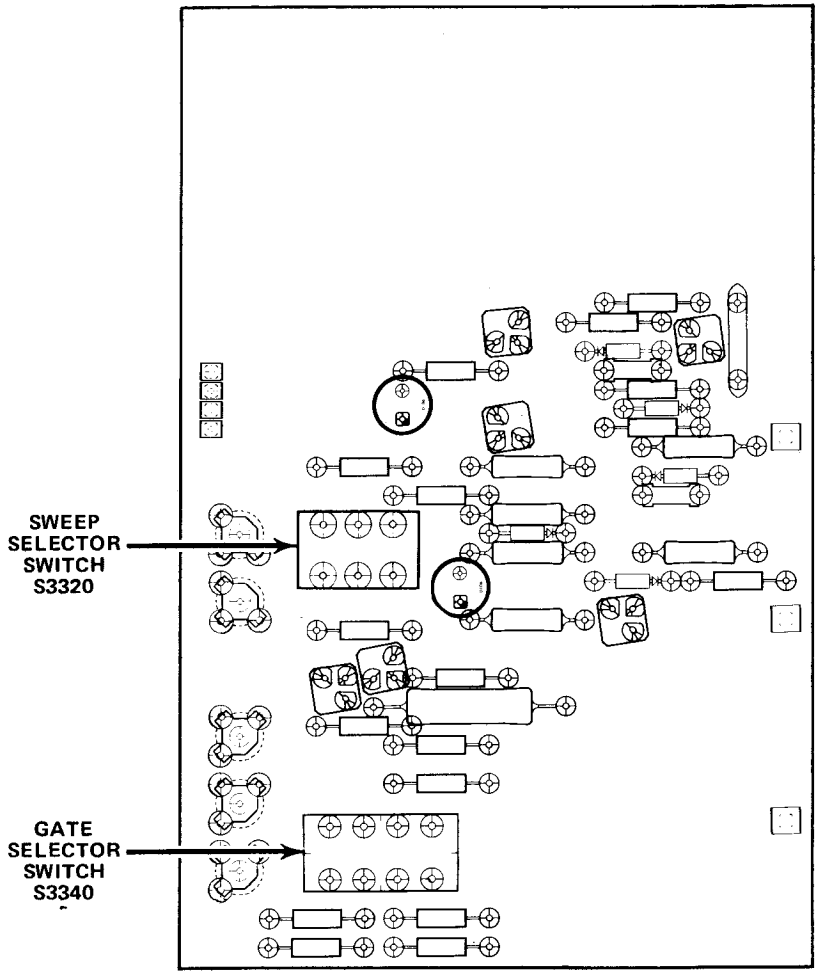
1988-9



1988-8

Figure 8-36. A24—Location of trace alignment adjustments.

A23 FOCUS



1988-11

Figure 8-37. A12—Location of Signals Out selector switches.

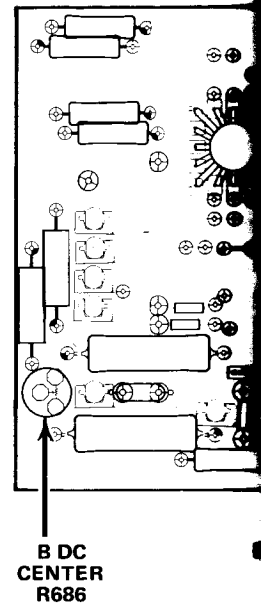
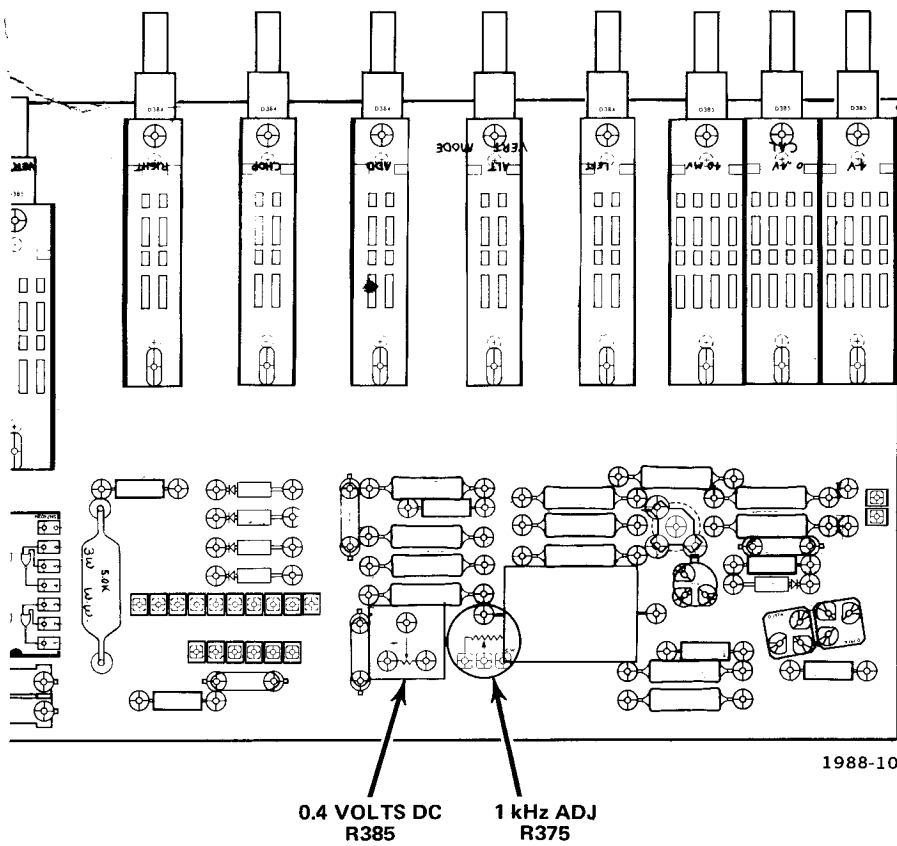
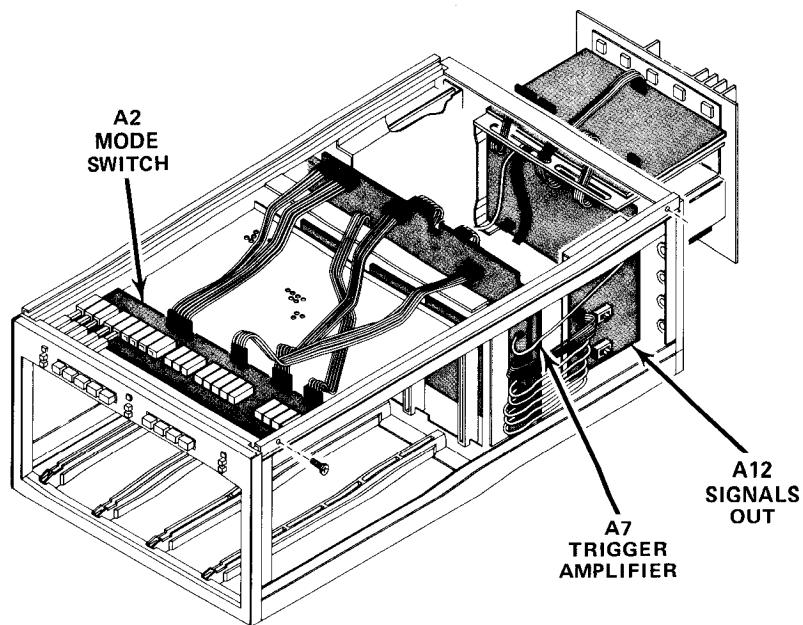


Figure 8-38. A2 (partial)—Location of Calibrator adjustments.



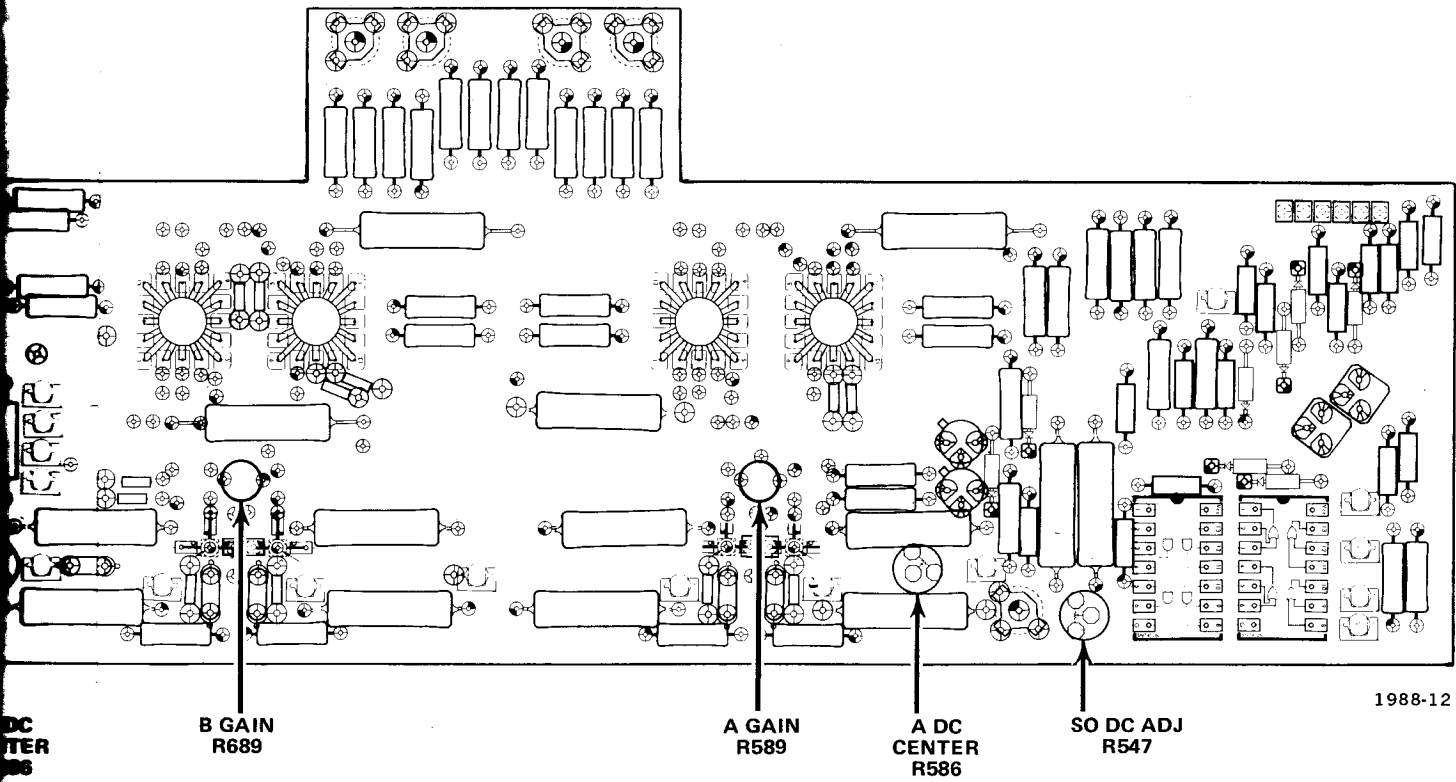


Figure 8-39. A7—Location of Trigger adjustments.

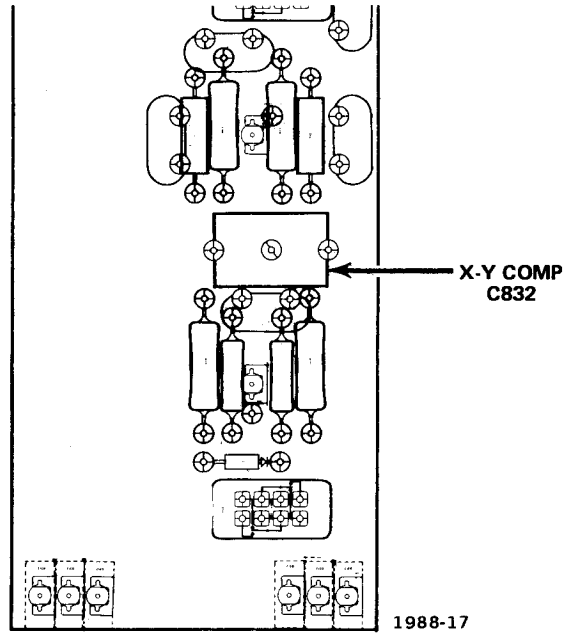


Figure 8-40. A9 (partial)—Location of X-Y Compensation adjustments.

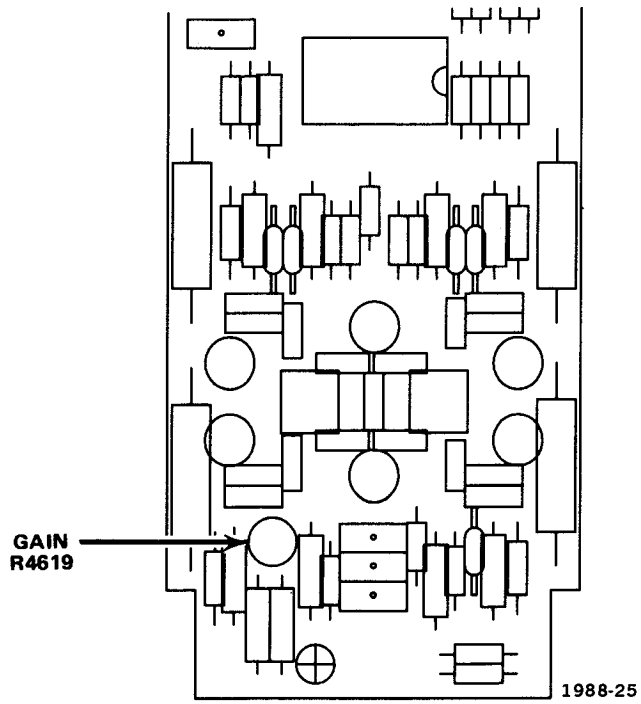
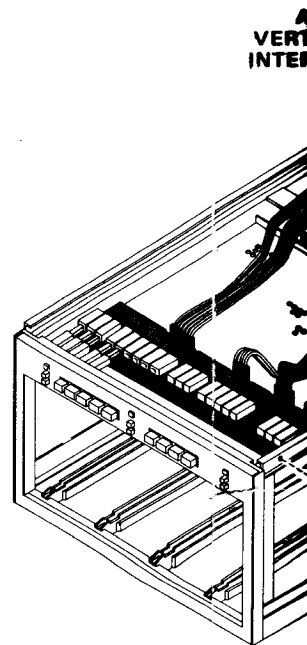


Figure 8-41. A8 (partial)—Location of Vertical Interface gain adjustment.



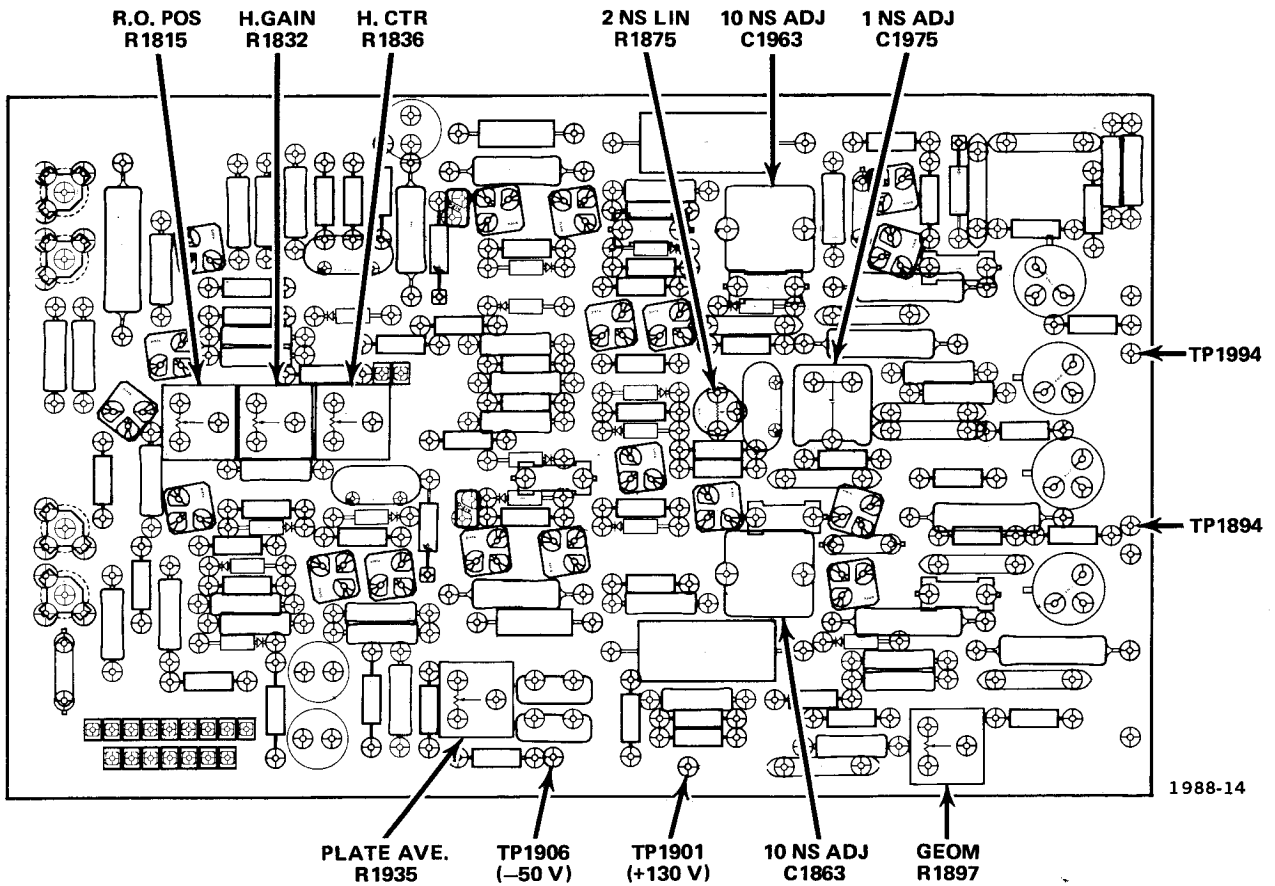
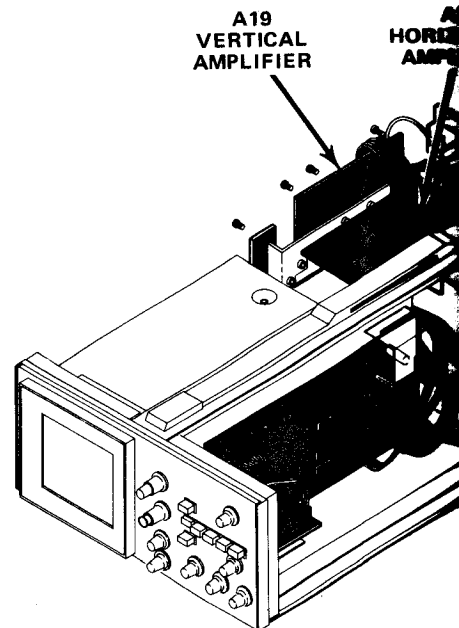
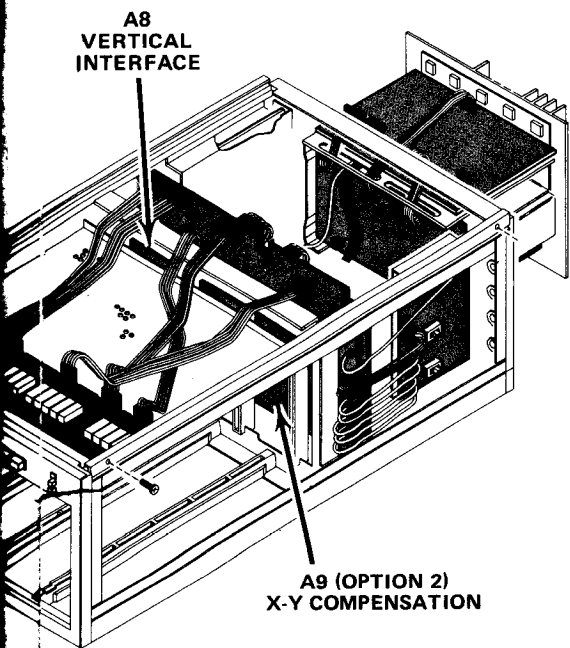


Figure 8-42. A20—Location of the Horizontal Amplifier test points and adjustment.



