TEKTRONIX®

7B92

DUAL TIME BASE

SERVICE

INSTRUCTION MANUAL

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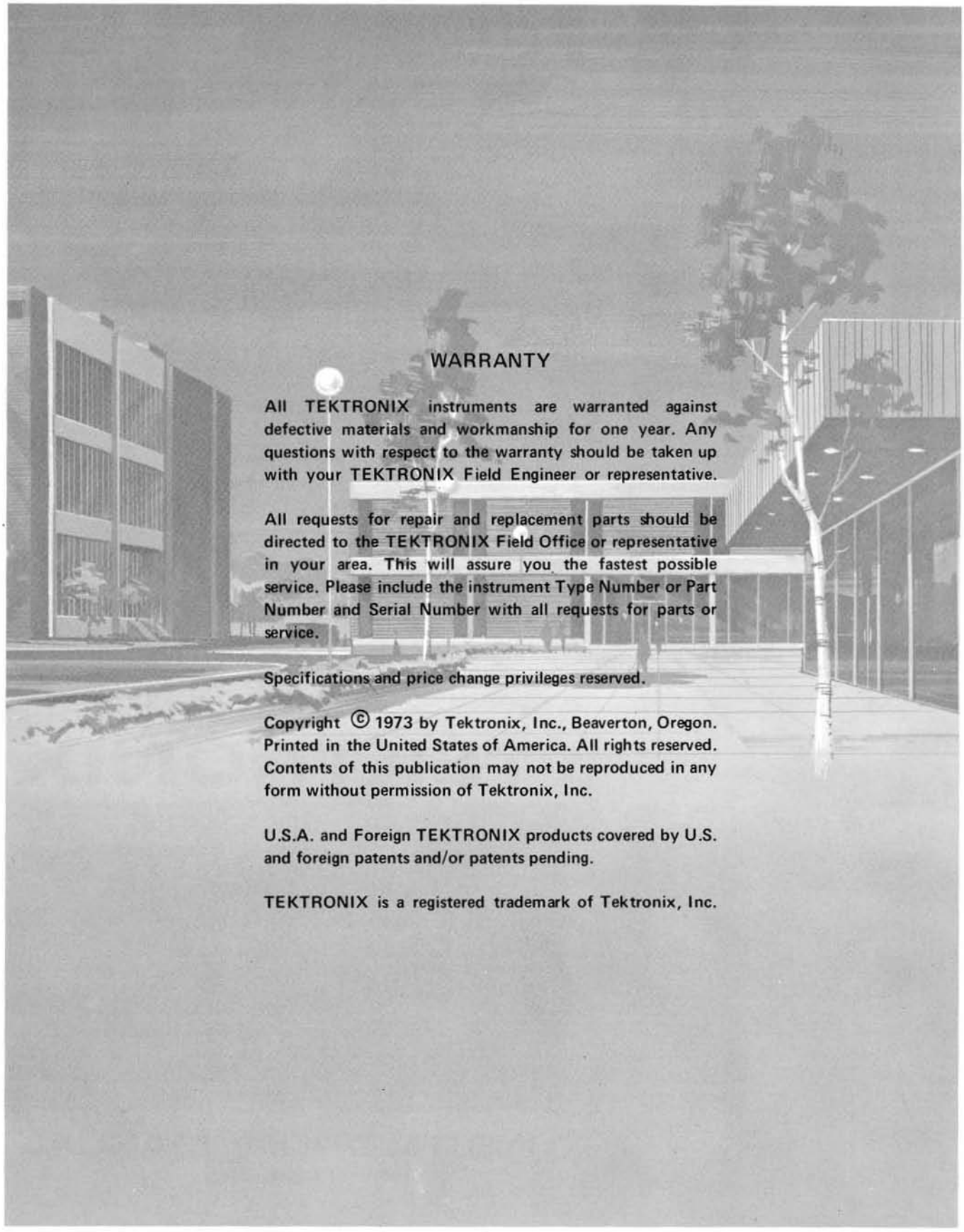