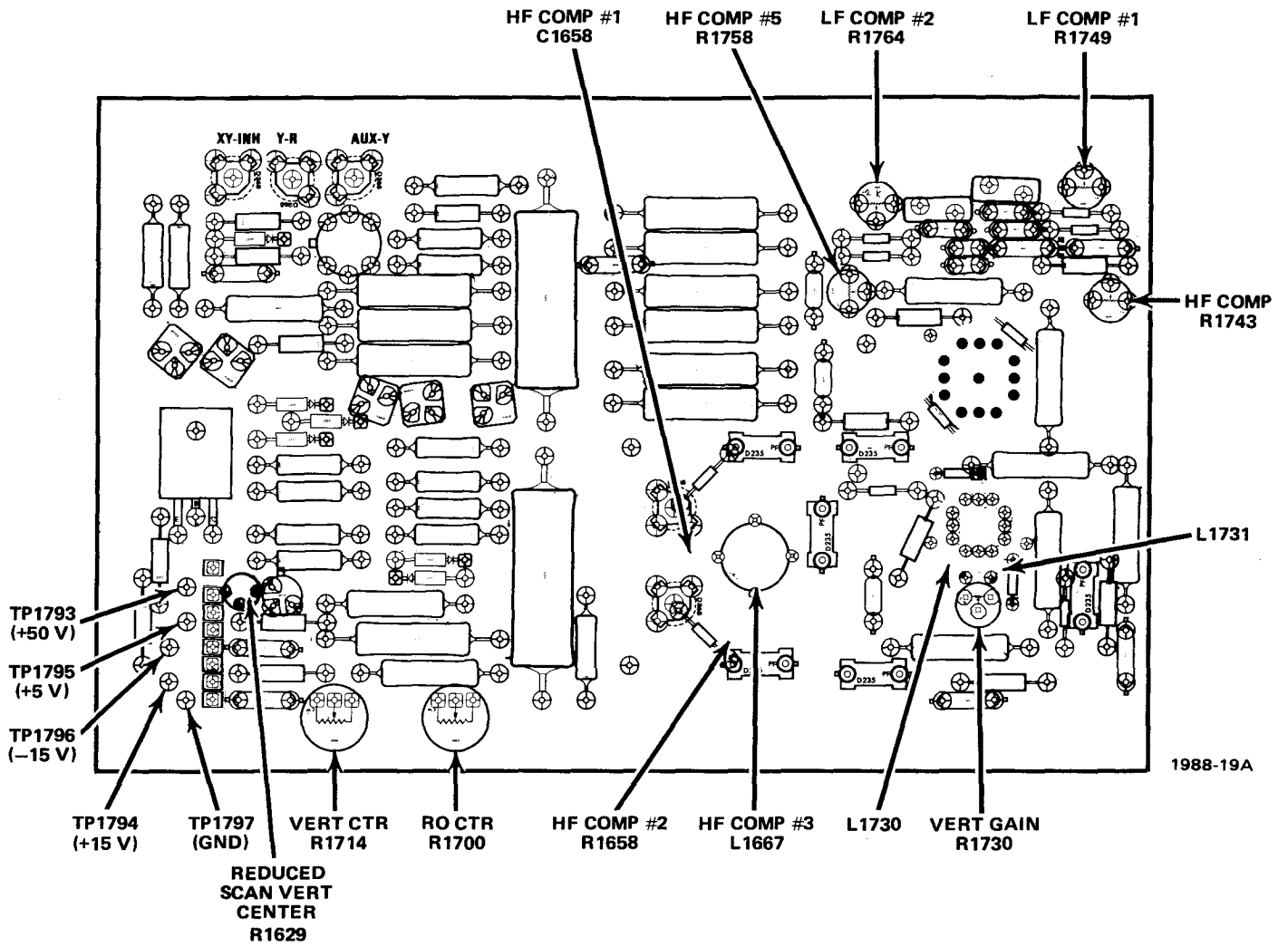
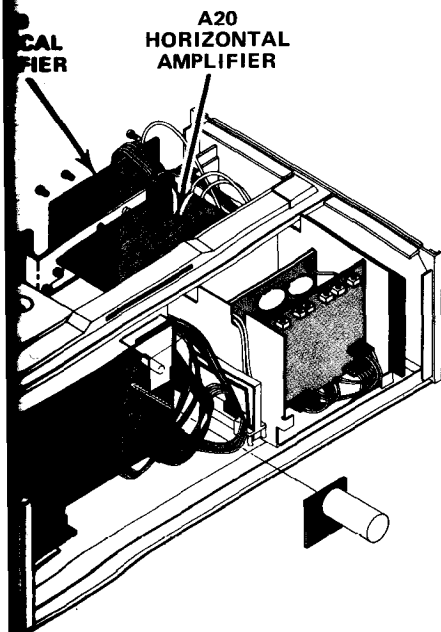


Figure 8-43. A19—Location of Vertical Amplifier adjustments.



R3490
VERTICAL
SEPARATION

Q3416
REMOVE
TO OBTAIN
ALL ZEROS

COLUMN
MATCH
R3407

ROW MATCH
R3422

FULL CHARACTER SCAN
R3437

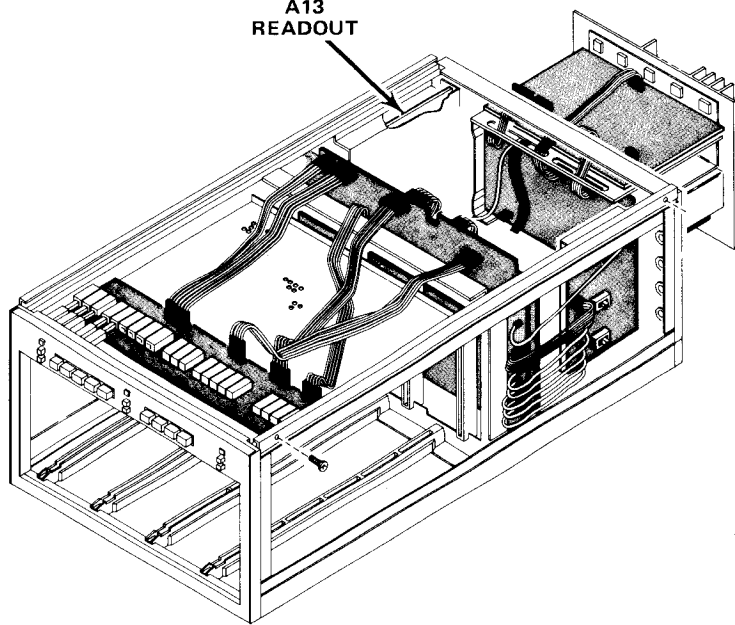
1988-15

PERIODIC
ERASE

ER
AF
SW

Figure 8-44. A13 (partial)—Location of Readout adjustments.

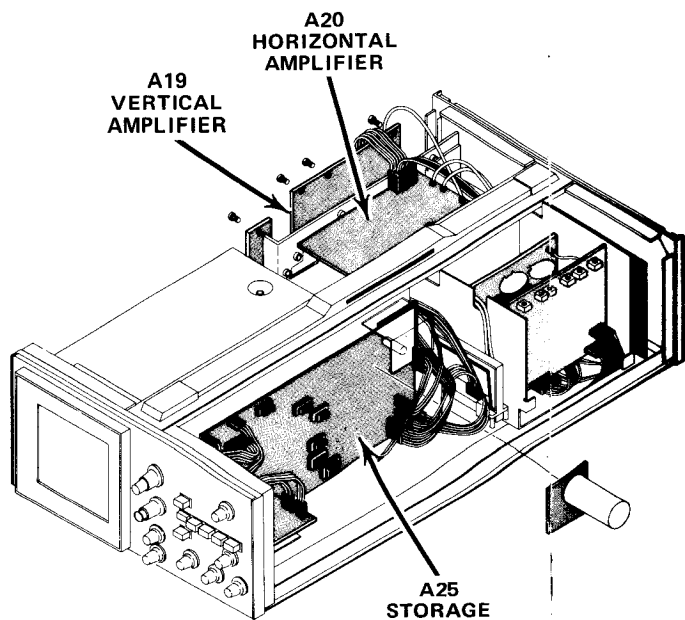
A13
READOUT



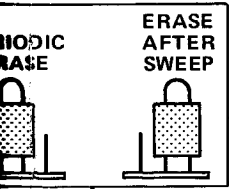
A19
VERTICAL
AMPLIFIER

A20
HORIZONTAL
AMPLIFIER

A25
STORAGE



P2531



NOTE
ON SOME INSTRUMENTS
P2848 AND P2849 ARE
LOCATED HERE.

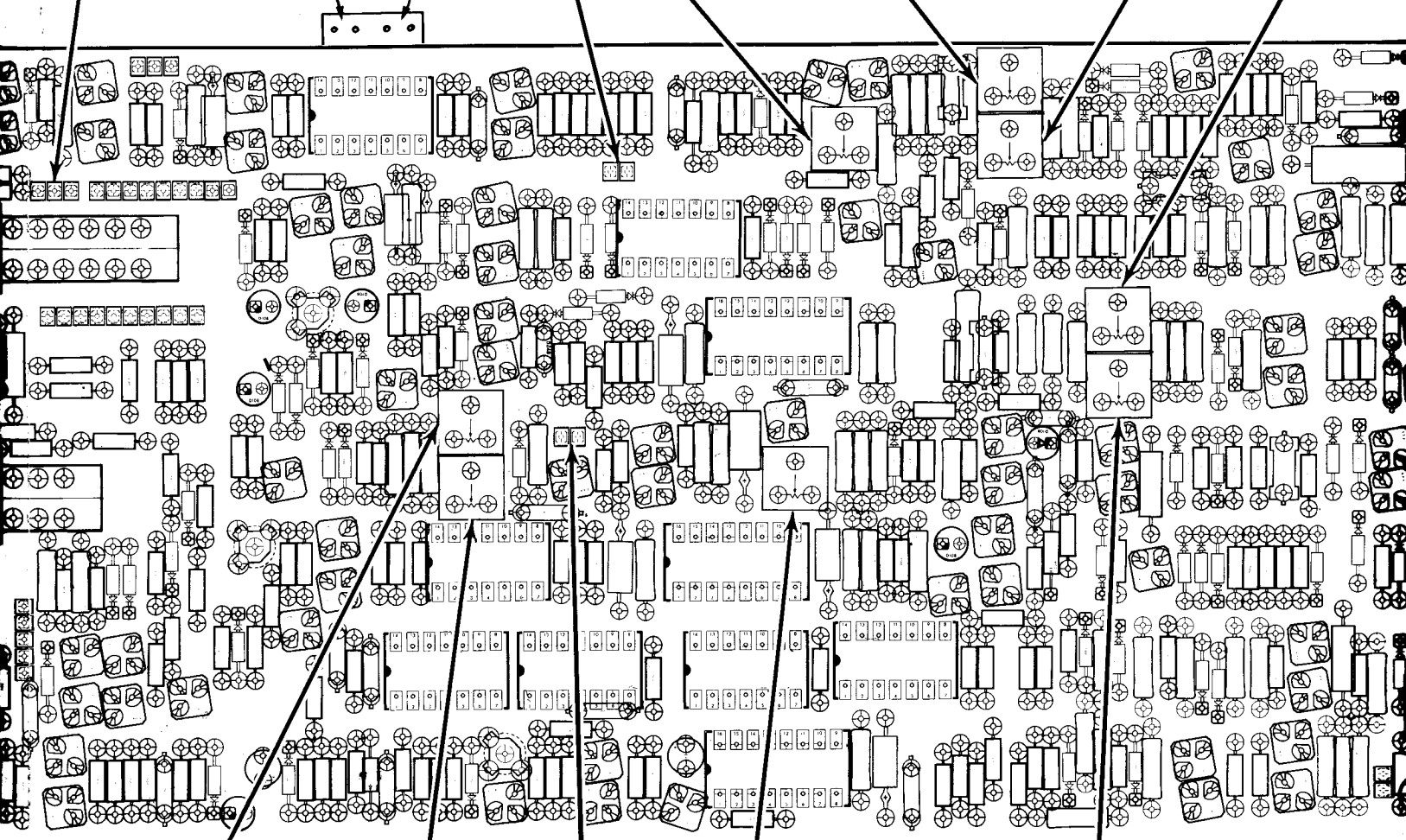
P2849
TEST POINT
CONNECTION

BS TSFR LEVEL
R2845

VP FAST STABILITY
R2705

VP TSFR
LEVEL
R2946

VP FAST PREP
R2850



VP PREP
R2735

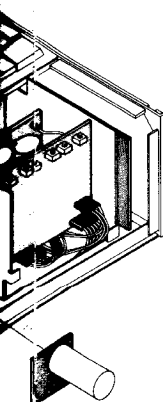
VP OP LEVEL
R2725

P2848
TEST POINT
CONNECTION

BS OP LEVEL
R2745

BS FAST PREP
R2855

Figure 8-45. A25—Location of Storage test points and adjustments.



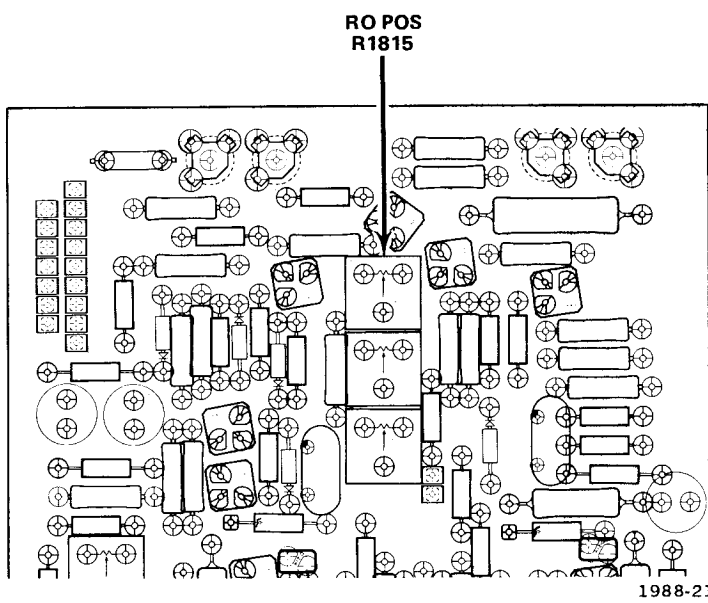
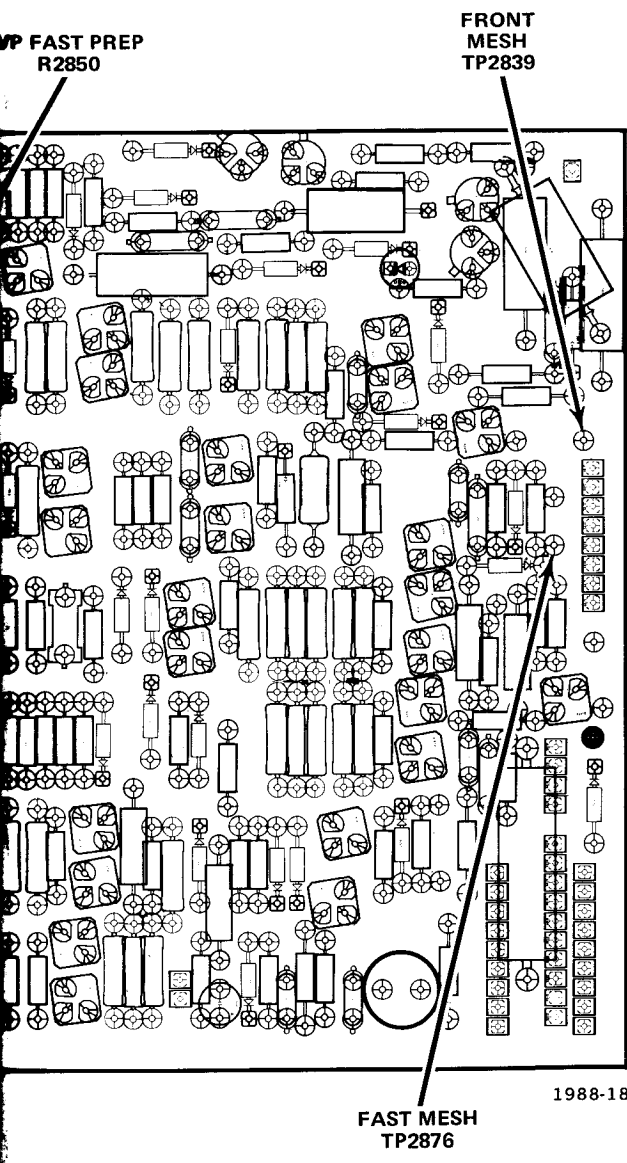


Figure 8-46. A20 (partial)—Location of horizontal Readout Position adjustment.

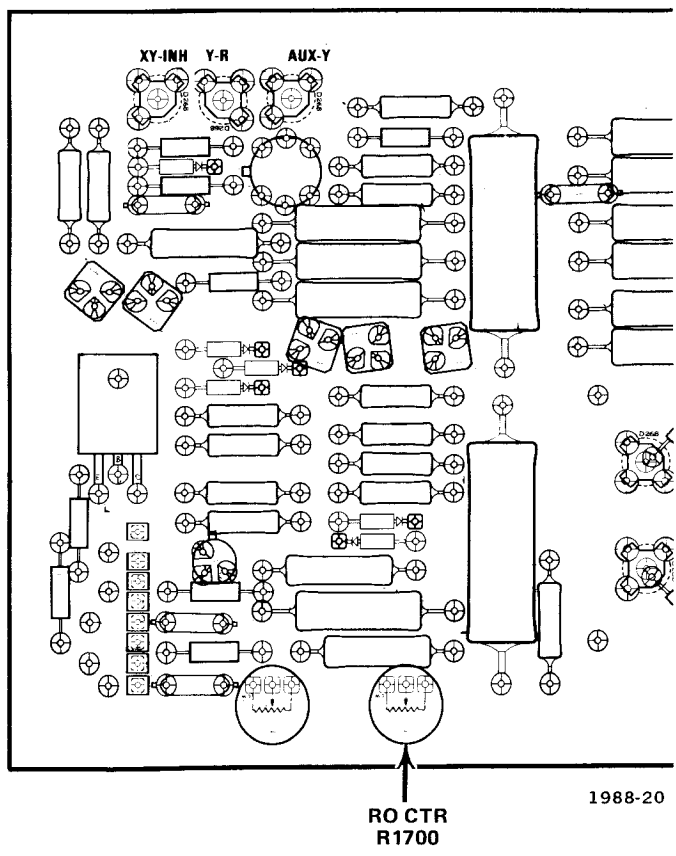
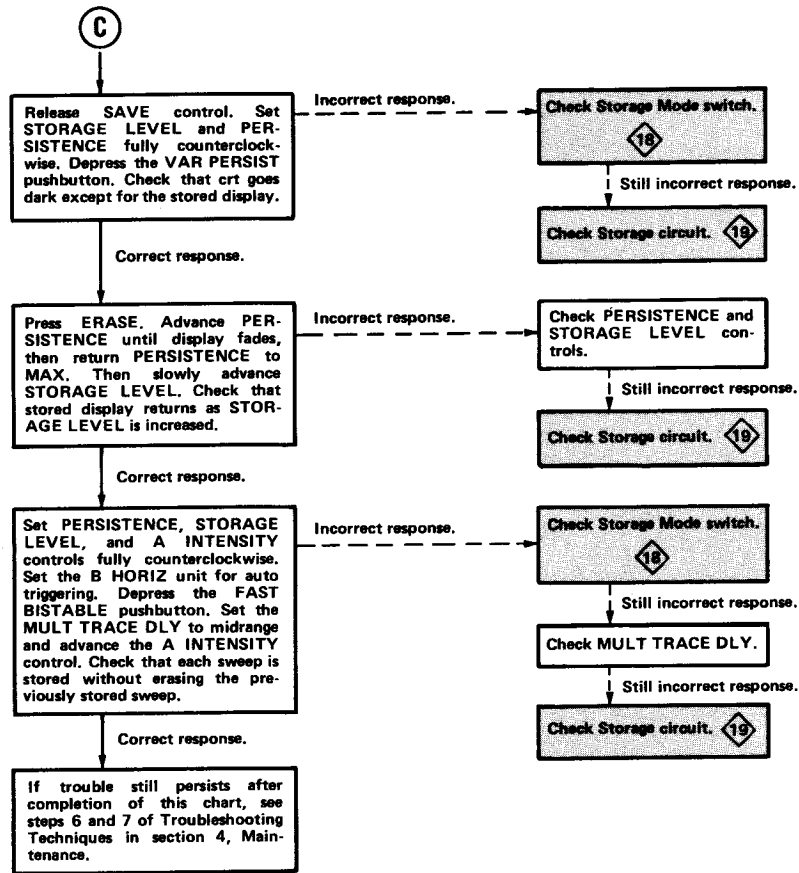


Figure 8-47. A19 (partial)—Location of vertical Readout Centering adjustment.



Main Interface B Trigger (diag. 6), and the timebase unit.

Main Interface Logic (diag. 4), HORIZ time.

Associated plug-in

Mount System.

Associated plug-in other compartment.

Readout still incorrect. Check associated plug-in unit.

the B INTENSITY control and press

no stored display.

Mode switch.

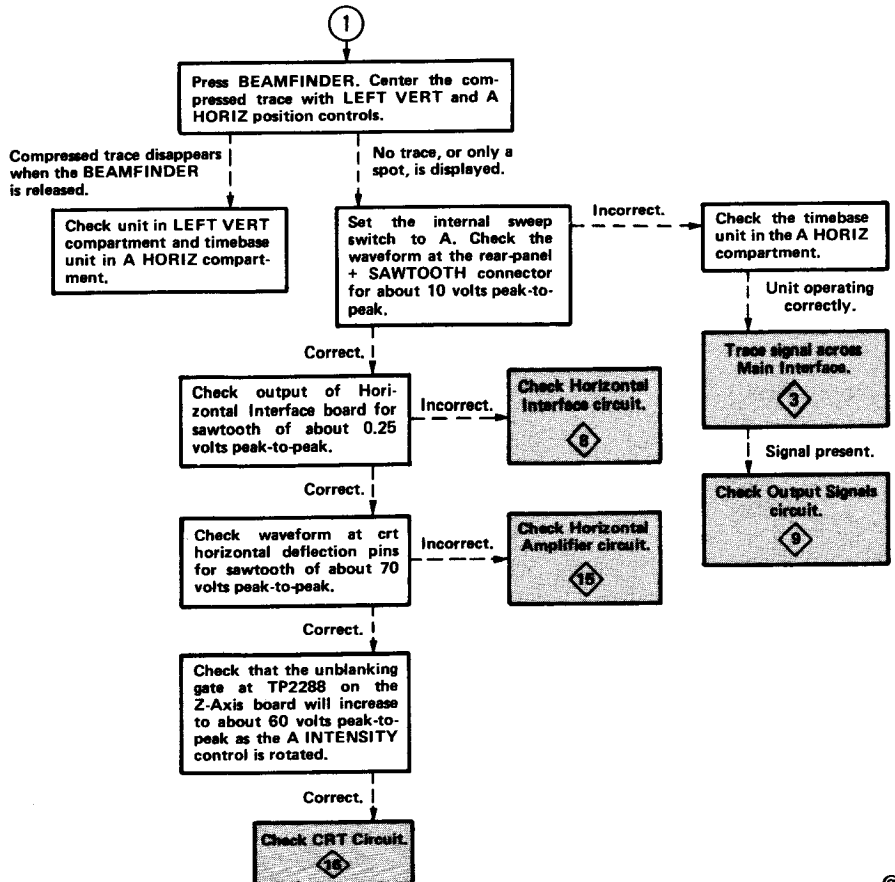
no stored display.

circuit. 19

switch and INTENSITY con-

no stored display.

circuit. 19



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.

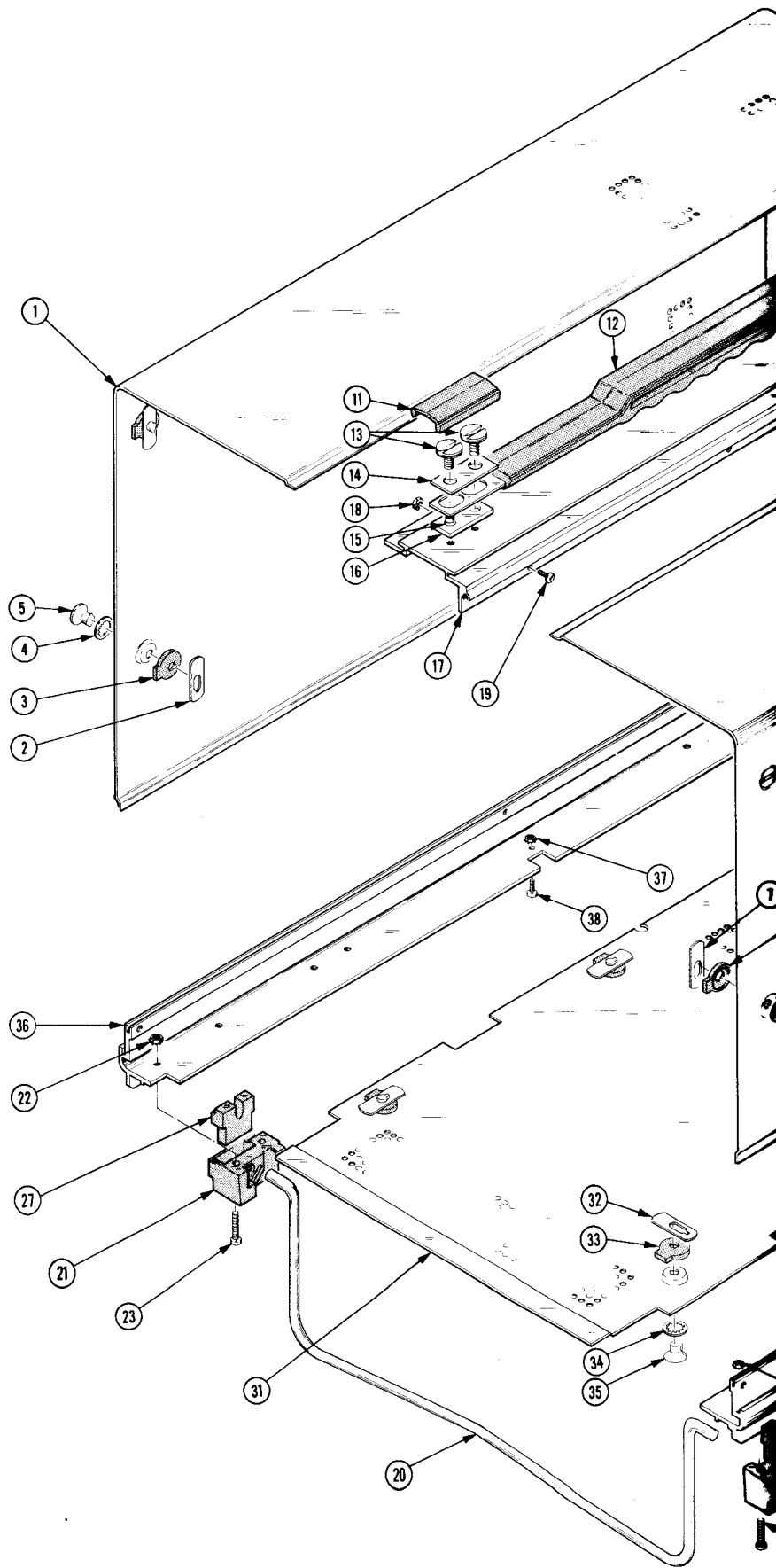
ABBREVIATIONS

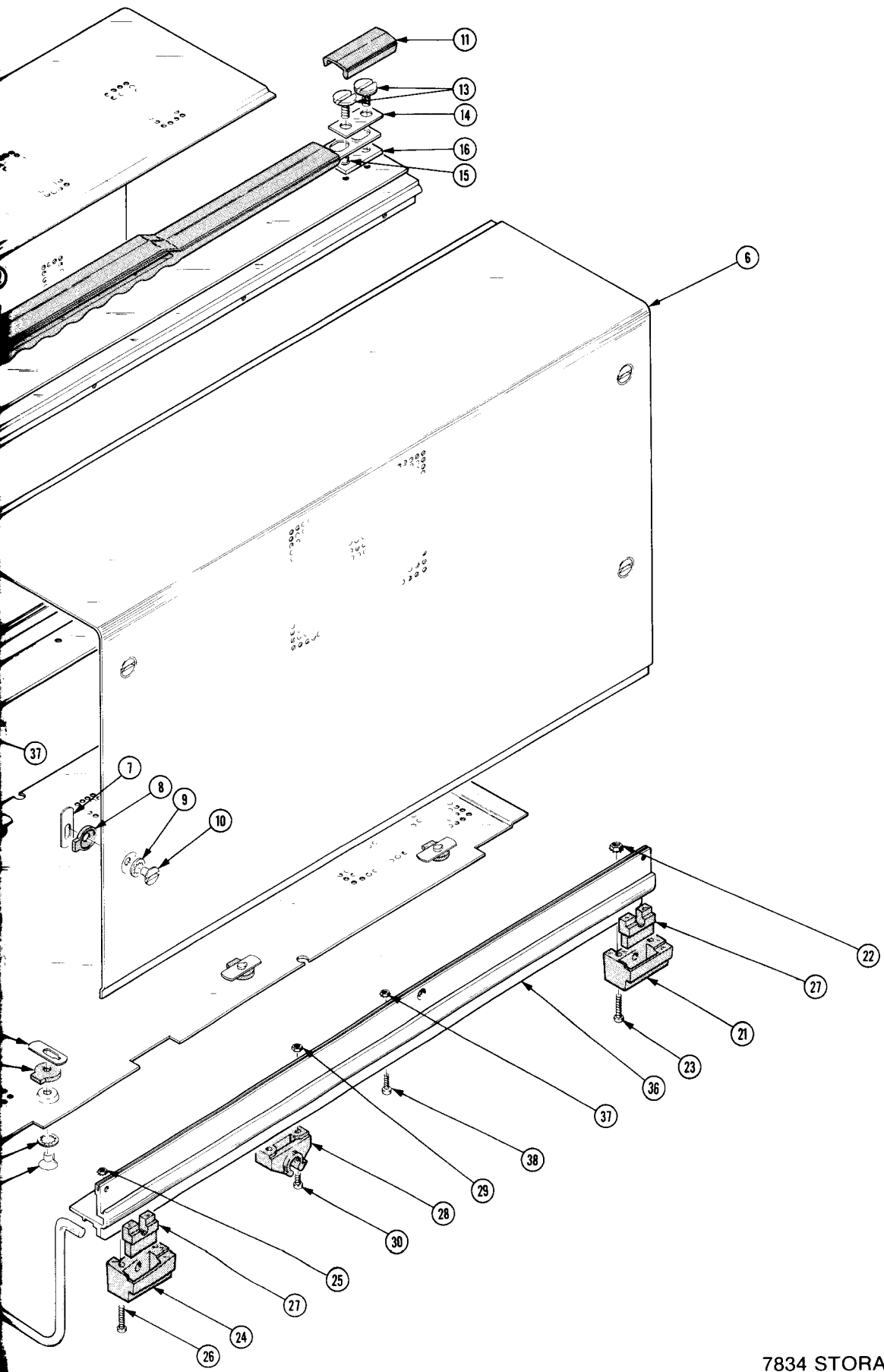
#	INCH	ELECTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCA	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELECLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ASSEM	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSY	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ATTEN	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
AWG	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVE
BD	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BRKT	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BR	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

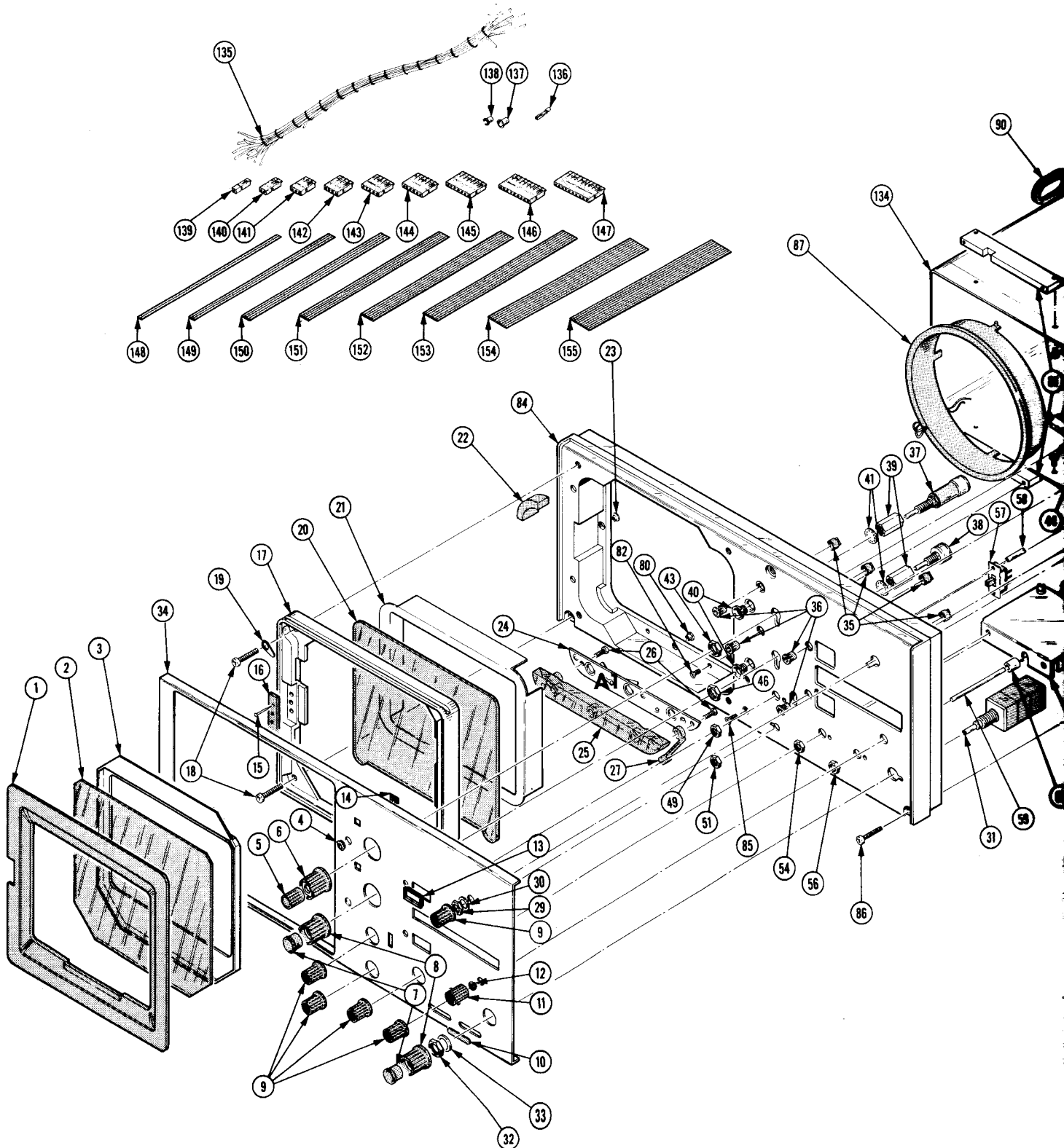
Mfr. Code	Manufacturer	Address	City, State, Zip
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OREGON 97005
0000A	LEMO USA	2015 SECOND ST.	BERKELEY, CA 94170
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02768	ILLINOIS TOOL WORKS, INC., FASTEX DIV.	195 ALGONQUIN ROAD	DES PLAINES, IL 60016
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
07707	USM CORP., USM FASTENER DIV.	510 RIVER RD.	SHELTON, CT 06484
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
11897	PLASTIGLIDE MFG. CORPORATION	P O BOX 867, 1757 STANFORD ST.	SANTA MONICA, CA 90406
12014	CHICAGO RIVET AND MACHINE CO.	950 S. 25TH AVENUE	BELLWOOD, IL 60104
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
26365	GRIES REPRODUCER CO., DIV. OF COATS AND CLARK, INC.	125 BEECHWOOD AVE.	NEW ROCHELLE, NY 10802
28520	HEYMAN MFG. CO.	147 N. MICHIGAN AVE.	KENILWORTH, NJ 07033
52792	THORNGREN TOOL AND MOLDING CO., INC.	1100 EVANS AVENUE	VALPARAISO, IN 46383
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
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
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80033	PRESTOLE EVERLOCK, INC.	P. O. BOX 278, 1345 MIAMI ST.	TOLEDO, OH 43605
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
87308	N. L. INDUSTRIES, INC., SOUTHERN SCREW DIV.	P. O. BOX 1360	STATESVILLE, NC 28677
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
95238	CONTINENTAL CONNECTOR CORP.	34-63 56TH ST.	WOODSIDE, NY 11377
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
98159	RUBBER TECK, INC.	19115 HAMILTON AVE., P O BOX 389	GARDENA, CA 90247

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	1 2 3 4 5	Name & Description	Mfr	
		Eff	Dscont				Code	Mfr Part Number
1 -1	390-0549-00			1		CABINET SIDE:LEFT	80009	390-0549-00
-2	386-1151-00			4		. CLAMP,RIM CLENC:SPG STL CD PL	80009	386-1151-00
-3	386-0227-00			4		. STOP,CLP,RIM CL:ACETAL	80009	386-0227-00
-4	214-0604-00			4		. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-5	214-0603-01			4		. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-6	390-0548-00			1		CABINET SIDE:RIGHT	80009	390-0548-00
-7	386-1151-00			4		. CLAMP,RIM CLENC:SPG STL CD PL	80009	386-1151-00
-8	386-0227-00			4		. STOP,CLP,RIM CL:ACETAL	80009	386-0227-00
-9	214-0604-00			4		. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-10	214-0603-01			4		. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-11	200-0728-00			2		COV,HANDLE END:	80009	200-0728-00
-12	367-0108-00			1		HANDLE CARRYING:19.19 INCH LONG,BLUE VINYL (ATTACHING PARTS)	80009	367-0108-00
-13	212-0597-00			4		SCREW,MACHINE:10-32 X 0.50 INCH,STL	93907	OBD
-14	386-1624-00			2		PLATE,HDL RTNG:STAINLESS STEEL -----*	80009	386-1624-00
-15	358-0485-00			2		BUSHING,SLEEVE:0.196ID X 0.287OD X 0.13" L	80009	358-0485-00
-16	386-1283-01			2		PLATE,HDL MTG:FRONT	80009	386-1283-01
-17	426-0819-00			1		FRAME SECT,CAB.:TOP CENTER (ATTACHING PARTS)	80009	426-0819-00
-18	210-0586-00			4		NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-19	211-0110-00			4		SCREW,MACHINE:4-40 X 0.312 INCH,PHB STL -----*	83385	OBD
-20	348-0193-00			1		FLIP-STAND,CAB.:	80009	348-0193-00
-21	348-0073-01			2		SPT PIVOT,FLIP:LEFT FRONT AND RIGHT REAR (ATTACHING PARTS FOR EACH)	80009	348-0073-01
-22	210-0457-00			2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-23	211-0532-00			2		SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL -----*	83385	OBD
-24	348-0074-01			2		SPT PIVOT,FLIP:RIGHT FRONT AND LEFT REAR (ATTACHING PARTS FOR EACH)	80009	348-0074-01
-25	210-0457-00			2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-26	211-0532-00			2		SCREW,MACHINE:6-32 X 0.75 INCH,FILH STL -----*	83385	OBD
-27	377-0119-00			4		INSERT,FOOT:0.352 X 0.832X 0.934,PU	80009	377-0119-00
-28	343-0256-00			2		RTNR BLK,SCOPE: (ATTACHING PARTS FOR EACH)	80009	343-0256-00
-29	210-0457-00			2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-30	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL -----*	87308	OBD
-31	390-0555-00			1		CABINET BOTTOM:	80009	390-0555-00
-32	386-1151-00			4		. CLAMP,RIM CLENC:SPG STL CD PL	80009	386-1151-00
-33	386-0227-00			4		. STOP,CLP,RIM CL:ACETAL	80009	386-0227-00
-34	214-0604-00			4		. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-35	214-0603-01			4		. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-36	426-0814-00			2		FRAME SECT,CAB.:BOTTOM (ATTACHING PARTS FOR EACH)	80009	426-0814-00
-37	210-0457-00			1		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-38	211-0507-00			1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL -----*	83385	OBD





7834 STORAGE OSCILLOSCOPE



7834 STORAGE OSCILLOSCOPE

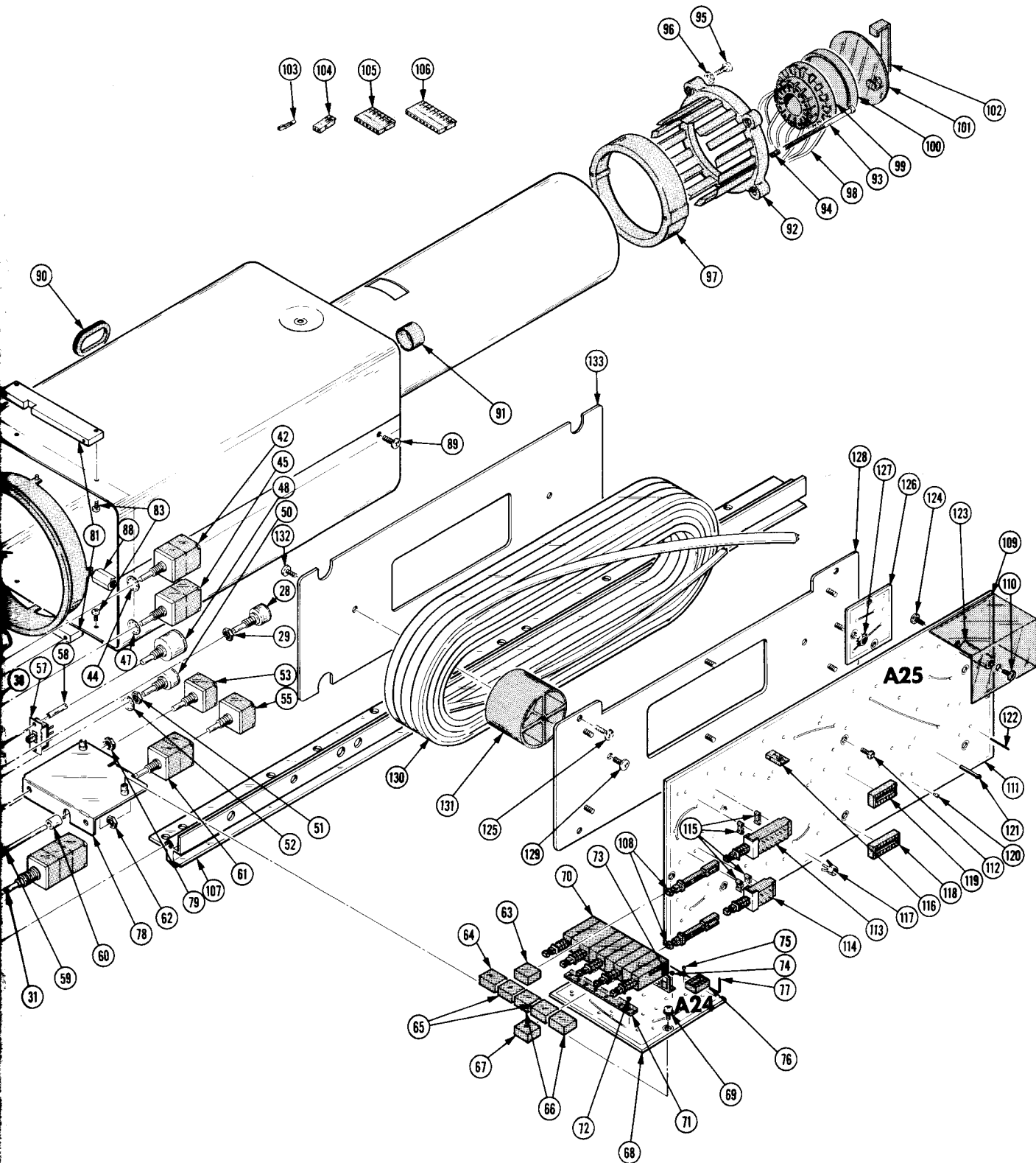


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	Name & Description					Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5		
2-1	426-0514-00			1						80009	426-0514-00
-2	378-0625-02			1						80009	378-0625-02
-3	331-0258-03			1						80009	331-0258-03
-4	358-0301-02			2						80009	358-0301-02
-5	366-1146-00			1						80009	366-1146-00
	213-0246-00			1						71159	0BD
-6	366-1164-00			1						80009	366-1164-00
	213-0153-00			2						000CY	0BD
-7	366-1122-00			2						80009	366-1122-00
	-----			-							
	213-0246-00			1						71159	0BD
-8	366-1120-00			2						80009	366-1120-00
	-----			-							
	213-0153-00			2						000CY	0BD
-9	366-1189-00			5						80009	366-1189-00
	-----			-							
	213-0153-00			1						000CY	0BD
-10	334-1418-00			1						80009	334-1418-00
-11	366-1023-01			1						80009	366-1023-01
	213-0246-00			1						71159	0BD
-12	358-0378-00	B010100	B021049	1						80009	358-0378-00
	358-0599-00	B021050		1						28520	B-187-125
-13	426-0568-00			7						80009	426-0568-00
-14	378-0635-01			1						80009	378-0635-01
	378-0635-02			1						80009	378-0635-02
-15	131-0765-00			3						80009	131-0765-00
-16	204-0380-00			1						80009	204-0380-00
-17	200-0939-01			1						80009	200-0939-01
-18	212-0008-00			4						83385	0BD
	-----			-							
-19	131-1022-00			2						80009	131-1022-00
-20	337-1159-00			1						80009	337-1159-00
-21	331-0245-00			1						80009	331-0245-00
-22	386-1517-00			4						80009	386-1517-00
-23	348-0055-00			1						80009	348-0055-00
-24	-----			1							
-25	378-0614-00			1						80009	378-0614-00
	-----			-							
-26	211-0062-00			2						83385	0BD
	-----			-							
-27	344-0179-00			2						80009	344-0179-00
-28	-----			1							
-29	210-0583-00			2						73743	2X20224-402
-30	210-0940-00			1						79807	0BD
	-----			-							
-31	-----			1							
-32	210-0413-00			1						73743	3145-402
-33	210-0978-00			1						78471	0BD
	-----			-							
-34	333-2057-00			1						80009	333-2057-00
-35	200-0935-00			4						80009	200-0935-00
-36	352-0157-00			4						80009	352-0157-00
-37	-----			1							
-38	-----			1							
-39	210-0471-00			2						80009	210-0471-00
	-----			-							
-40	358-0409-00			1						80009	358-0409-00
-41	210-0046-00			1						78189	1214-05-00-0541C
	-----			-							