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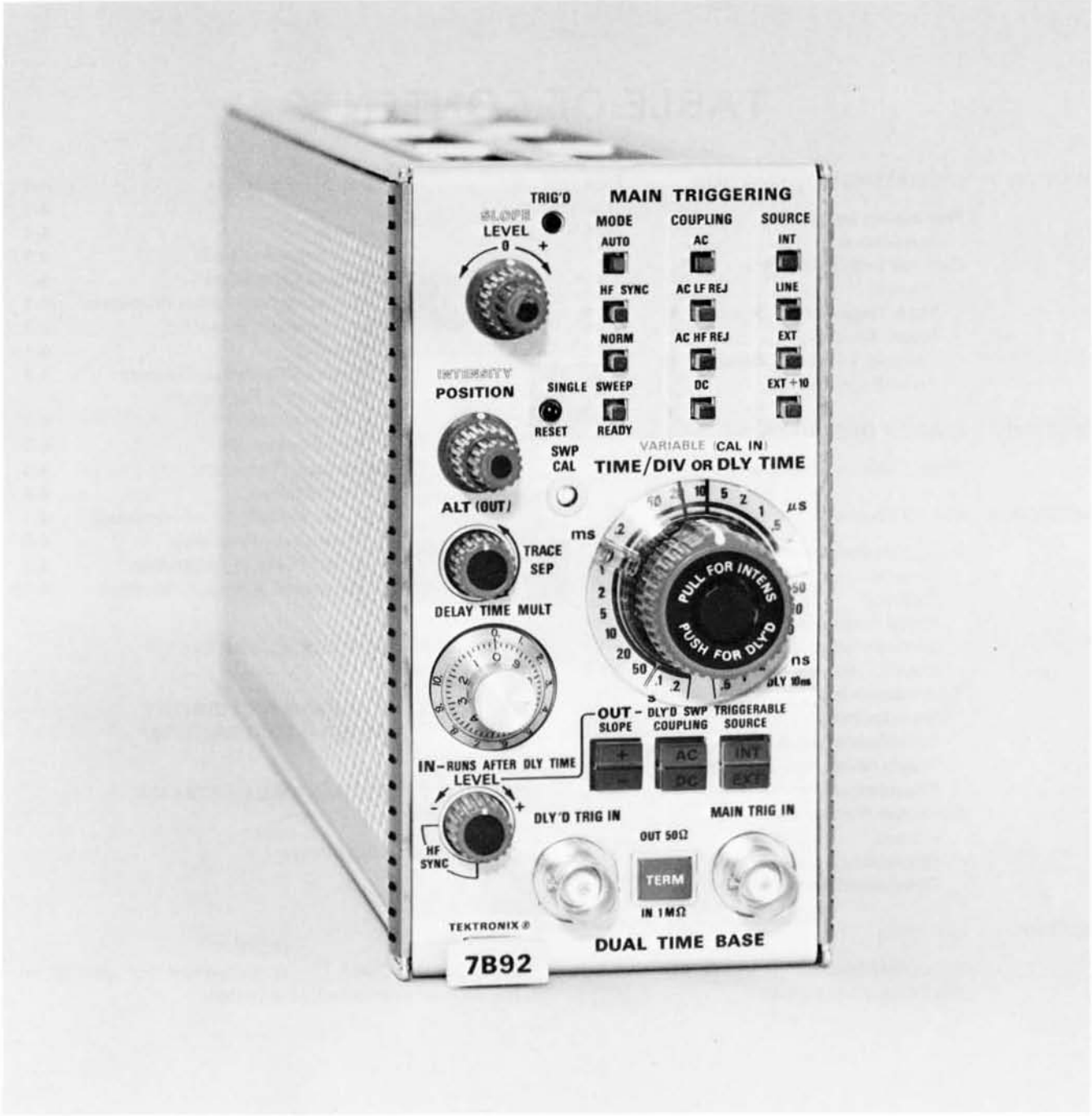
NOTE

Refer to the 7B92 Operators manual for specifications and complete operating information.