Replaceable Mechanical Parts—7834

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
2-42	-----	-----		1						RESISTOR,VAR:(SEE R2165,R2310 EPL) (ATTACHING PARTS)		
-43	210-0413-00			1						NUT,PLAIN,HEX.:0.375-32 X 0.50 INCH,STL	73743	3145-402
-44	210-0046-00			1						WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-45	-----	-----		1						RESISTOR,VAR:(SEE R2313,S2313 EPL) (ATTACHING PARTS)		
-46	210-0413-00			1						NUT,PLAIN,HEX.:0.375-32 X 0.50 INCH,STL	73743	3145-402
-47	210-0046-00			1						WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-48	-----	-----		1						RESISTOR,VAR:(SEE R2320,S2320 EPL) (ATTACHING PARTS)		
-49	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20224-402
-50	-----	-----		1						RESISTOR,VAR:(SEE R917 EPL) (ATTACHING PARTS)		
-51	210-0583-00			2						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-52	210-0046-00			1						WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-53	-----	-----		1						RESISTOR,VAR:(SEE R2570 EPL) (ATTACHING PARTS)		
-54	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20224-402
-55	-----	-----		1						RESISTOR,VAR:(SEE R2500 EPL) (ATTACHING PARTS)		
-56	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20224-402
-57	-----	-----		1						SWITCH,SLIDE:(SEE S2610 EPL) (ATTACHING PARTS)		
-58	220-0464-00			2						NUT,PLAIN,ROUND:2-56 X 0.156 OD X 0.454 L - - - * - - -	80009	220-0464-00
-59	384-1174-00			1						EXTENSION SHAFT:1.80 INCH LONG	80009	384-1174-00
-60	376-0029-00			1						CPLG,SHAFT,RGD:0.128 ID X 0.312 OD X 0.5"L	80009	376-0029-00
-61	213-0075-00			2						SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	000BK	0BD
-61	-----	-----		1						RESISTOR,VAR:(SEE R2616,S2616 EPL) (ATTACHING PARTS)		
-62	210-0583-00			1						NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS - - - * - - -	73743	2X20224-402
-63	366-1161-64			1						PUSH BUTTON:GRAY,REDUCED SCAN	80009	366-1161-64
-64	366-1161-65			1						PUSH BUTTON:GRAY,NON-STORE	80009	366-1161-65
-65	366-1161-62			2						PUSH BUTTON:GRAY,BI-STABLE	80009	366-1161-62
-66	366-1161-61			2						PUSH BUTTON:GRAY,VAR PERSIST	80009	366-1161-61
-67	366-1161-63			1						PUSH BUTTON:GRAY,SAVE	80009	366-1161-63
-68	-----	-----		1						CKT BOARD ASSY:STORAGE MODE SW(SEE A24 EPL) (ATTACHING PARTS)		
-69	211-0116-00			2						SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS - - - * - - -	83385	0BD
-70	-----	-----		-						. CKT BOARD ASSY INCLUDES:		
-71	343-0495-07			1						. ACTR ASSY,PB:(SEE S2404 EPL)		
-71	343-0495-07			1						. CLIP,SWITCH:FRONT,7.5MM,7 UNIT (ATTACHING PARTS)	80009	343-0495-07
-72	210-3033-00			9						. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-73	343-0499-04			1						. CLIP,SWITCH:REAR,7.5MM X 4 UNIT (ATTACHING PARTS)	80009	343-0499-04
-74	210-3033-00			4						. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
	343-0499-05			1						. CLIP,SWITCH:REAR,7.5MM X 5 UNIT (ATTACHING PARTS)	80009	343-0499-05
	210-3033-00			5						. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
	136-0220-00	B010100	B021061X	4						. SOCKET,PLUG-IN:3 PIN,SQUARE - - - * - - -	71785	133-23-11-034

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
2-75	136-0252-04	B010100 B021061	6	.					SOCKET, PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B021062	18	.					SOCKET, PIN TERM:0.188 INCH LONG	22526	75060
-76	136-0514-00		1	.					SOCKET, PLUG IN:MICROCIRCUIT, 8 CONTACT	82647	C93-08-18
-77	131-0608-00		17	.					TERMINAL, PIN:0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-78	407-1688-00		1	BRKT, CKT CARD:						80009	407-1688-00
									(ATTACHING PARTS)		
-79	210-0457-00		2	NUT, PLAIN, EXT W:6-32 X 0.312 INCH, STL						83385	OBD
									- - - * - - -		
-80	348-0031-00		1	GROMMET, PLASTIC:0.156 INCH DIA						80009	348-0031-00
-81	214-2417-00		2	NUT, BAR:3.1 INCH LONG, AL						80009	214-2417-00
									(ATTACHING PARTS FOR EACH)		
-82	211-0117-00		2	SCREW, MACHINE:4-40 X 0.312 INCH, PNH, SST						70318	OBD
-83	211-0110-00		2	SCREW, MACHINE:4-40 X 0.312 INCH, PHB STL						83385	OBD
									- - - * - - -		
-84	426-0808-03		1	FRAME, PNL CAB.:UPPER FRONT						80009	426-0808-03
									(ATTACHING PARTS)		
-85	211-0538-00		2	SCREW, MACHINE:6-32 X 0.312"100 DEG, FLH STL						83385	OBD
-86	213-0270-00		3	SCR, TPG, THD FOR:10-32 X 0.75 INCH FILH STL						83385	OBD
									- - - * - - -		
-87	-----		1	COIL, TUBE DEFLE:TRACE ROTATOR(SEE L2200 EPL)							
-88	166-0098-00		2	SPACER, POST:0.656 INCH LONG, HEX						80009	166-0098-00
									(ATTACHING PARTS FOR EACH)		
-89	212-0023-00		1	SCREW, MACHINE:8-32 X 0.375 INCH, PNH STL						83385	OBD
									- - - * - - -		
-90	348-0233-00		1	GROMMET, PLASTIC:GRAY, OVAL SHAPE, 0.927 ID						80009	348-0233-00
-91	348-0064-00		1	GROMMET, PLASTIC:0.625 INCH DIA						80009	348-0064-00
-92	343-0205-01		1	RTNR, ELCTR TU:3.0 DIA X 1.5L, DELRIN						80009	343-0205-01
									(ATTACHING PARTS)		
-93	211-0170-00		2	SCREW, MACHINE:4-40 X 2.75 INCH, PNH STL						83385	OBD
-94	214-1333-00		2	SPRING, HLCPS:0.213 OD X 0.375 INCH LONG						80009	214-1333-00
-95	211-0510-00		2	SCREW, MACHINE:6-32 X 0.375 INCH, PNH STL						83385	OBD
-96	210-0949-00		2	WASHER, FLAT:0.141 ID X 0.50 INCH OD, BRS						12327	OBD
									- - - * - - -		
-97	354-0347-00		1	RING, CRT CLAMP:						80009	354-0347-00
-98	136-0661-00		1	SKT, PL-IN ELEK:ELCTR TU, 14 CONT W/LEADS						80009	136-0661-00
-99	136-0304-00		1	SOCKET, PLUG-IN:PLASTIC						80009	136-0304-00
-100	200-0917-01		1	COV, ELECTRON TU:2.052 OD X 0.291" THK, PLSTC						80009	200-0917-01
-101	367-0117-00		1	PULL, SOCKET:						80009	367-0117-00
-102	343-0254-00		1	CLP, ELCTR TUBE:						80009	343-0254-00
-103	131-0621-00		18	CONNECTOR, TERM:22-26 AWG, BRS CU BE GOLD						22526	46231
-104	352-0198-01		1	HLDR, TERM CONN:2 WIRE BROWN						80009	352-0198-01
	352-0198-02		1	HLDR, TERM CONN:2 WIRE RED						80009	352-0198-02
	352-0198-03		1	HLDR, TERM CONN:2 WIRE ORANGE						80009	352-0198-03
-105	352-0203-00		1	HLDR, TERM CONN:7 WIRE BLACK						80009	352-0203-00
-106	352-0206-00		1	HLDR, TERM CONN:10 WIRE BLACK						80009	352-0206-00
-107	426-1291-00		2	FRAME SECT, CAB.:BOTTOM						80009	426-1291-00
-108	384-1875-00		2	EXTENSION SHAFT:OFFSET, 1.235 LONG						80009	384-1875-00
-109	337-2294-00		1	SHIELD, ELEC:HIGH VOLTAGE						80009	337-2294-00
									(ATTACHING PARTS)		
-110	211-0558-00		1	SCREW, MACHINE:6-32 X 0.250 BDGH, NYL, SLOT						26365	921-1150-0014
									- - - * - - -		
-111	-----		1	CKT BOARD ASSY:STORAGE(SEE A25 EPL)							
									(ATTACHING PARTS)		
-112	211-0008-00		6	SCREW, MACHINE:4-40 X 0.25 INCH, PNH STL						83385	OBD
									- - - * - - -		
									. CKT BOARD INCLUDES:		
-113	-----		1	SWITCH, PUSH:4PDT, 1A, 25V(SEE S2558 EPL)							
-114	-----		1	SWITCH, PUSH:4PDT, 1A, 28V(SEE S2624 EPL)							
-115	361-0383-00		4	SPACER, PB SW:CHARCOAL, 0.33 INCH LONG						80009	361-0383-00
-116	131-0993-00		1	LNK, TERM. CONNE:2 WIRE BLACK						00779	530153-2
-117	131-1003-00		3	CONNECTOR BODY, :CKT BD MT, 2 PRONG						80009	131-1003-00
-118	136-0260-02		3	SOCKET, PLUG-IN:16 CONTACT, LOW CLEARANCE						82647	C9316-18
-119	136-0269-02		7	SOCKET, PLUG-IN:14 CONTACT, LOW CLEARANCE						01295	C95140

Replaceable Mechanical Parts—7834

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-120	136-0252-04	B010100	B020549	15	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B020550		12	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0220-00	B020550		1	.	SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
-121	214-0579-00			9	.	TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-122	131-0608-00			82	.	TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-123	385-0013-00			1	.	SPACER,POST:0.75 L W/6-32THD THRU,NYLON (ATTACHING PARTS)	80009	385-0013-00
-124	211-0558-00			1	.	SCREW,MACHINE:6-32 X 0.250 BDGH,NYL,SLOT - - - * - - -	26365	921-1150-0014
	119-0757-00			1	.	DELAY LINE,ELEC:65NS,100 OHMS (ATTACHING PARTS)	80009	119-0757-00
-125	211-0507-00			4	.	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-126	-----	-----		-	.	DELAY LINE ASSEMBLY INCLUDES: 1 . CKT BOARD ASSY:TERMINATION(SEE DL650 EPL) (ATTACHING PARTS)		
-127	210-0586-00			1	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL - - - * - - -	78189	211-041800-00
-128	386-3357-00			1	.	PLATE,SUPPORT:DELAY LINE,TOP (ATTACHING PARTS)	80009	386-3357-00
-129	213-0041-00			2	.	SCR,TPG,THD CTG:6-32 X 0.375 INCH,TRH STL - - - * - - -	83385	OBD
-130	175-1309-00			1	.	CABLE,RF:1.5 NS/FT DLY,100 OHM	80009	175-1309-00
-131	129-0325-00			2	.	POST,NONMETALLI:1.5 OD X 1.165 LONG,PLSTC (ATTACHING PARTS FOR EACH)	80009	129-0325-00
-132	212-0041-00			1	.	SCREW,MACHINE:8-32 X 1.75,82 DEG,FLH STL - - - * - - -	83385	OBD
-133	386-3358-00			1	.	PLATE,SUPPORT:DELAY LINE,BOTTOM	80009	386-3358-00
	198-3090-00			1	.	WIRE SET,ELEC:	80009	198-3090-00
-134	337-2217-00			1	.	SHIELD,ELEC:CRT	80009	337-2217-00
-135	179-2461-00			1	.	WIRING HARNESS,:COAX	80009	179-2461-00
-136	131-0707-00			5	.	CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
-137	210-0774-00			5	.	EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS	80009	210-0774-00
-138	210-0775-00			5	.	EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS	80009	210-0775-00
	179-2469-00			1	.	WIRING HARNESS:PULSE OUTPUT COAX	80009	179-2469-00
	131-0707-00			28	.	CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
	131-0708-00			24	.	CONTACT,ELEC:0.48"L,28-32 AWG WIRE	22526	47437
	198-2316-00			1	.	WIRE SET,ELEC:	80009	198-2316-00
	131-0707-00			208	.	CONNECTOR,TERM.:22-26 AWG,BRS CU BE GOLD	22526	47439
	131-0621-00			22	.	CONNECTOR,TERM:22-26 AWG,BRS CU BE GOLD	22526	46231
	210-0775-00			5	.	EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS	80009	210-0775-00
	210-0774-00			5	.	EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS	80009	210-0774-00
-139	352-0171-02			2	.	CONN BODY,PL,EL:1 WIRE RED	80009	352-0171-02
	352-0171-03			2	.	CONN BODY,PL,EL:1 WIRE ORANGE	80009	352-0171-03
	352-0197-00			2	.	CONN BODY,PL,EL:1 WIRE BLACK	80009	352-0197-00
-140	352-0169-00			1	.	HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
	352-0169-02			1	.	CONN BODY,PL,EL:2 WIRE RED	80009	352-0169-00
	352-0169-03			1	.	CONN BODY,PL,EL:2 WIRE ORANGE	80009	352-0169-03
	352-0169-04			1	.	CONN BODY,PL,EL:2 WIRE YELLOW	80009	352-0169-04
	352-0169-06			1	.	CONN BODY,PL,EL:2 WIRE BLUE	80009	352-0169-06
	352-0169-08			1	.	CONN BODY,PL,EL:2 WIRE GRAY	80009	352-0169-08
-141	352-0161-02			1	.	CONN BODY,PL,EL:3 WIRE RED	80009	352-0161-02
	352-0161-05			2	.	CONN BODY,PL,EL:3 WIRE GREEN	80009	352-0161-05
-142	352-0162-05			2	.	CONN BODY,PL,EL:4 WIRE GREEN	80009	352-0162-05
	352-0162-08			2	.	CONN BODY,PL,EL:4 WIRE GRAY	80009	352-0162-08
-143	352-0163-05			2	.	CONN BODY,PL,EL:5 WIRE GREEN	80009	352-0163-05
-144	352-0164-01			1	.	CONN BODY,PL,EL:6 WIRE BROWN	80009	352-0164-01
-145	352-0165-04			2	.	CONN BODY,PL,EL:7 WIRE YELLOW	80009	352-0165-04
	352-0165-07			3	.	CONN BODY,PL,EL:7 WIRE VIOLET	80009	352-0165-07
-146	352-0167-01			2	.	CONN BODY,PL,EL:9 WIRE BROWN	80009	352-0167-01
	352-0167-02			3	.	CONN BODY,PL,EL:9 WIRE RED	80009	352-0167-02
	352-0167-09			2	.	CONN BODY,PL,EL:9 WIRE WHITE	80009	352-0167-09
-147	352-0168-04			4	.	CONN BODY,PL,EL:10 WIRE YELLOW	80009	352-0168-04
	352-0203-01			1	.	CONN BODY,PL,EL:7 WIRE BROWN	80009	352-0203-01
	352-0206-07			2	.	HLDR,TERM CONN:10 WIRE VIOLET	80009	352-0206-07

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	1	2	3	4	5	Name & Description	Mfr	
		Eff	Dscont								Code	Mfr Part Number
2-148	175-0825-00			FT	.	WIRE, ELECTRICAL: 2	WIRE RIBBON				80009	175-0825-00
-149	175-0826-00			FT	.	WIRE, ELECTRICAL: 3	WIRE RIBBON				80009	175-0826-00
-150	175-0827-00			FT	.	WIRE, ELECTRICAL: 4	WIRE RIBBON				08261	SS-0426-710610C
-151	175-0828-00			FT	.	WIRE, ELECTRICAL: 5	WIRE RIBBON				08261	OBD
-152	175-0829-00			FT	.	WIRE, ELECTRICAL: 6	WIRE RIBBON				08261	SS-0626-710610C
-153	175-0830-00			FT	.	WIRE, ELECTRICAL: 7	WIRE RIBBON				08261	SS-0726-710610C
-154	175-0832-00			FT	.	WIRE, ELECTRICAL: 9	WIRE RIBBON				08261	SS-0926(1061)0C
-155	175-0833-00			FT	.	WIRE, ELECTRICAL: 10	WIRE RIBBON				08261	OBD

Replaceable Mechanical Parts—7834

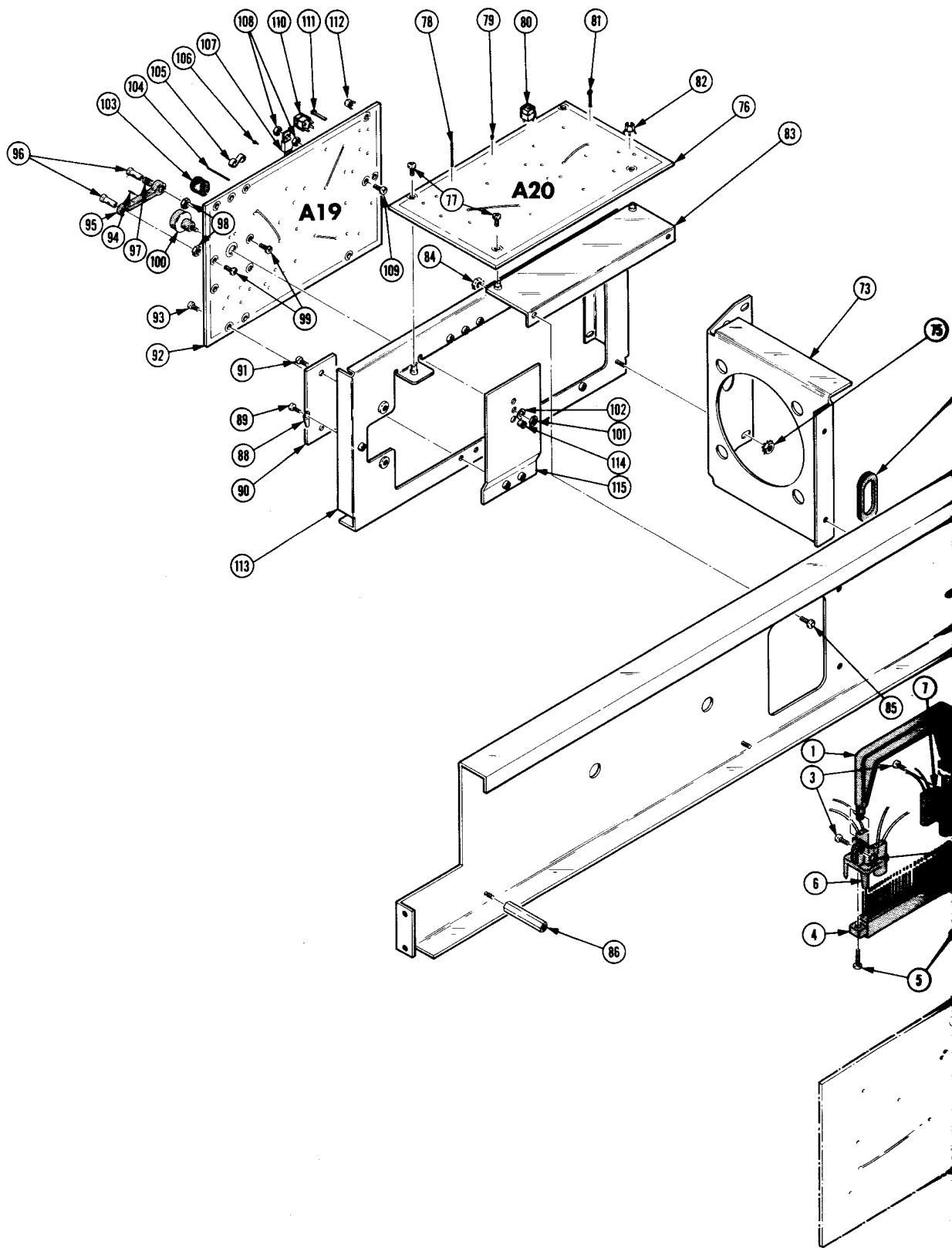
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-1	367-0156-00			1		HANDLE, BOW: 3.83 INCH LONG, BLACK NYLON (ATTACHING PARTS)	80009	367-0156-00
-2	210-0586-00			2		NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	211-041800-00
-3	211-0097-00			2		SCREW, MACHINE: 4-40 X 0.312 INCH, PNH STL - - - * - - -	83385	OBD
-4	131-1250-00			1		CONNECTOR, RCPT, :60 CONTACT (ATTACHING PARTS)	95238	K60010060 WA-30
-5	213-0082-00			2		SCR, TPG, THD CTG: 4-40 X 0.50 INCH, PNH STL - - - * - - -	93907	OBD
-6	175-1927-00			1		CABLE ASSY, RF: 50 OHM COAX W/CONN, 17"	80009	175-1927-00
-7	175-1928-00			1		CABLE ASSY, RF: 50 OHM COAX W/CONN, 7"	80009	175-1928-00
-8	343-0411-00			2		STRAP, RETAINING: 2.494 X 0.8, STL (ATTACHING PARTS FOR EACH)	80009	343-0411-00
-9	210-0457-00			2		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-10	211-0510-00			2		SCREW, MACHINE: 6-32 X 0.375 INCH, PNH STL - - - * - - -	83385	OBD
-11	369-0035-00			1		IMPLR, FAN AXIAL: PLASTIC	52792	3500-CCW.080N
-12	-----			1		CKT BOARD ASSY: FAN (SEE A17 EPL) (ATTACHING PARTS)		
-13	211-0008-00			1		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-14	131-0608-00			2		. CKT BOARD INCLUDES: . TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-15	136-0220-00	B010100	B021061	1		. SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
	136-0252-04	B021062		3		. SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
-16	-----			1		. MOTOR, DC: 10-1, 5V, 145MA (SEE B1610 EPL)		
-17	136-0269-02			1		. SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	01295	C95140
-18	407-1874-00			1		BRACKET, ANGLE: FAN (ATTACHING PARTS)	80009	407-1874-00
-19	210-0457-00			1		NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-20	211-0504-00			1		SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-21	129-0338-00			1		POST, ELEC-MECH: HEX., 0.188 X 0.64 INCH LONG	80009	129-0338-00
-22	131-1315-00			3		CONNECTOR, RCPT, : BNC, FEMALE	24931	28JR235-1
-23	333-2058-00			1		PANEL, REAR: LOWER UNIT (ATTACHING PARTS)	80009	333-2058-00
-24	211-0008-00			8		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-25	426-0809-02			1		FRAME PNL, CAB.: FRONT (ATTACHING PARTS)	80009	426-0809-02
-26	210-0586-00			2		NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	211-041800-00
-27	211-0101-00			2		SCREW, MACHINE: 4-40 X 0.25" 100 DEG, FLH STL - - - * - - -	83385	OBD
-28	200-1834-00			1		COVER, PWR SPLY: HIGH VOLTAGE (ATTACHING PARTS)	80009	200-1834-00
-29	211-0008-00			4		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-30	-----			1		CKT BOARD ASSY: FOCUS (SEE A23 EPL) (ATTACHING PARTS)		
-31	211-0008-00			4		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-32	131-0589-00			20		. CKT BOARD INCLUDES: . TERM, PIN: 0.46 L X 0.025 SQ. PH BRZ GL	22526	47350
-33	136-0220-00	B010100	B020579	7		. SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
	136-0220-00	B020580	B021061X	8		. SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
	136-0183-00	B010100	B021061X	2		. SOCKET, PLUG-IN: 3 PIN, ROUND	80009	136-0183-00
-34	214-0579-00			2		. TERM., TEST PT: BRS CD PL	80009	214-0579-00
-35	131-0608-00			14		. TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-36	136-0252-04	B010100	B021061	33		. SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
	136-0252-04	B021062		36		. SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
-37	-----			1		CKT BOARD ASSY: HIGH VOLTAGE (SEE A22 EPL) (ATTACHING PARTS)		
-38	211-0008-00			2		SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD

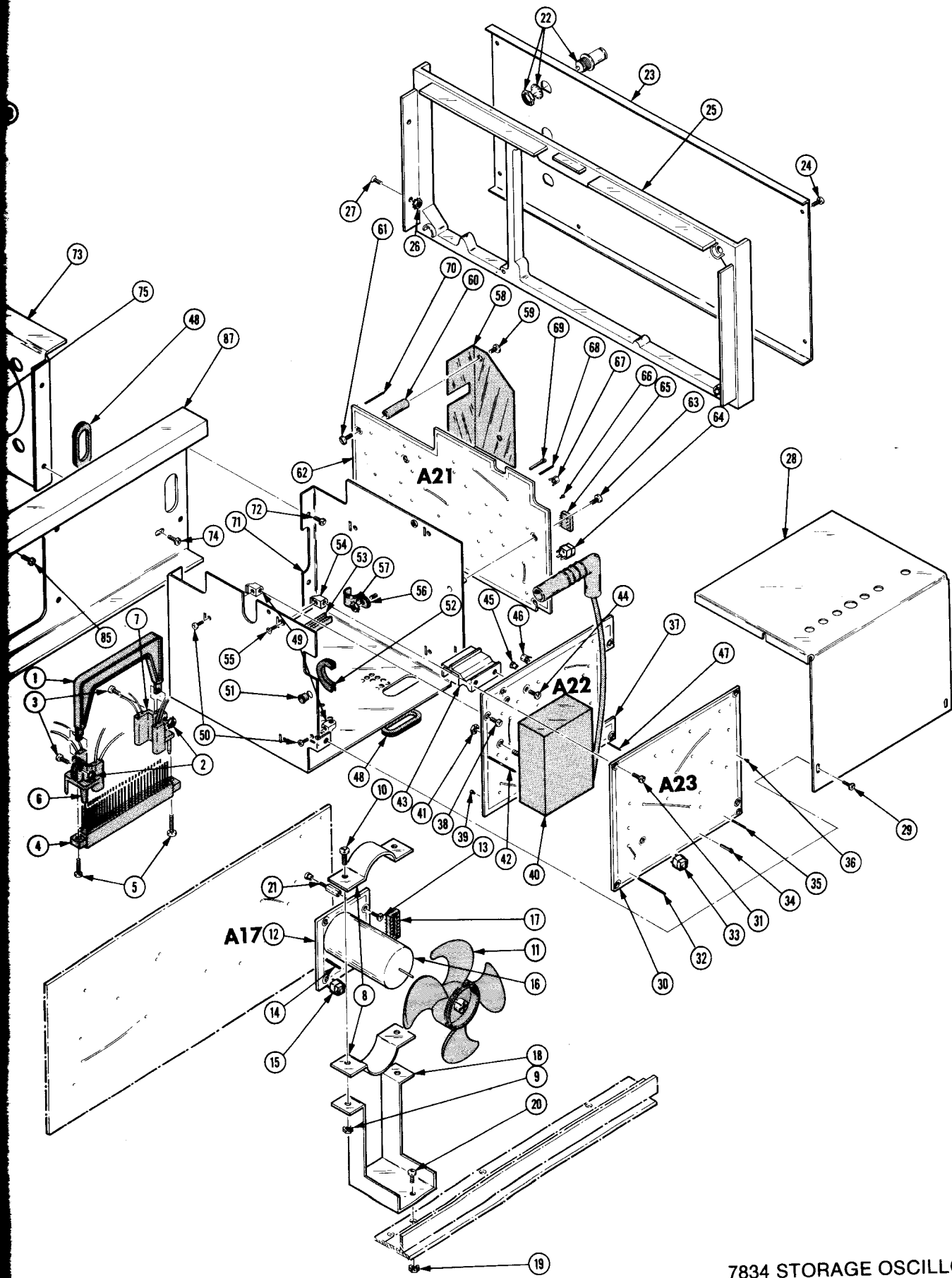
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
3-	-----			-	.	CKT BOARD ASSY INCLUDES:						
-39	136-0252-04			2	.	SOCKET, PIN TERM:0.188 INCH LONG					22526	75060
-40	-----			1	.	SEMICONDC DVC SE:HV MULT,4K(SEE U2012 EPL)				(ATTACHING PARTS)		
-41	220-0796-00			2	.	NUT, PLAIN HEX.:8-32 X 0.375 INCH, NYLON					95987	N-832-X
-42	131-0589-00			9	.	TERM, PIN:0.46 L X 0.025 SQ. PH BRZ GL					22526	47350
-43	386-2041-00			2	.	SUPPORT, XFMR:				(ATTACHING PARTS FOR EACH)	80009	386-2041-00
-44	211-0008-00			2	.	SCREW, MACHINE:4-40 X 0.25 INCH, PNH STL					83385	OBD
-45	361-0007-00			1	.	SPACER, SLEEVE:0.250 INCH DIA, PLASTIC					80009	361-0007-00
-46	131-1003-00			2	.	CONNECTOR BODY,:CKT BD MT,2 PRONG					80009	131-1003-00
-47	131-0608-00			4	.	TERMINAL, PIN:0.365 L X 0.25 PH, BRZ, GOLD PL					22526	47357
	198-3302-00			1	.	WIRE SET, ELEC:					80009	198-3302-00
-48	348-0233-00			2	.	GROMMET, PLASTIC:GRAY, OVAL SHAPE, 0.927 ID					80009	348-0233-00
-49	220-0547-01			3	.	NUT, BLOCK:0.38 X 0.25 X 0.282"OA				(ATTACHING PARTS FOR EACH)	80009	220-0547-01
-50	211-0007-00			1	.	SCREW, MACHINE:4-40 X 0.188 INCH, PNH STL					83385	OBD
-51	348-0055-00			1	.	GROMMET, PLASTIC:0.25 INCH DIA					80009	348-0055-00
-52	348-0150-00	B010100	B020299	1	.	GROMMET, PLASTIC:U SHAPED					80009	348-0150-00
	348-0171-00	B020300		1	.	GROMMET, PLASTIC:U-SHAPED					80009	348-0171-00
-53	351-0087-00			1	.	GUIDE, CKT CARD:4.75 INCH LONG, PLASTIC					80009	351-0087-00
-54	220-0547-01			5	.	NUT, BLOCK:0.38 X 0.25 X 0.282"OA				(ATTACHING PARTS FOR EACH)	80009	220-0547-01
-55	211-0105-00			1	.	SCREW, MACHINE:4-40 X 0.188"100 DEG, FLH STL					83385	OBD
-56	343-0042-00	B010100	B010174	1	.	CLAMP, LOOP:0.287 INCH DIA					95987	5-16-6BH
	343-0004-00	B010175		1	.	CLAMP, LOOP:0.312 INCH DIAMETER, PLSTC				(ATTACHING PARTS)	95987	5-16-6B
-57	210-0586-00			1	.	NUT, PLAIN, EXT W:4-40 X 0.25 INCH, STL					78189	211-041800-00
-58	337-2270-00			1	.	SHIELD, ELEC:CKT CARD, PLASTIC				(ATTACHING PARTS)	80009	337-2270-00
-59	211-0558-00			2	.	SCREW, MACHINE:6-32 X 0.250 BDGH, NYL, SLOT					26365	921-1150-0014
-60	385-0013-00			2	.	SPACER, POST:0.75 L W/6-32THD THRU, NYLON				(ATTACHING PARTS FOR EACH)	80009	385-0013-00
-61	211-0558-00			1	.	SCREW, MACHINE:6-32 X 0.250 BDGH, NYL, SLOT					26365	921-1150-0014
-62	-----			1	.	CKT BOARD ASSY:Z AXIS(SEE A21 EPL)				(ATTACHING PARTS)		
-63	211-0008-00			4	.	SCREW, MACHINE:4-40 X 0.25 INCH, PNH STL					83385	OBD
-64	136-0220-00	B010100	B021061	25	.	SOCKET, PLUG-IN:3 PIN, SQUARE					71785	133-23-11-034
	136-0252-04	B021062		75	.	SOCKET, PIN TERM:0.188 INCH LONG					22526	75060
-65	136-0514-00			1	.	SOCKET, PLUG IN:MICROCIRCUIT, 8 CONTACT					82647	C93-08-18
-66	136-0252-04			89	.	SOCKET, PIN TERM:0.188 INCH LONG					22526	75060
-67	131-1003-00			4	.	CONNECTOR BODY,:CKT BD MT,2 PRONG					80009	131-1003-00
-68	131-0608-00			31	.	TERMINAL, PIN:0.365 L X 0.25 PH, BRZ, GOLD PL					22526	47357
-69	214-0579-00			6	.	TERM., TEST PT:BRS CD PL					80009	214-0579-00
-70	131-0589-00			4	.	TERM, PIN:0.46 L X 0.025 SQ. PH BRZ GL					22526	47350
-71	380-0450-00			1	.	HSG, HV PWR SPLY:ALUMINUM				(ATTACHING PARTS)	80009	380-0450-00
-72	211-0507-00			4	.	SCREW, MACHINE:6-32 X 0.312 INCH, PNH STL					83385	OBD
-73	386-3351-00			1	.	SUPPORT, CRT:REAR				(ATTACHING PARTS)	80009	386-3351-00
-74	211-0507-00	B010100	B020299	2	.	SCREW, MACHINE:6-32 X 0.312 INCH, PNH STL					83385	OBD
	211-0507-00	B020300		4	.	SCREW, MACHINE:6-32 X 0.312 INCH, PNH STL					83385	OBD
-75	210-0457-00			2	.	NUT, PLAIN, EXT W:6-32 X 0.312 INCH, STL					83385	OBD

Replaceable Mechanical Parts—7834

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscnt	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-76	-----		1		CKT BOARD ASSY:HORIZONTAL AMP(SEE A20 EPL) (ATTACHING PARTS)		
-77	211-0008-00		4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	-----		-		. CKT BOARD ASSY INCLUDES:		
-78	131-0608-00		16		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-79	136-0252-04	B010100 B021061	72		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B021062	126		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-80	136-0220-00	B010100 B021061X	18		. SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
-81	214-0579-00		4		. TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-82	131-1003-00		4		. CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-83	407-1690-00		1		BRKT,CKT CARD:HORIZONTAL,RIGHT (ATTACHING PARTS)	80009	407-1690-00
-84	210-0457-00		2		NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-85	211-0504-00		2		SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
	-----		-		. CKT BOARD ASSY INCLUDES:		
-86	385-0154-00		4		SPACER,POST:1.296 L W/6-32 THD EA END,AL	80009	385-0154-00
-87	386-3354-00		1		SUPPORT,CHASSIS:MAIN	80009	386-3354-00
-88	210-0201-00		1		TERMINAL,LUG:SE #4 (ATTACHING PARTS)	86928	A373-157-2
-89	211-0008-00		1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-90	-----		1		RES.,FXD,FILM:(SEE R1782 EPL) (ATTACHING PARTS)		
-91	211-0507-00		1		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-92	-----		1		CKT BOARD ASSY:VERTICAL AMP(SEE A19 EPL) (ATTACHING PARTS)		
-93	211-0008-00		7		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	211-0511-00	XB020490	2		SCREW,MACHINE:6-32 X 0.50 INCH,PNH STL	83385	OBD
	-----		-		. CKT BOARD ASSY INCLUDES:		
-94	210-0627-00	B010100 B020489	2		. RIVET,SOLID:0.042 DIA X 0.25 INCH,RDH	80009	210-0627-00
	210-0627-00	B020490	1		. RIVET,SOLID:0.042 DIA X 0.25 INCH,RDH	80009	210-0627-00
-95	343-0097-00	B010100 B020489	2		. RTNR,TRANSISTOR:HEAT SINK	80009	343-0097-00
	343-0097-00	B020490	1		. RTNR,TRANSISTOR:HEAT SINK (ATTACHING PARTS FOR EACH)	80009	343-0097-00
-96	210-0599-00		2		. NUT,SLEEVE:4-40 X 0.391 INCH LONG	80009	210-0599-00
-97	214-0368-00		1		. SPRING,HLCPS:0.24 DIA X 0.438 INCH LONG	80009	214-0368-00
-98	210-0551-00	B010100 B020489	2		. NUT,PLAIN,HEX.:4-40 X 0.25 INCH,STL	83385	OBD
	210-0551-00	B020490	4		. NUT,PLAIN,HEX.:4-40 X 0.25 INCH,STL	83385	OBD
-99	211-0097-00	B010100 B020489	2		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
	211-0097-00	B020490	3		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
	198-2016-00	B010100 B020489X	1		. WIRE SET ELEC:	80009	198-2016-00
-100	-----		1		. MICROCIRCUIT,LI:OUTPUT AMP(SEE U1745 EPL) (ATTACHING PARTS)		
-101	210-0407-00		1		. NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-102	210-0055-00		1		. WASHER,LOCK:SPLIT,0.145 ID X 0.253 OD,STL	83385	OBD
	136-0252-00	XB020490	4		. SOCKET,PIN TERM:0.145 INCH LONG	00779	2-330808-7
	214-1683-01	B010100 B020489	1		. HEAT SINK,XSTR:VERTICAL AMPLIFIER,RIGHT	80009	214-1683-01
	214-1683-03	B020490	1		. HT SK,MICROCKT:VERTICAL AMPLIFIER,RIGHT	80009	214-1683-03
-103	136-0235-00		1		. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-104	131-0608-00		8		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-105	200-1167-00		1		. COVER,XSTR:TEMP STAB FOR 2 TO-18 CS STYLE	80009	200-1167-00
-106	136-0252-04	B010100 B021061	27		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B0201062	30		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-06		10		. SOCKET,PIN TERM:0.178 INCH LONG	00779	2-332095-6
	136-0252-00		16		. SOCKET,PIN TERM:0.145 INCH LONG	00779	2-330808-7
-107	-----		1		. TRANSISTOR:(SEE Q1785 EPL) (ATTACHING PARTS)		
-108	210-0551-00		2		. NUT,PLAIN,HEX.:4-40 X 0.25 INCH,STL	83385	OBD
-109	211-0097-00		1		. SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD

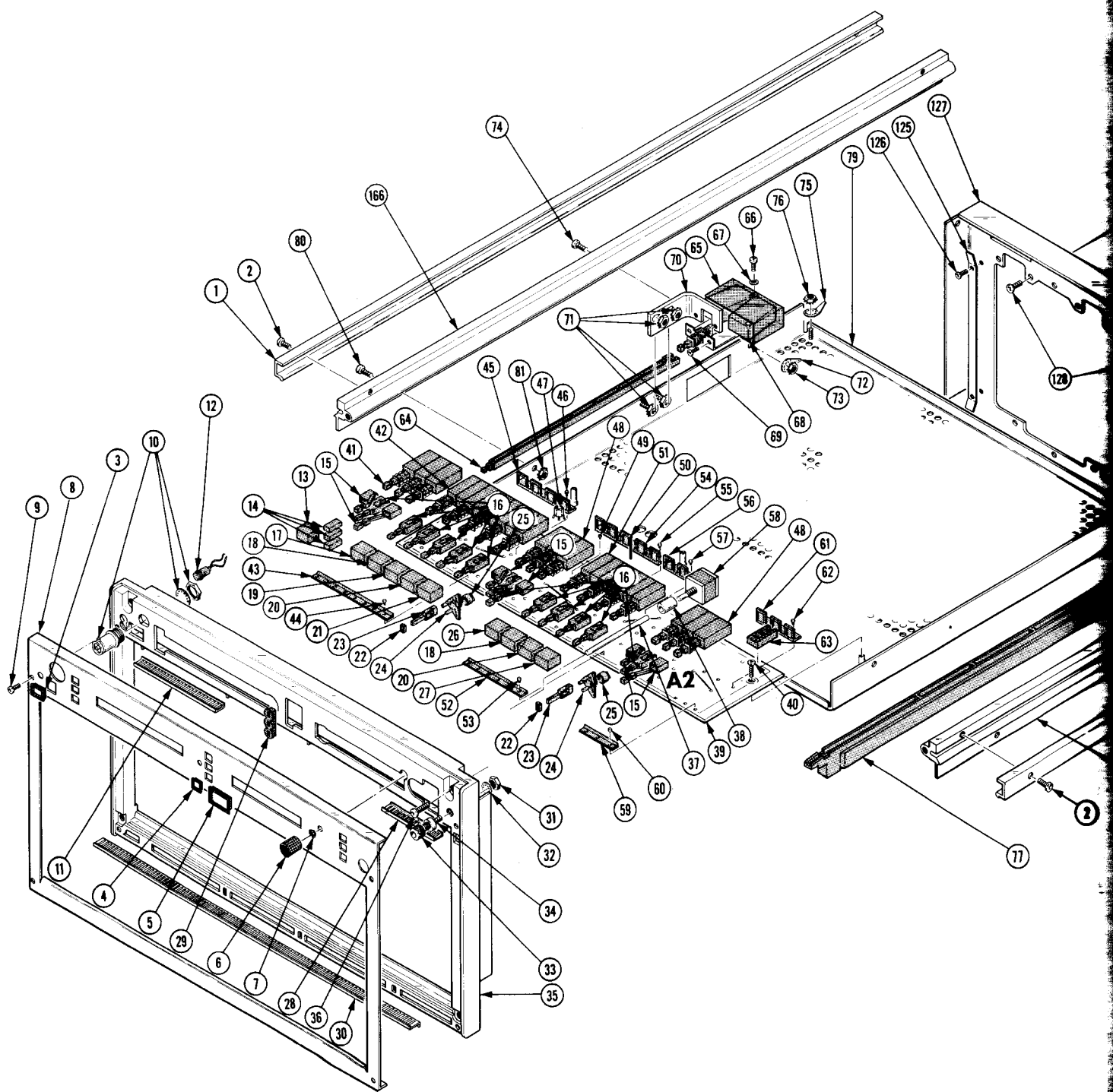
Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	1	2	3	4	5	Name & Description	Mfr	
		Eff	Dscont								Code	Mfr Part Number
3-110	136-0220-00	B010100	B021061X	6	.					SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
-111	214-0579-00	B010100	B020489	7	.					TERM., TEST PT: BRS CD PL	80009	214-0579-00
	214-0579-00	B020490		8	.					TERM., TEST PT: BRS CD PL	80009	214-0579-00
-112	131-1003-00			5	.					CONNECTOR BODY, :CKT BD MT, 2 PRONG	80009	131-1003-00
	195-0048-00			2	.					LEAD, ELECTRICAL: 0.018 DIA X 0.75" MIN L	80009	195-0048-00
	129-0303-00	XB020490		2	.					POST, ELEC-MECH: 0.25 OD X 0.237 INCH LONG (ATTACHING PARTS FOR EACH)	80009	129-0303-00
	210-0407-00	XB020490		1	.					NUT, PLAIN, HEX.: 6-32 X 0.25 INCH, BRS - - - * - - -	73743	3038-0228-402
-113	441-1285-00			1						CHASSIS, SCOPE: VERTICAL AMPLIFIER	80009	441-1285-00
-114	348-0031-00			2						GROMMET, PLASTIC: 0.156 INCH DIA	80009	348-0031-00
-115	214-2416-00			1						HT SK, MICROCKT: VERTICAL AMPLIFIER, BACK	80009	214-2416-00





7834 STORAGE OSCILLOSCOPE

FIG. 4 LOWER UNIT FRONT & PLUG-IN HOUSING



7834 STORAGE OSCILLOSCOPE

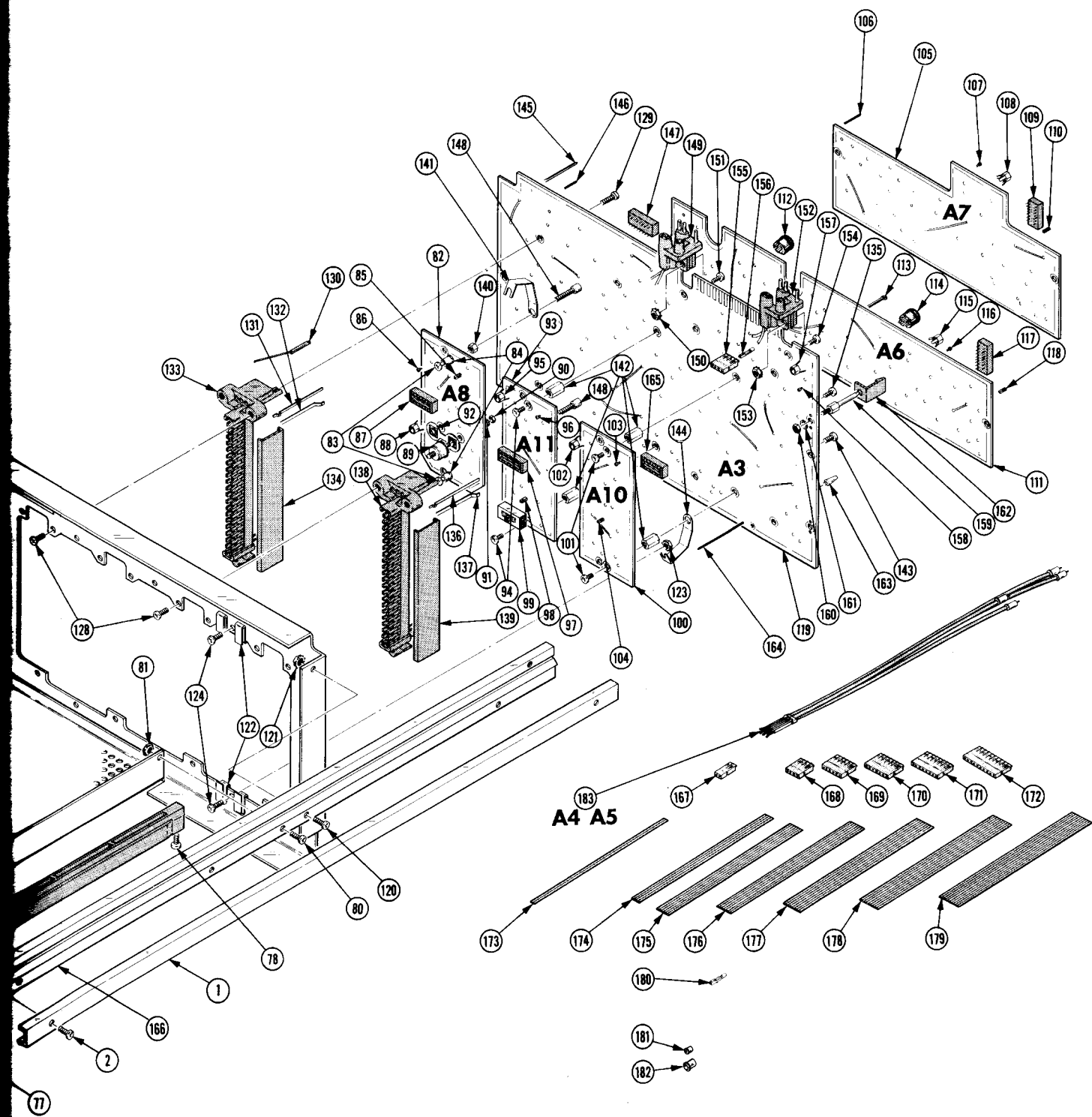


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-1	426-0849-00			2		FRAME SECT,CAB.:COUPLING (ATTACHING PARTS FOR EACH)	80009	426-0849-00
-2	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-3	426-0681-00			1		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-4	426-1072-00			9		FRAME,PUSH BTN:PLASTIC	80009	426-1072-00
-5	426-0568-00			9		FR,PUSHBUTTON:PANEL MOUNT	80009	426-0568-00
-6	366-1023-01			1		KNOB:GRAY	80009	366-1023-01
	213-0153-00			1		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-7	358-0378-00			1		BUSHING,SLEEVE:PRESS MOUNT	80009	358-0378-00
-8	333-2059-00			1		PANEL,FRONT:LOWER UNIT (ATTACHING PARTS)	80009	333-2059-00
-9	213-0055-00			5		SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL - - - * - - -	93907	OBD
-10	131-1315-00			1		CONNECTOR,RCPT,:BNC,FEMALE	24931	28JR235-1
-11	337-1543-00			3		SHLD GSKT,ELECT:2.50 INCHES LONG	80009	337-1543-00
-12	-----			1		LAMP,CARTRIDGE:GREEN,5V,60MA(SEE DS365 EPL)		
-13	366-1480-02			1		PUSH BUTTON:BLACK,POWER OFF	80009	366-1480-02
-14	366-1559-00			3		PUSH BUTTON:GRAY	80009	366-1559-00
-15	384-1354-00			6		EXTENSION SHAFT:1.585 INCH LONG,OFFSET,NYL	80009	384-1354-00
-16	384-1099-00			12		EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG	80009	384-1099-00
-17	366-1161-57			1		PUSH BUTTON:GRAY--LEFT	80009	366-1161-57
-18	366-1161-31			2		PUSH BUTTON:GRAY--ALT	80009	366-1161-31
-19	366-1161-27			1		PUSH BUTTON:GRAY--ADD	80009	366-1161-27
-20	366-1161-30			2		PUSH BUTTON:GRAY--CHOP	80009	366-1161-30
-21	366-1161-58			1		PUSH BUTTON:GRAY--RIGHT	80009	366-1161-58
-22	378-0074-00			2		REFLECTOR,LIGHT:PUSH BUTTON	80009	378-0074-00
-23	366-1650-00			6		PUSH BUTTON:CLEAR,0.184 X 0.214 X 8.0 L	80009	360-1650-00
-24	386-3440-00			2		LT CNDCT,PB ILL:3 BUTTON,7.5 MM SPACING	80009	386-3440-00
-25	200-0935-00			2		BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-26	366-1161-55			1		PUSH BUTTON:GRAY--A	80009	366-1161-55
-27	366-1161-56			1		PUSH BUTTON:GRAY--B	80009	366-1161-56
-28	337-1542-00			1		SHLD GSKT,ELECT:2.10 INCHES LONG	80009	337-1542-00
-29	351-0469-00			2		GUIDE,SWITCH:4 BUTTON	80009	351-0469-00
-30	348-0204-00			1		SHLD GSKT,ELEK:FINGER TYPE,10.65 INCH LONG	80009	348-0204-00
	129-0103-00			1		POST,BDG,ELEC:ASSEMBLY (ATTACHING PARTS)	80009	129-0103-00
-31	210-0583-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20224-402
-32	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL - - - * - - -	78189	1214-05-00-0541C
-33	200-0103-00			1		. GND POST ASSEMBLY INCLUDES: NUT,PLAIN,KNURL:0.25-28 X 0.375" OD,BRASS	80009	200-0103-00
-34	129-0077-00			1		STUD,SHOULDERED:0.938 INCH LONG,BRASS	80009	129-0077-00
-35	426-0806-02			1		FRAME PNL,CAB.:LOWER FRONT (ATTACHING PARTS)	80009	426-0806-02
-36	213-0270-00			4		SCR,TPG,THD FOR:10-32 X 0.75 INCH FILH STL - - - * - - -	83385	OBD
-37	384-0341-00			1		EXTENSION SHAFT:0.125 OD X 3.6 INCH LONG	80009	384-0341-00
-38	376-0029-00			1		CPLG,SHAFT,RGD:0.128 ID X 0.312 OD X 0.5"L	80009	376-0029-00
	213-0075-00			2		. SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	000BK	OBD
-39	-----			1		CKT BOARD ASSY:MODE SWITCH(SEE A2 EPL) (ATTACHING PARTS)		
-40	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	OBD
-41	-----			1		. CKT BOARD ASSY INCLUDES: . ACTR ASSY,PB:(SEE S395 EPL)		
-42	-----			1		. ACTR ASSY,PB:(SEE S344 EPL)		
-43	343-0495-09			1		. CLIP,SWITCH:FRONT,7.5 MM,9 UNIT (ATTACHING PARTS)	80009	343-0495-09
-44	210-3033-00			9		. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-45	343-0499-04			1		. CLIP,SWITCH:REAR,7.5MM X 4 UNIT (ATTACHING PARTS)	80009	343-0499-04
-46	210-3033-00			4		. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25

Replaceable Mechanical Parts—7834

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
4-47	131-1003-00		1	.					CONNECTOR BODY, :CKT BD MT, 2 PRONG	80009	131-1003-00
-48	-----		2	.					ACTR ASSY, PB: (SEE S325, S354 EPL)		
	136-0220-00	B010100 B021061	10	.					SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
-49	136-0252-04	B010100 B021061	19	.					SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
	136-0252-04	B021062	49	.					SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
-50	131-0608-00		34	.					TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-51	-----		1	.					ACTR ASSY, PB: (SEE S342 EPL)		
-52	343-0495-07		1	.					CLIP, SWITCH: FRONT, 7.5MM, 7 UNIT (ATTACHING PARTS)	80009	343-0495-07
-53	210-3033-00		7	.					EYELET, METALLIC: 0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-54	343-0499-05		2	.					CLIP, SWITCH: REAR, 7.5MM X 5 UNIT (ATTACHING PARTS FOR EACH)	80009	343-0499-05
-55	210-3033-00		5	.					EYELET, METALLIC: 0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-56	343-0499-02		1	.					CLIP, SWITCH: REAR, 7.5 MM, 2 UNIT (ATTACHING PARTS)	80009	343-0499-02
-57	210-3033-00		2	.					EYELET, METALLIC: 0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-58	-----		1	.					RESISTOR, VAR: (SEE R345 EPL)		
-59	343-0496-03		3	.					CLIP, SWITCH: FRONT, 10 MM X 3 UNIT (ATTACHING PARTS FOR EACH)	80009	343-0496-03
-60	210-3033-00		3	.					EYELET, METALLIC: 0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-61	343-0497-03		3	.					CLIP, SWITCH: REAR, 10 MM X 3 UNIT (ATTACHING PARTS FOR EACH)	80009	343-0497-03
-62	210-3033-00		3	.					EYELET, METALLIC: 0.59 OD X 0.156 INCH LONG - - - * - - -	07707	SE-25
-63	136-0269-02		5	.					SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	01295	C95140
-64	384-1876-00		1	.					EXTENSION SHAFT:	80009	384-1876-00
-65	200-1731-00		1	.					COVER, ELEC SW: 1.9 X 1.0 INCH (ATTACHING PARTS)	80009	200-1731-00
-66	211-0034-00		1	.					SCREW, MACHINE: 2-56 X 0.50 INCH, PNH	83385	OBD
-67	210-0850-00		1	.					WASHER, FLAT: 0.093 ID X 0.281 INCH OD - - - * - - -	12327	OBD
-68	-----		1	.					SWITCH, PUSH: 4 PDT (SEE S1200 EPL) (ATTACHING PARTS)		
-69	211-0008-00		2	.					SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL - - - * - - -	83385	OBD
-70	407-1873-00		1	.					BRACKET, ANGLE: POWER SWITCH (ATTACHING PARTS)	80009	407-1873-00
-71	210-0457-00		4	.					NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL - - - * - - -	83385	OBD
-72	210-0202-00		1	.					TERMINAL, LUG: 0.146 ID, LOCKING, BRZ TINNED (ATTACHING PARTS)	78189	2104-06-00-2520N
-73	210-0457-00		1	.					NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL	83385	OBD
-74	211-0507-00		1	.					SCREW, MACHINE: 6-32 X 0.312 INCH, PNH STL - - - * - - -	83385	OBD
-75	210-0202-00		1	.					TERMINAL, LUG: 0.146 ID, LOCKING, BRZ TINNED (ATTACHING PARTS)	78189	2104-06-00-2520N
-76	210-0457-00		1	.					NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL - - - * - - -	83385	OBD
-77	351-0181-03		4	.					GUIDE, SLIDE: LWR, PLUG-IN UNIT (ATTACHING PARTS FOR EACH)	80009	351-0181-03
-78	213-0146-00		1	.					SCR, TPG, THD FOR: 6-20 X 0.313 INCH, PNH STL - - - * - - -	83385	OBD
-79	441-1286-00		1	.					CHAS, PL-IN UNIT: TOP (ATTACHING PARTS)	80009	441-1286-00
-80	211-0507-00		3	.					SCREW, MACHINE: 6-32 X 0.312 INCH, PNH STL	83385	OBD
-81	210-0457-00		3	.					NUT, PLAIN, EXT W: 6-32 X 0.312 INCH, STL - - - * - - -	83385	OBD
-82	-----		1	.					CKT BOARD ASSY: VERTICAL INTERFACE (SEE A8 EPL) (ATTACHING PARTS)		
-83	211-0155-00		2	.					SCREW, EXT, RLV B: 4-40 X 0.375 INCH, SST - - - * - - -	80009	211-0155-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
4-	-----	-----	-	.	.	.	.	.	CKT BOARD ASSY INCLUDES:		
-84	361-0238-00		2	.	.	.	.	.	SPACER,SLEEVE:0.25 OD X 0.34 INCH LONG	80009	361-0238-00
-85	136-0263-04		5	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-86	136-0252-04		6	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-00		38	.	.	.	.	.	SOCKET,PIN TERM:0.145 INCH LONG	00779	2-330808-7
-87	136-0269-02		1	.	.	.	.	.	SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C95140
-88	131-1003-00		6	.	.	.	.	.	CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-89	-----	-----	1	.	.	.	.	.	MICROCKT,LI:FREQ DIFF AMPL(SEE U4625,4685 EPL) (ATTACHING PARTS)		
-90	210-0406-00		2	.	.	.	.	.	NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-91	210-0906-00		2	.	.	.	.	.	WASHER,NONMETAL:FIBER,0.125 ID X 0.203"OD	86928	OBD
				-	-	-	-	-	* - - - -		
-92	131-1429-00		2	.	.	.	.	.	CONTACT,ELEC:IC GND,DUAL	80009	131-1429-00
-93	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:HORIZ INTERFACE(SEE A11 EPL) (ATTACHING PARTS)		
-94	211-0008-00		2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
				-	-	-	-	-	* - - - -		
				-	.	.	.	.	CKT BOARD INCLUDES:		
-95	131-1003-00		6	.	.	.	.	.	CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-96	136-0252-04		6	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-97	136-0260-02		1	.	.	.	.	.	SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C9316-18
-98	136-0263-04		5	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-99	-----	-----	1	.	.	.	.	.	SWITCH,SLIDE:(SEE S865 EPL)		
-100	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:HORIZ INTCON(SEE A10 EPL) (ATTACHING PARTS)		
-101	211-0008-00		2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
				-	-	-	-	-	* - - - -		
				-	.	.	.	.	CKT BOARD ASSY INCLUDES:		
-102	131-1003-00		4	.	.	.	.	.	CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-103	136-0252-04		4	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-104	136-0263-04		8	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-105	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:TRIGGER AMPL(SEE A7 EPL)		
-106	131-0608-00		6	.	.	.	.	.	TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-107	136-0252-04		77	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-108	131-1003-00		5	.	.	.	.	.	CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-109	136-0269-02		2	.	.	.	.	.	SOCKET,PLUG-IN:14 CONTACT,LOW CLEARANCE	01295	C95140
-110	136-0263-04		16	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-111	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:LOGIC(SEE A6 EPL)		
-112	136-0241-00		4	.	.	.	.	.	SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-113	214-0579-00		9	.	.	.	.	.	TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-114	136-0220-00	B010100 B021061	15	.	.	.	.	.	SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
	136-0252-04	B021062	45	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-115	131-1003-00		2	.	.	.	.	.	CONNECTOR BODY,:CKT BD MT,2 PRONG	80009	131-1003-00
-116	136-0252-04		46	.	.	.	.	.	SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-117	136-0260-02		3	.	.	.	.	.	SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C9316-18
-118	136-0263-04		41	.	.	.	.	.	SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	48059
-119	-----	-----	1	.	.	.	.	.	CKT BOARD ASSY:MAIN INTERFACE(SEE A3 EPL) (ATTACHING PARTS)		
-120	211-0507-00		4	.	.	.	.	.	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-121	210-0457-00		4	.	.	.	.	.	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
				-	-	-	-	-	* - - - -		
				-	.	.	.	.	CKT BOARD ASSY INCLUDES:		
-122	131-0930-00		6	.	.	.	.	.	CONTACT,ELEC:PLUG-IN GROUND (ATTACHING PARTS FOR EACH)	80009	131-0930-00
-123	210-0586-00		1	.	.	.	.	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-124	211-0008-00		1	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
				-	-	-	-	-	* - - - -		
-125	131-0800-00		2	CONTACT,ELEC:PLUG-IN GROUND (ATTACHING PARTS FOR EACH)	80009	131-0800-00
-126	213-0138-00		2	SCR,TPG,THD FOR:4-40 X 0.188 INCH,PNH STL	83385	OBD
				-	-	-	-	-	* - - - -		

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Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-127	426-0813-00		1	.	FRAME, PL-IN HSG: REAR (ATTACHING PARTS)	80009	426-0813-00
-128	213-0034-00	B010100 B020349	12	.	SCR, TPG, THD CTG: 4-40 X 0.188 INCH, PNH STL	83385	OBD
	213-0263-00	B020350	12	.	SCREW, TPG, TF: 4-24 X 0.375 INCH, PNH STL	83385	OBD
	131-0767-05		2	.	CONNECTOR, RCPT, : PLUG-IN CKT BD, 35/70 CONT (ATTACHING PARTS FOR EACH)	80009	131-0767-05
-129	213-0232-00		2	.	SCR, TPG, THD FOR: 2-32 X 0.312 INCH, PNH STL	83385	OBD
	-----		-	.	EACH CONNECTOR INCLUDES:		
-130	214-1665-00		1	.	SPRING, FLAT: 2.35 X 0.041 MUSIC WIRE	80009	214-1665-00
-131	131-0726-00		32	.	CONTACT, ELEC: STRAIGHT	80009	131-0726-00
-132	131-0727-00		32	.	CONTACT, ELEC: OFFSET	80009	131-0727-00
-133	204-0365-02		1	.	BODY, CONNECTOR: PLUG-IN CIRCUIT CARD	80009	204-0365-02
-134	200-0950-00		2	.	COVER, ELEC CONN: PLASTIC	80009	200-0950-00
	131-0767-07		2	.	CONNECTOR, RCPT, : PLUG-IN CKT BD, 70 CONTACT (ATTACHING PARTS FOR EACH)	80009	131-0767-07
-135	213-0232-00		2	.	SCR, TPG, THD FOR: 2-32 X 0.312 INCH, PNH STL	83385	OBD
	-----		-	.	EACH CONNECTOR INCLUDES:		
-136	131-0726-00		35	.	CONTACT, ELEC: STRAIGHT	80009	131-0726-00
-137	131-0727-00		35	.	CONTACT, ELEC: OFFSET	80009	131-0727-00
-138	204-0365-02		1	.	BODY, CONNECTOR: PLUG-IN CIRCUIT CARD	80009	204-0365-02
-139	200-0950-00		2	.	COVER, ELEC CONN: PLASTIC	80009	200-0950-00
-140	220-0561-00		2	.	NUT, PLAIN, HEX.: 10-32 X 0.25 INCH, BRS	80009	220-0561-00
-141	131-0805-00		1	.	LINK, TERM. CONNE: J-SHAPE, 0.90 X 0.82 X 0.312"	80009	131-0805-00
-142	129-0308-00		4	.	POST, ELEC-MECH: HEX., 0.25 X 0.465 INCH LONG (ATTACHING PARTS FOR EACH)	80009	129-0308-00
-143	211-0008-00		1	.	SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-144	131-0804-00		3	.	LINK, TERM. CONNE: J-SHAPE	80009	131-0804-00
-145	131-0591-00		55	.	CONTACT, ELEC: 0.835 INCH LONG	22526	47352
-146	131-0608-00		80	.	TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-147	136-0260-02		2	.	SOCKET, PLUG-IN: 16 CONTACT, LOW CLEARANCE	82647	C9316-18
-148	351-0227-00		2	.	GUIDE-POST, LOCK: 0.84 INCH LONG	80009	351-0227-00
-149	175-1925-00		1	.	CABLE ASSY, RF: 50 OHM COAX, W/CONNECTORS (ATTACHING PARTS)	80009	175-1925-00
-150	210-0586-00		1	.	NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	211-041800-00
-151	211-0097-00		1	.	SCREW, MACHINE: 4-40 X 0.312 INCH, PNH STL	83385	OBD
-152	175-1927-00		1	.	CABLE ASSY, RF: 50 OHM COAX W/CONN, 17" (ATTACHING PARTS)	80009	175-1927-00
-153	210-0586-00		1	.	NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	211-041800-00
-154	211-0097-00		1	.	SCREW, MACHINE: 4-40 X 0.312 INCH, PNH STL	83385	OBD
-155	352-0200-04		1	.	HLDR, TERM CONN: 4 WIRE YELLOW	80009	352-0200-04
-157	131-1003-00		10	.	CONNECTOR BODY, : CKT BD MT, 2 PRONG	80009	131-1003-00
	136-0220-00	B010100 B021061X	3	.	SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
-158	136-0252-04	B010100 B021061	16	.	SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
	136-0252-04	B021062	25	.	SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
-159	214-1568-00		4	.	PIN, GUIDE: 0.119 DIA X 0.25 HEX (ATTACHING PARTS FOR EACH)		
-160	210-0406-00		1	.	NUT, PLAIN, HEX.: 4-40 X 0.188 INCH, BRS	73743	2X12161-402
-161	210-0054-00		1	.	WASHER, LOCK: SPLIT, 0.118 1D X 0.212" OD STL	83385	OBD
-162	344-0147-00		4	.	CLIP, SPR, TNSN: CIRCUIT CARD MOUNTING	80009	344-0147-00
-163	386-1558-00		7	.	SPACER, CKT BD: 0.335 H, ACETAL	80009	386-1558-00
-164	131-0592-00		17	.	CONTACT, ELEC: 0.885 INCH LONG	22526	47353
-165	136-0269-02		1	.	SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	01295	C95140
	198-3014-00		1	.	WIRE SET, ELEC:	80009	198-3014-00
-166	426-1291-00		2	.	FRAME SECT, CAB.: BOTTOM	80009	426-1291-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
4-	198-2317-00		1		WIRE SET, ELEC:	80009	198-2317-00
-167	352-0169-01		1		. CONN BODY, PL, EL:2 WIRE BROWN	80009	352-0169-01
	352-0169-02		2		. CONN BODY, PL, EL:2 WIRE RED	80009	352-0169-00
	352-0169-03		2		. CONN BODY, PL, EL:2 WIRE ORANGE	80009	352-0169-03
-168	352-0162-02		2		. CONN BODY, PL, EL:4 WIRE RED	80009	352-0162-02
	352-0162-07		2		. CONN BODY, PL, EL:4 WIRE VIOLET	80009	352-0162-07
-169	352-0164-04		2		. CONN BODY, PL, EL:6 WIRE YELLOW	80009	352-0164-04
-170	352-0165-06		2		. CONN BODY, PL, EL:7 WIRE BLUE	80009	352-0165-06
-171	352-0166-03		2		. CONN BODY, PL, EL:8 WIRE ORANGE	80009	352-0166-03
	352-0166-04		2		. CONN BODY, PL, EL:8 WIRE YELLOW	80009	352-0166-04
-172	352-0168-02		2		. CONN BODY, PL, EL:10 WIRE RED	80009	352-0168-02
	352-0168-03		2		. CONN BODY, PL, EL:10 WIRE ORANGE	80009	352-0168-03
-173	175-0825-00		FT		. WIRE, ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00
-174	175-0827-00		FT		. WIRE, ELECTRICAL:4 WIRE RIBBON	08261	SS-0426-710610C
-175	175-0829-00		FT		. WIRE, ELECTRICAL:6 WIRE RIBBON	08261	SS-0626-710610C
-176	175-0830-00		FT		. WIRE, ELECTRICAL:7 WIRE RIBBON	08261	SS-0726-710610C
-177	175-0831-00		FT		. WIRE, ELECTRICAL:8 WIRE RIBBON	08261	0BD
-178	175-0832-00		FT		. WIRE, ELECTRICAL:9 WIRE RIBBON	08261	SS-0926(1061)0C
-179	175-0833-00		FT		. WIRE, ELECTRICAL:10 WIRE RIBBON	08261	0BD
	175-0855-00		FT		. WIRE, ELECTRICAL:10 WIRE RIBBON	08261	SS-1022(1061)0C
-180	131-0707-00		120		. CONNECTOR, TERM.:22-26 AWG, BRS CU BE GOLD	22526	47439
-181	210-0775-00		2		. EYELET, METALLIC:0.126 OD X 0.23 INCH L, BRS	80009	210-0775-00
-182	210-0774-00		2		. EYELET, METALLIC:0.152 OD X 0.245 INCH L, BRS	80009	210-0774-00
-183	-----		2		CKT BOARD ASSY:50 OHM FOLLOWER(SEE A4 & A5 EPL)		

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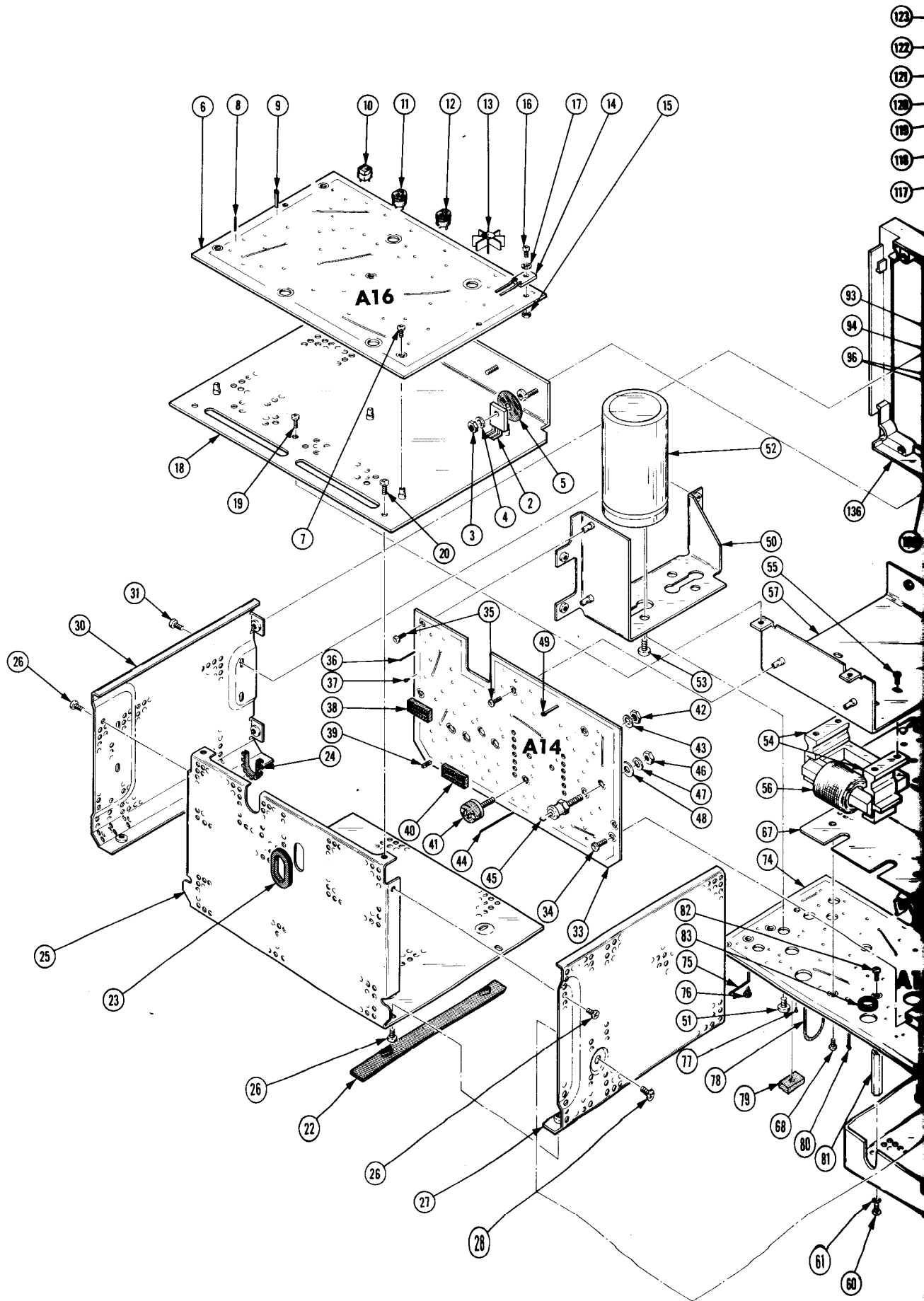
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
5-	620-0250-00		1						POWER SUPPLY: (ATTACHING PARTS)	80009	620-0250-00
-1	211-0578-00		4						SCREW,MACHINE:6-32 X 0.438 INCH,PNH STL -----*	83385	OBD
-2	-----		-						. POWER SUPPLY INCLUDES: 5 . TRANSISTOR:(SEE Q1428,1538,1588,1498,1458 EPL) (ATTACHING PARTS FOR EACH)		
-3	210-0407-00		1						. NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-4	210-0071-00		1						. WASHER,SPR TNSN:0.146 ID X 0.323" OD,STL	78189	4706-05-01-0531
-5	342-0136-00		1						. INSULATOR,WSHR:0.812 OD X 0.0025 INCH THK -----*	04713	OBD
-6	-----		1						. CKT BOARD ASSY:LOW VOLTAGE RGLTR(SEE A16 EPL) (ATTACHING PARTS)		
-7	211-0008-00		5						. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL -----*	83385	OBD
-8	131-0608-00		39						. . . CKT BOARD ASSY INCLUDES: . . . TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-9	214-0579-00		9						. . . TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-10	136-0220-00	B010100 B021061	6						. . . SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
	136-0252-04	B021062	18						. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-11	136-0235-00		8						. . . SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-12	136-0183-00	B010100 B021061	7						. . . SOCKET,PLUG-IN:3 PIN,ROUND	80009	136-0183-00
	136-0252-04	B021062	21						. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-13	214-1291-00	B010100 B022597	2						. . . HEAT SINK,ELEC:XSTR,0.72 OD X 0.375"H	05820	207-AB
	210-0629-00	B022598	2						. . . EYELET,METALLIC:0.059 OD X 0.093 L,BRS	80009	210-0629-00
-14	-----		1						. . . TRANSISTOR:(SEE Q1555 EPL) (ATTACHING PARTS)		
-15	210-0551-00		1						. . . NUT,PLAIN,HEX.:4-40 X 0.25 INCH,STL	83385	OBD
-16	211-0097-00		1						. . . SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-17	210-1122-00		1						. . . WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL -----*	04713	B52200F006
-18	441-1304-00		1						. CHASSIS,SCOPE: (ATTACHING PARTS)	80009	441-1304-00
-19	211-0008-00		2						. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-20	211-0503-00		2						. SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL	83385	OBD
-21	211-0507-00		3						. SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL -----*	83385	OBD
-22	351-0279-00		2						. GUIDE,SHOE:5.18 X 0.375,NYLON	80009	351-0279-00
-23	348-0233-00		1						. GROMMET,PLASTIC:GRAY,OVAL SHAPE,0.927 ID	80009	348-0233-00
-24	255-0334-00		1						. PLASTIC CHANNEL:12.75 X 0.175 X 0.155,NYLON	11897	122-37-2500
-25	200-1906-00		1						. COVER,PWR SPLY:BOTTOM AND FRONT (ATTACHING PARTS)	80009	200-1906-00
-26	211-0503-00		6						. SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL -----*	83385	OBD
-27	200-1263-01		1						. COVER,PWR SPLY:RIGHT SIDE (ATTACHING PARTS)	80009	200-1263-01
-28	211-0503-00		1						. SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL	83385	OBD
-29	211-0504-00		2						. SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL -----*	83385	OBD
-30	200-1262-02		1						. COVER,PWR SPLY:LEFT SIDE (ATTACHING PARTS)	80009	200-1262-02
-31	211-0503-00		4						. SCREW,MACHINE:6-32 X 0.188 INCH,PNH STL	83385	OBD
-32	211-0504-00		2						. SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL -----*	83385	OBD
-33	-----		1						. CKT BOARD ASSY:CAP RECTIFIER(SEE A14 EPL) (ATTACHING PARTS)		
-34	211-0504-00		1						. SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
-35	211-0008-00		4						. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL -----*	83385	OBD
-36	131-0608-00		22						. . . CKT BOARD INCLUDES: . . . TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
	136-0220-00	B010100 B021061X	2						. . . SOCKET,PLUG-IN:3 PIN,SQUARE	71785	133-23-11-034
-37	136-0252-04	B010100 B021061	6						. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B021062	12						. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
5-38	136-0269-02			1	.	.	.	.	.	SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	01295	C95140
-39	136-0263-04			7	.	.	.	.	.	SOCKET, PIN TERM: FOR 0.025 INCH SQUARE PIN	22526	48059
-40	136-0260-02			1	.	.	.	.	.	SOCKET, PLUG-IN: 16 CONTACT, LOW CLEARANCE	82647	C9316-18
-41	-----			1	.	.	.	.	.	SW, THERMOSTATIC: (SEE S1305 EPL) (ATTACHING PARTS)		
-42	210-0407-00			1	.	.	.	.	.	NUT, PLAIN, HEX.: 6-32 X 0.25 INCH, BRS	73743	3038-0228-402
-43	210-0802-00			1	.	.	.	.	.	WASHER, FLAT: 0.15 ID X 0.312 INCH OD	12327	OBD
-44	131-0589-00			4	.	.	.	.	.	TERM, PIN: 0.46 L X 0.025 SQ. PH BRZ GL	22526	47350
-45	-----			6	.	.	.	.	.	SEMICONV DEVICE: (SEE CR1310, 1313, 1345, 1346, 1347, 1348 EPL) (ATTACHING PARTS FOR EACH)		
-46	210-0410-00			1	.	.	.	.	.	NUT, PLAIN, HEX.: 10-32 X 0.312 INCH, BRS	73743	2X20003-402
-47	210-0056-00			1	.	.	.	.	.	WASHER, LOCK: SPLIT, 0.195 ID X 0.32" OD, P BRZ	83385	OBD
-48	210-1003-00			1	.	.	.	.	.	WASHER, FLAT: # 10 X 0.036 THICK, BRS	12327	OBD
-49	214-0579-00			2	.	.	.	.	.	TERM., TEST PT: BRS CD PL	80009	214-0579-00
-50	407-0964-01			1	.	.	.	.	.	BRACKET, CAP. MTG: (ATTACHING PARTS)	80009	407-0964-01
-51	212-0518-00			4	.	.	.	.	.	SCREW, MACHINE: 10-32 X 0.312 INCH, PNH STL	83385	OBD
-52	-----			2	.	.	.	.	.	CAP., FXD, ELCTLT: (C1216, C1217 EPL) (ATTACHING PARTS FOR EACH)		
-53	212-0518-00			2	.	.	.	.	.	SCREW, MACHINE: 10-32 X 0.312 INCH, PNH STL	83385	OBD
-54	386-2041-00			2	.	.	.	.	.	SUPPORT, XFMR: (ATTACHING PARTS FOR EACH)	80009	386-2041-00
-55	211-0008-00			2	.	.	.	.	.	SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-56	-----			1	.	.	.	.	.	XFMR, PWR, STPDN: (SEE T1310 EPL)		
-57	441-1314-00			1	.	.	.	.	.	CHASSIS, XFMR: (ATTACHING PARTS)	80009	441-1314-00
-58	211-0097-00			2	.	.	.	.	.	SCREW, MACHINE: 4-40 X 0.312 INCH, PNH STL	83385	OBD
-59	337-1490-00			1	.	.	.	.	.	SHLD, ELECTRICAL: CIRCUIT CARD (ATTACHING PARTS)	80009	337-1490-00
-60	211-0040-00			2	.	.	.	.	.	SCREW, MACHINE: 4-40 X 0.25", BDGH PLSTC	26365	OBD
-61	210-0054-00			2	.	.	.	.	.	WASHER, LOCK: SPLIT, 0.118 ID X 0.212" OD STL	83385	OBD
-62	220-0623-00			1	.	.	.	.	.	NUT BLOCK: 0.375 X 0.5 X 0.448 (ATTACHING PARTS)	80009	220-0623-00
-63	211-0504-00			1	.	.	.	.	.	SCREW, MACHINE: 6-32 X 0.25 INCH, PNH STL	83385	OBD
-64	-----			2	.	.	.	.	.	TRANSISTOR: (SEE Q1234, Q1241 EPL) (ATTACHING PARTS FOR EACH)		
-65	210-0586-00			2	.	.	.	.	.	NUT, PLAIN, EXT W: 4-40 X 0.25 INCH, STL	78189	211-041800-00
-66	386-0978-00			2	.	.	.	.	.	INSULATOR, PLATE: TRANSISTOR, MICA	80009	386-0978-00
-67	337-1826-00			1	.	.	.	.	.	SHIELD, ELEC: LINE-INVERT, TOP (ATTACHING PARTS)	80009	337-1826-00
-68	211-0008-00			3	.	.	.	.	.	SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
-69	211-0101-00			2	.	.	.	.	.	SCREW, MACHINE: 4-40 X 0.25" 100 DEG, FLH STL	83385	OBD
-70	344-0118-00			2	.	.	.	.	.	SHIELD INCLUDES: CLIP, SPG TENS: CAPACITOR MTG (ATTACHING PARTS FOR EACH)	80033	E50008-044
-71	210-0623-00			1	.	.	.	.	.	RIVET, TUBULAR:	12014	R-3682
-72	386-2634-00			1	.	.	.	.	.	PL, CHOKE MTG: (ATTACHING PARTS)	80009	386-2634-00
-73	211-0619-00			2	.	.	.	.	.	SCREW, MACHINE: 6-32 X 1.5 INCH, FLH STL	83385	OBD

Replaceable Mechanical Parts—7834

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
5-74	-----	-----		1	.	.	.	.	.	CKT BOARD ASSY:PWR SPLY INVT(SEE A15 EPL)		
-75	131-0591-00			7	.	.	.	.	.	CONTACT,ELEC:0.835 INCH LONG	22526	47352
-76	348-0023-00			6	.	.	.	.	.	PLUG,HOLE:	02768	207090201000101
-77	136-0254-01			4	.	.	.	.	.	SOCKET,PIN TERM:0.145 INCH LONG	00779	1-331892-8
-78	346-0032-00			1	.	.	.	.	.	STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-79	361-0414-00			1	.	.	.	.	.	SPACER,DIODE:	80009	361-0414-00
-80	214-0579-00			3	.	.	.	.	.	TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-81	129-0323-00			2	.	.	.	.	.	POST,ELEC-MECH:HEX,0.25 X 1 INCH LONG (ATTACHING PARTS FOR EACH)	80009	129-0323-00
-82	211-0097-00			1	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-83	348-0005-00			1	.	.	.	.	.	GROMMET,RUBBER:0.50 INCH DIA	70485	230
-84	355-0518-02			4	.	.	.	.	.	STUD,PRESSMOUNT:4-40 X 0.625 INCH,BRASS	80009	355-0518-02
-85	348-0023-00			6	.	.	.	.	.	PLUG,HOLE:	02768	207090201000101
-86	342-0103-00			1	.	.	.	.	.	INSULATOR,BLOCK:HEAT-SINK SHIELD,NYLON (ATTACHING PARTS)	80009	342-0103-00
-87	210-0457-00			1	.	.	.	.	.	NUT,PLAIN,EXT W:6-32 X 0.312 INCH,STL	83385	OBD
-88	211-0512-00			1	.	.	.	.	.	SCREW,MACHINE:6-32 X 0.50" 100 DEG,FLH STL	83385	OBD
-89	213-0041-00			2	.	.	.	.	.	SCR,TPG,THD CTG:6-32 X 0.375 INCH,TRH STL - - - * - - -	83385	OBD
-90	214-1625-00			1	.	.	.	.	.	SPRING,FLAT:2.0 INCH LONG,BOWED	80009	214-1625-00
-91	214-1871-00			1	.	.	.	.	.	HEAT SINK,SHLD:	80009	214-1871-00
-92	342-0193-00			1	.	.	.	.	.	INSULATOR,PLATE:	80009	342-0193-00
-93	-----			1	.	.	.	.	.	SWITCH,SLIDE:CONTROL ILLUM(SEE S1314 EPL) (ATTACHING PARTS)		
-94	210-0586-00			2	.	.	.	.	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-95	211-0097-00			2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-96	210-0202-00	B010100	B021052	2	.	.	.	.	.	TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
	210-0202-00	B021053		1	.	.	.	.	.	TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
	210-0204-00	B021053		1	.	.	.	.	.	TERMINAL,LUG:0.146 INCH DIA DE,45 DEG BEND (ATTACHING PARTS)	78189	2157-06-01-2520N
-97	210-0586-00	B010100	B021052	2	.	.	.	.	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
	210-0407-00	B021053		3	.	.	.	.	.	NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-98	211-0510-00	B010100	B021052	1	.	.	.	.	.	SCREW,MACHINE:6-32 X 0.375 INCH,PNH STL	83385	OBD
	211-0511-00	B021053		1	.	.	.	.	.	SCREW,MACHINE:6-32 X 0.50 INCH,PNH STL - - - * - - -	83385	OBD
-99	-----			1	.	.	.	.	.	SWITCH,SLIDE:LINE VOLTAGE SEL(SEE S1212 EPL) (ATTACHING PARTS)		
-100	210-0586-00			2	.	.	.	.	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-101	211-0097-00			2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-102	-----			1	.	.	.	.	.	FILTER,RFI:(SEE FL1200 EPL) (ATTACHING PARTS)		
-103	210-0586-00			2	.	.	.	.	.	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL	78189	211-041800-00
-104	210-0201-00			1	.	.	.	.	.	TERMINAL,LUG:SE #4	86928	A373-157-2
-105	211-0014-00			2	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL - - - * - - -	83385	OBD
-106	352-0362-00			1	.	.	.	.	.	FUSEHOLDER: W/MOUNTING HARDWARE	75915	345001
-107	210-0873-00			1	.	.	.	.	.	WASHER,NONMETAL:0.5 ID X 0.688 INCH OD,NPRN	70485	OBD
-108	214-2299-00			1	.	.	.	.	.	HEAT SINK,ELEC:POWER SUPPLY	80009	214-2299-00
-109	-----			1	.	.	.	.	.	CKT BOARD ASSY:READOUT(SEE A13 EPL) (ATTACHING PARTS)		
-110	211-0507-00			2	.	.	.	.	.	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL - - - * - - -	83385	OBD
-111	131-0771-00			2	.	.	.	.	.	CKT BOARD ASSY INCLUDES: CONN,RCPT,ELEC:4 CONT,QUICK DISCONNECT (ATTACHING PARTS FOR EACH)	0000A	ROA-304NYL
-112	220-0551-00			1	.	.	.	.	.	NUT,PLAIN,HEX.:9 MM X 0.437 INCH - - - * - - -	73743	OBD
-113	386-2153-00			1	.	.	.	.	.	PANEL,REAR:READOUT	80009	386-2153-00
-114	441-1065-00			1	.	.	.	.	.	CHAS,PL-IN UNIT:READOUT (ATTACHING PARTS)	80009	441-1065-00
-115	211-0097-00			4	.	.	.	.	.	SCREW,MACHINE:4-40 X 0.312 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
5-116	136-0252-04	B010100	B021061	5	.	SOCKET, PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	B021062		38	.	SOCKET, PIN TERM:0.188 INCH LONG	22526	75060
-117	136-0220-00	B010100	B021061X	11	.	SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
-118	136-0235-00			1	.	SOCKET, PLUG-IN: 6 CONTACT, ROUND	71785	133-96-12-062
-119	131-0608-00			24	.	TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-120	131-1003-00			5	.	CONNECTOR BODY, :CKT BD MT, 2 PRONG	80009	131-1003-00
-121	214-0579-00			2	.	TERM., TEST PT: BRS CD PL	80009	214-0579-00
-122	136-0260-02			12	.	SOCKET, PLUG-IN: 16 CONTACT, LOW CLEARANCE	82647	C9316-18
-123	136-0269-02			3	.	SOCKET, PLUG-IN: 14 CONTACT, LOW CLEARANCE	01295	C95140
	198-1885-03			1	.	WIRE SET, ELEC:	80009	198-1885-03
-124	-----			1		CKT BOARD ASSY: SIGNAL OUT(SEE A12 EPL) (ATTACHING PARTS)		
-125	211-0507-00			2		SCREW, MACHINE: 6-32 X 0.312 INCH, PNH STL	83385	OBD
	-----			1	.	CKT BOARD ASSY INCLUDES:		
-126	131-1315-00			2	.	CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR235-1
-127	131-0955-00			3	.	CONNECTOR, PLUG-IN: :BNC, FEMALE, W/HARDWARE	13511	31-279
-128	333-2099-00			1	.	PANEL, REAR:	80009	333-2099-00
-129	441-1064-00			1	.	CHAS, PL-IN UNIT: SIGNALS OUT (ATTACHING PARTS)	80009	441-1064-00
-130	211-0008-00			3	.	SCREW, MACHINE: 4-40 X 0.25 INCH, PNH STL	83385	OBD
	136-0220-00	B010100	B021061X	6	.	SOCKET, PLUG-IN: 3 PIN, SQUARE	71785	133-23-11-034
-131	131-1003-00			5	.	CONNECTOR BODY, :CKT BD MT, 2 PRONG	80009	131-1003-00
-132	136-0252-04	B010100	B021061	23	.	SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
	136-0252-04	B021062		41	.	SOCKET, PIN TERM: 0.188 INCH LONG	22526	75060
-133	131-0608-00			5	.	TERMINAL, PIN: 0.365 L X 0.25 PH, BRZ, GOLD PL	22526	47357
-134	-----			1	.	SWITCH, SLIDE: SWEEP(SEE S3320 EPL)		
-135	-----			1	.	SWITCH, SLIDE: GATE(SEE S3340 EPL)		
	198-3015-00			1	.	WIRE SET, ELEC:	80009	198-3015-00
-136	426-0807-02			1	.	FRAME PNL, CAB.: REAR (ATTACHING PARTS)	80009	426-0807-02
-137	213-0270-00			4	.	SCR, TPG, THD FOR: 10-32 X 0.75 INCH FILH STL	83385	OBD
-138	352-0169-00			1	.	HLD, TERM CONN: 2 WIRE BLACK	80009	352-0169-00
-139	352-0161-01			2	.	CONN BODY, PL, EL: 3 WIRE BROWN	80009	352-0161-01
	352-0161-02			1	.	CONN BODY, PL, EL: 3 WIRE RED	80009	352-0161-02
-140	352-0164-02			2	.	CONN BODY, PL, EL: 6 WIRE RED	80009	352-0164-02
-141	352-0167-04			2	.	CONN BODY, PL, EL: 9 WIRE YELLOW	80009	352-0167-04
-142	175-0825-00			FT	.	WIRE, ELECTRICAL: 2 WIRE RIBBON	80009	175-0825-00
-143	175-0826-00			FT	.	WIRE, ELECTRICAL: 3 WIRE RIBBON	80009	175-0826-00
	175-0862-00			FT	.	WIRE, ELECTRICAL: 3 WIRE RIBBON	08261	SS-0322-1910610C
-144	175-0859-00			FT	.	WIRE, ELECTRICAL: 6 WIRE RIBBON	08261	SS-0622-1910610C
-145	175-0856-00			FT	.	WIRE, ELECTRICAL: 9 WIRE RIBBON	08261	SS-0922-1910610C
-146	131-0861-00			4	.	TERM, QIK DISC: 16-20 AWG, 0.22 W X 0.02 THK	00779	42617-2
-147	131-0707-00			41	.	CONNECTOR, TERM.: 22-26 AWG, BRS CU BE GOLD	22526	47439
-148	175-1091-00			IN	.	CABLE, SP, ELEC: (4) #18 STRANDED WIRE	80009	175-1091-00
-149	200-1075-00			4	.	COVER, ELEC CONN: PLASTIC	00779	1-480435-0



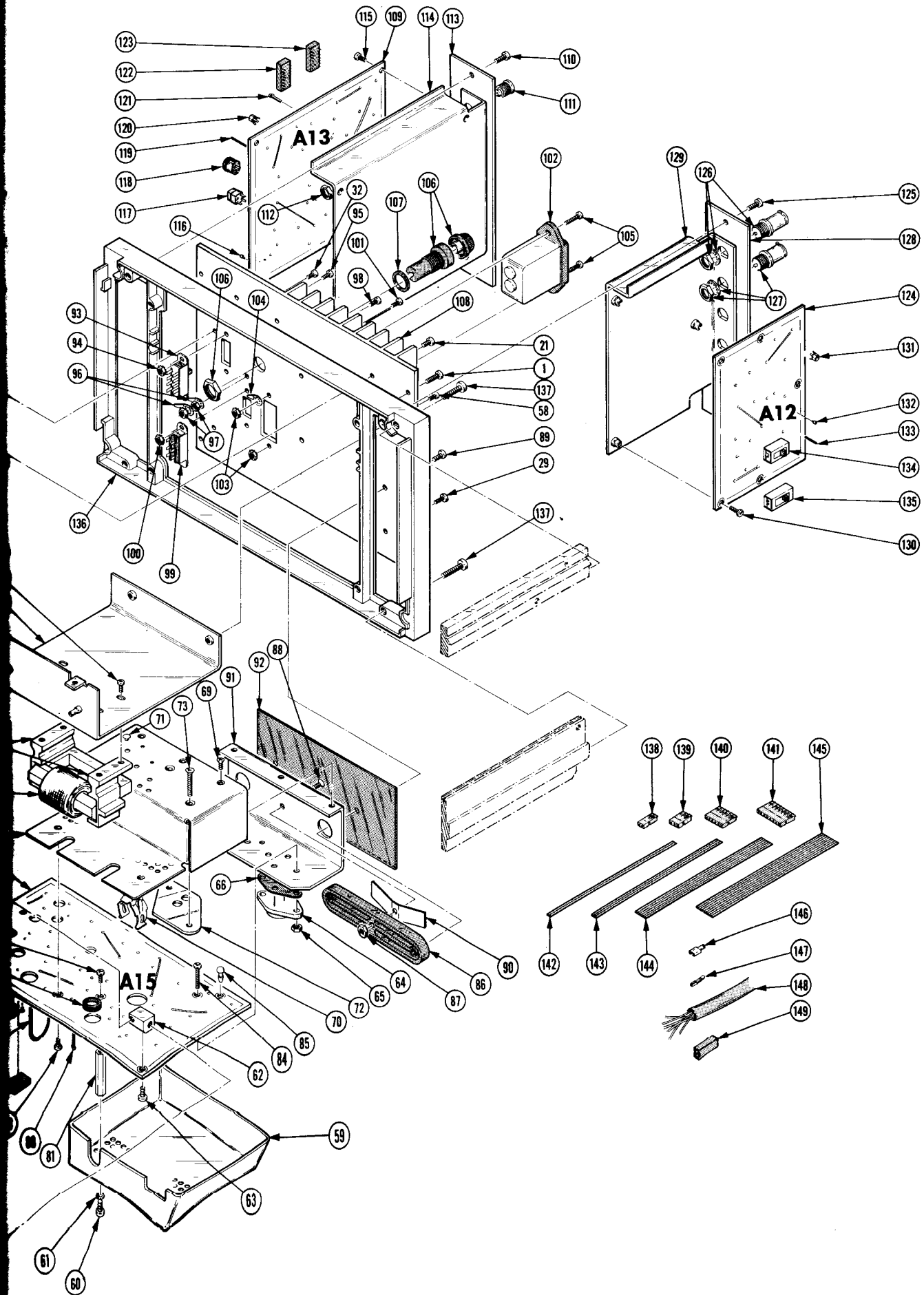


FIG. 3 POWER SUPPLY

7834 STORAGE OSCILLOSCOPE

OPTION 1

Without Readout Circuit Board

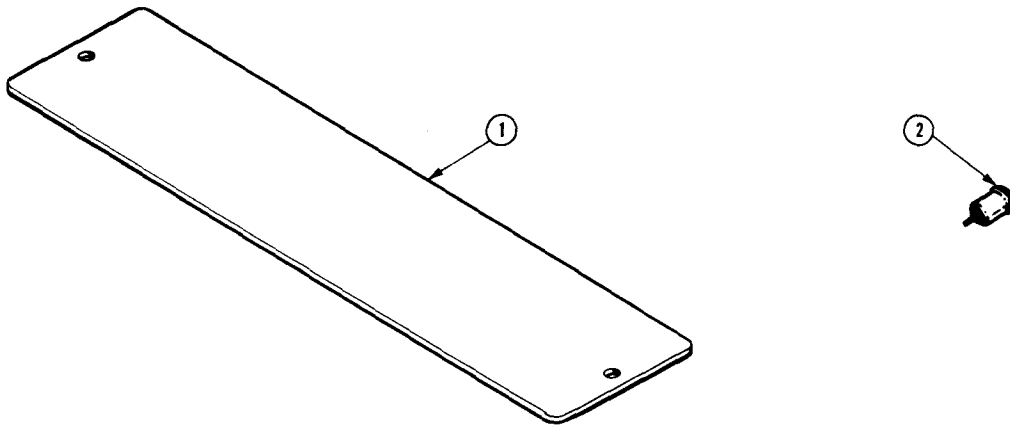


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty					Name & Description	Mfr Code	Mfr Part Number
				1	2	3	4	5			

OPTION 1

-1	200-1352-00			1					COVER, ACCESS:	80009	200-1352-00
-2	131-2016-00			1					PLUG-GND: PELTOLA	80009	131-2016-00

OPTION 2

X-Y Compensation

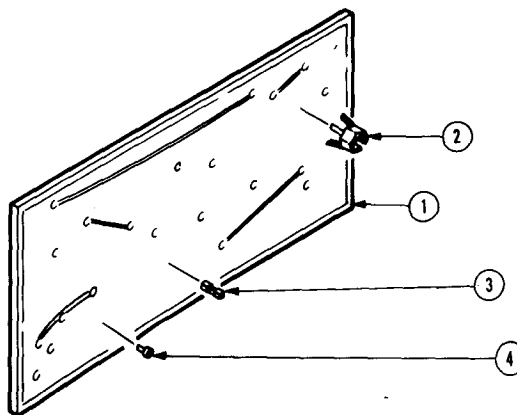


Fig. & Index No.

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty					Name & Description	Mfr Code	Mfr Part Number
				1	2	3	4	5			

OPTION 2

-1	-----			1					CKT CARD ASSY:X-Y COMPENSATION(SEE A9 EPL)		
2	131-1003-00			4					CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-3	136-0263-04			8					SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-4	136-0252-04			20					SOCKET,PIN TERM:0.188 INCH LONG	22526	75060

-1
 -2
 -3
 -4
 -5
 -6
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 -21
 -22

OPTION 3

Electromagnetic Interference (EMI)

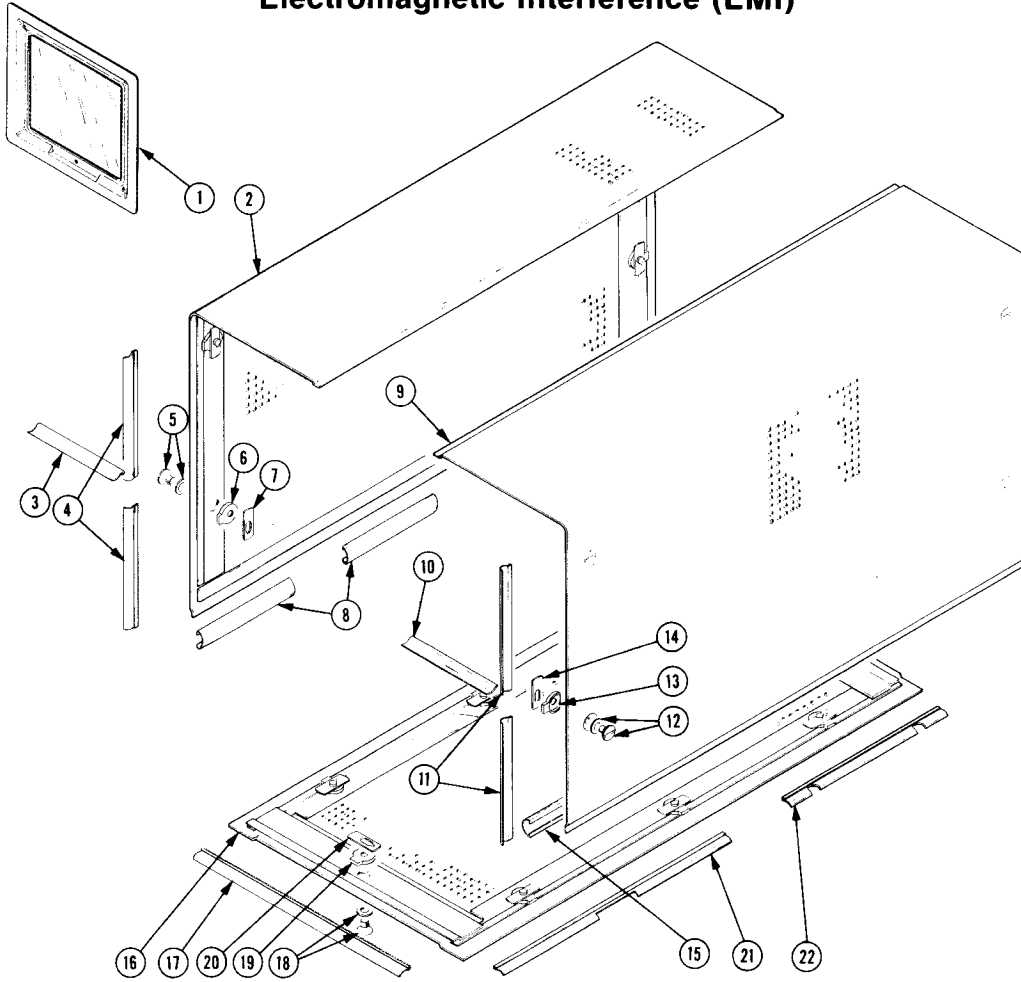


Fig. &
Index
No.

Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	Name & Description					Mfr Code	Mfr Part Number
			1	2	3	4	5		
-1	378-0603-00	1						80009	378-0603-00
-2	390-0550-00	1						80009	390-0550-00
-3	348-0332-00	2						80009	348-0332-00
-4	348-0333-00	4						80009	348-0333-00
-5	214-0603-02	4						80009	214-0603-02
-6	386-1634-00	4						80009	386-1634-00
-7	386-1633-00	4						80009	386-1633-00
-8	348-0336-00	4						80009	348-0336-00
-9	390-0551-00	1						80009	390-0551-00
-10	348-0332-00	2						80009	348-0332-00
-11	348-0333-00	4						80009	348-0333-00
-12	214-0603-02	4						80009	214-0603-02
-13	386-1634-00	4						80009	386-1634-00
-14	386-1633-00	4						80009	386-1633-00
-15	348-0336-00	4						80009	348-0336-00
-16	390-0554-00	1						80009	390-0554-00
-17	348-0274-00	2						80009	348-0274-00
-18	214-0603-02	6						80009	214-0603-02
-19	386-1634-00	6						80009	386-1634-00
-20	386-1633-00	6						80009	386-1633-00
-21	348-0335-00	2						80009	348-0335-00
-22	348-0334-00	2						80009	348-0334-00

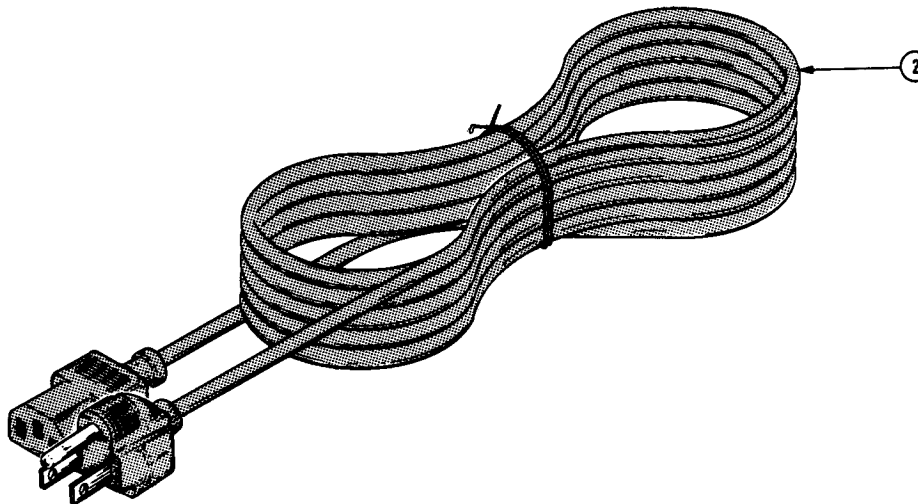
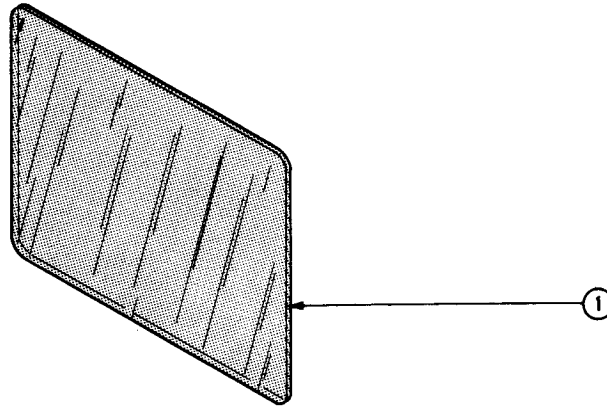


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty						Name & Description	Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5			
STANDARD ACCESSORIES												
-1	378-0625-02			1						FILTER,LT,CRT:GRAY	80009	378-0625-02
	378-0625-08			1						FILTER,LT,CRT:GREEN	80009	378-0625-08
-2	161-0066-00			1						CABLE ASSY,PWR:3 WIRE,98 INCH LONG	80009	161-0066-00
	070-1987-00			1						MANUAL,TECH:OPERATORS	80009	070-1987-00
	070-1988-00			1						MANUAL,TECH:INSTRUCTION	80009	070-1988-00

ACCESSORIES

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107 108	PG 501 - Risetime less than 3.5 ns into 50 Ω . PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 Ω . 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B 191 067-0532-01	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μ s. 2001 - Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.



TEKTRONIX®

*committed to
technical excellence*

MANUAL CHANGE INFORMATION

PRODUCT 7834

CHANGE REFERENCE C5/978

070-1988-00

DATE 9-13-78

CHANGE:

DESCRIPTION

Pilot Change #79

EFF SN B020240

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

CHANGE TO:

R4425 315-0391-00 RES., FXD, CMPSN:390 OHM, 5%, 0.25W

R4425 is located on the LOGIC circuit board and shown on diagram 4.

CHANGE	DESCRIPTION
--------	-------------

EFF SN B141775 (7844) 070-1676-01

EFF SN B140840 (R7844) 070-1676-01

TEST OUT WEEK 18 (R7903) 070-1464-00

TEST OUT WEEK 18 (7904) 070-2390-00

TEST OUT WEEK 18 (7834) 070-1988-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

- | | | |
|-----|-------------|---|
| A27 | 670-1610-09 | CKT BOARD ASSY:POWER SUPPLY INVERTER (7844/R7844) |
| A14 | 670-1610-08 | CKT BOARD ASSY:POWER SUPPLY INVERTER (R7903) |
| A11 | 670-1610-08 | CKT BOARD ASSY:POWER SUPPLY INVERTER (7904) |

REMOVE:

- | | | |
|--------|-------------|---|
| CR1238 | 152-0401-00 | SEMICOND DEVICE:SILICON,3-LAYER,TRIGGER |
|--------|-------------|---|

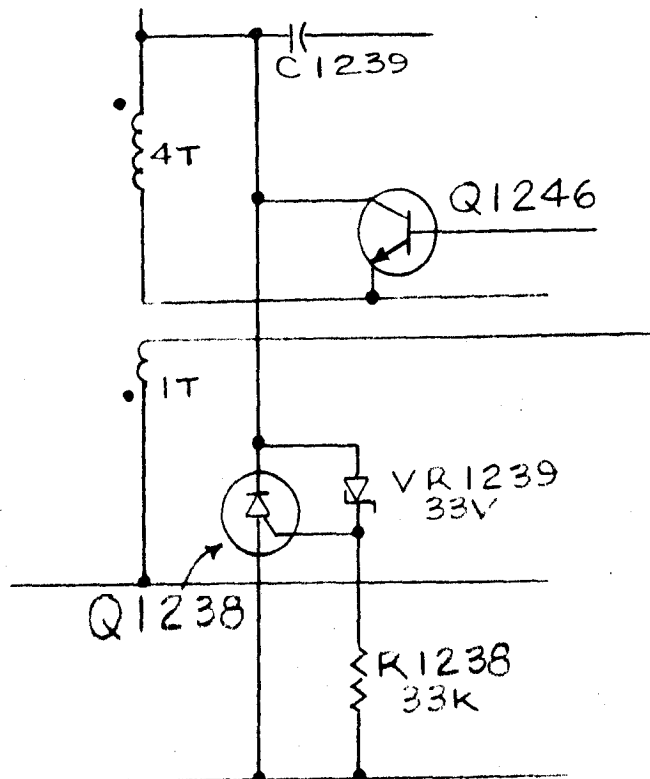
ADD:

- | | | |
|--------|-------------|--|
| Q1238 | 151-0508-00 | TRANSISTOR:SILICON,UJT,2N6027 |
| R1238 | 315-0333-00 | RES.,FXD,CMPSN:33K OHM,5%,0.25W |
| VR1239 | 152-0241-00 | SEMICOND DEVICE:ZENER,0.4W,33V,5%,1N973B |

DIAGRAM **9** CONVERTER/RECTIFIERS (R7903 & 7904)

DIAGRAM **18** CONVERTER/RECTIFIERS (7844/R7844)

DIAGRAM **11** CONVERTER/RECTIFIERS (7834)





MANUAL CHANGE INFORMATION

PRODUCT 7834
070-1988-00

CHANGE REFERENCE M34893
DATE 9-13-78

CHANGE:

DESCRIPTION

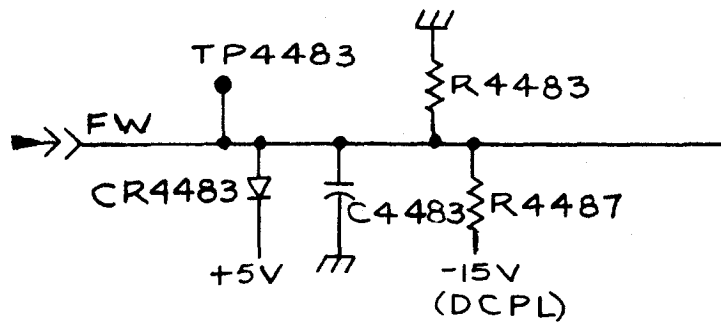
EFF SN B021100

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

ADD:

CR4483 152-0141-02 SEMICOND DEVICE: SILICON, 30V, 150MA, 1N4152
SELECTED WHEN NEEDED

DIAGRAM 4 LOGIC - Partial



Tektronix[®]

COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATIONChange Reference: M35048Date: 3-30-79Product: 7834/R 070-1988-00 EFF SN B021420

CHANGE

DESCRIPTION

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A14	670-3964-01	CKT BOARD ASSY:CAPACITOR RECTIFIER
C1277	283-0212-00	CAP.,FXD,CER DI:2UF,20%,50V
C1278	283-0212-00	CAP.,FXD,CER DI:2UF,20%,50V
R1279	315-0560-00	RES.,FXD,CMPSN:56 OHM,5%,0.25W

The above parts are located on the CAPACITOR RECTIFIER circuit board and shown on diagram 11 CONVERTER AND RECTIFIERS.

Tektronix[®]

COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATIONChange Reference: M35322 Date: 3-29-79 Product: 7834 070-1988-00 EFF SN B021420

CHANGE

DESCRIPTION

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

C1235 283-0060-00 CAP.,FXD,CER DI:100PF,5%,200V

C1235 is located on the POWER SUPPLY INVERTER circuit board assembly and shown on diagram 11 CONVERTER AND RECTIFIERS.

CHANGE	DESCRIPTION
--------	-------------

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A14	670-3964-02	CKT BOARD ASSY:CAPACITOR RECTIFIER
CR1311	152-0686-00	SEMICONV DEVICE:SILICON,100V,5A,MR821
CR1312	152-0686-00	SEMICONV DEVICE:SILICON,100V,5A,MR821
R1304	321-0282-00	RES., FXD, FILM:8.45K OHM,1%,0.125W

The above parts are located on the CAPACITOR RECTIFIER circuit board assembly and are shown on diagram 11 CONVERTER/RECTIFIERS.

Date: 7-10-79Change Reference: M37540Product: 7104, 7834, 7844, R7844, R7903, 7904Manual Part No.: see below**DESCRIPTION**

EFF SN B020255 (7104) 070-2314-00

EFF SN B022025 (7834) 070-1988-00

EFF SN B141860 (7844) 070-1676-01

EFF SN B140880 (R7844) 070-1676-01

EFF SN B181180 (R7903) 070-1464-00

EFF SN B269300 (7904) 070-2390-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

R1238 315-0332-00 RES.,FXD,CMPSN:3.3K OHM,5%,0.25W

R1238 is shown on diagram 14 (7104), diagram 11 (7834), diagram 18 (7844/R7844), diagram 9 (R7903 and 7904). R1238 was added on M31286.

Date: 9-18-79Change Reference: C6/979Product: 7834 STORAGE OSCILLOSCOPEManual Part No.: 070-1988-00**DESCRIPTION**

TEXT CORRECTIONS

SECTION 4 MAINTENANCE

Pages 4-8 and 4-9 Step B, parts 4 and 6

CHANGE TO READ:

4. Disconnect P3068, the four pin connector with the black housing on the lower rear of the Storage board, to make the following resistance checks. Check the resistance of the power supplies at the test points given in Table 4-2 (See Figures 8-42 and 8-43 for the location of these test points.)

6. Replace all electrical connections which were disconnected in parts 4 and 5.