7B92 Features

The 7B92 Dual Time Base unit provides normal, intensified, delayed, and alternate sweep operation for Tektronix 7000-Series Oscilloscopes. Calibrated sweep rates from 0.2 second to 0.5 nanosecond and triggering to 500 megahertz are provided. The 7B92 is intended for use with high-frequency 7000-Series Oscilloscope systems; however, most 7B92 functions are compatible with all 7000-Series Oscilloscopes.

Other features include lighted pushbutton switches, compatibility with oscilloscopes having an alphanumeric readout system, and 0 to 9.9 times continuous sweep delay. A VARIABLE control allows continuously variable sweep rates between calibrated steps. Also, when operating in the AUTO MAIN TRIGGERING MODE, a bright base line is displayed in the absence of a trigger signal.

OPERATING INFORMATION

The 7B92 Dual Time Base unit operates with a Tektronix 7900-Series oscilloscope and a 7A-Series amplifier unit to form a complete high-frequency oscilloscope system. To effectively use the 7B92, its operation and capabilities should be known. Brief operating information is given in this section. For more detailed instructions, refer to the 7B92 Operators Manual.

PRELIMINARY INFORMATION

Installation

The 7B92 is designed to operate in the horizontal compartment of the oscilloscope. This instrument can also be installed in the vertical plug-in compartment to provide a sweep that runs vertically on the CRT. However, when used in this manner, there is no retrace blanking or internal triggering, and the unit may not meet the specifications given in the Operators Manual. The instructions in this manual are written for use of the 7B92 in the horizontal plug-in compartment.

Before proceeding with installation, check the settings of the Variable Selector multi-pin connector and the Mainframe Selector multi-pin connector (see Fig. 1-1). The Variable Selector determines whether the front-panel VARIABLE control operates in conjunction with the Delaying or Delayed Sweep. The Mainframe Selector determines the oscilloscope in which the 7B92 is to be operated; any 7900-Series Oscilloscope, or any other 7000-Series Oscilloscope.

CONTROLS AND CONNECTORS

General

All controls required for the operation of the 7B92, except the Variable Time/Division Selector and Mainframe Selector, are located on the front panel of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each control. A brief description of the front-panel controls and connectors is given here. More detailed information is given in the 7B92 Operators Manual. Fig. 1-2 shows the front-panel controls and connectors of the 7B92.

(1) Main Triggering Controls

LEVEL. Selects the amplitude point on the trigger signal where sweep triggering occurs when operating in the AUTO, NORM, or SINGLE SWEEP MAIN TRIGGERING MODE. When operating in the HF SYNC MAIN TRIGGERING MODE, the LEVEL control adjusts the frequency of the trigger generator to synchronize with the triggering signal to provide a stable display.

SLOPE. Permits triggering on the positive or negative-going portion of the trigger signal in all positions of the MAIN TRIGGERING MODE switch except HF SYNC.

TRIG'D Light. Indicates that the sweep is triggered and will produce a display with the correct setting of the POSITION control and the controls of the associated vertical units and oscilloscope.

MODE. Four pushbutton switches to select the desired triggering mode. Selected mode is indicated by lighted pushbutton.

AUTO. Triggered sweep is initiated by the applied trigger signal at a point selected by the LEVEL control and SLOPE switch when the trigger signal repetition rate is above 30 hertz and within the frequency range selected by the COUPLING switch. The sweep free-runs to provide a reference trace under the following conditions: When the LEVEL control is outside the amplitude range, the trigger repetition rate is outside the frequency range selected by the COUPLING switch, or the trigger signal is inadequate.

HF SYNC. Sweep initiated by trigger signals with repetition rates above 100 megahertz and within the range selected by the COUPLING switch. Stable displays can be obtained when the LEVEL control adjusts the frequency of the trigger generator to the frequency (or subharmonic) of the trigger signal frequency. When the LEVEL control is adjusted to frequencies between subharmonics, the sweep free- runs.

NORM. Sweep initiated by the applied trigger signal at a point selected by the LEVEL control and SLOPE switch over the frequency range selected by the COUPLING switch. Triggered sweep can be obtained only over the amplitude range of the applied trigger signal. When the LEVEL control is outside the amplitude range, the trigger repetition rate is outside the frequency range selected by the COUPLING switch, or the trigger signal is inadequate, there is no trace.

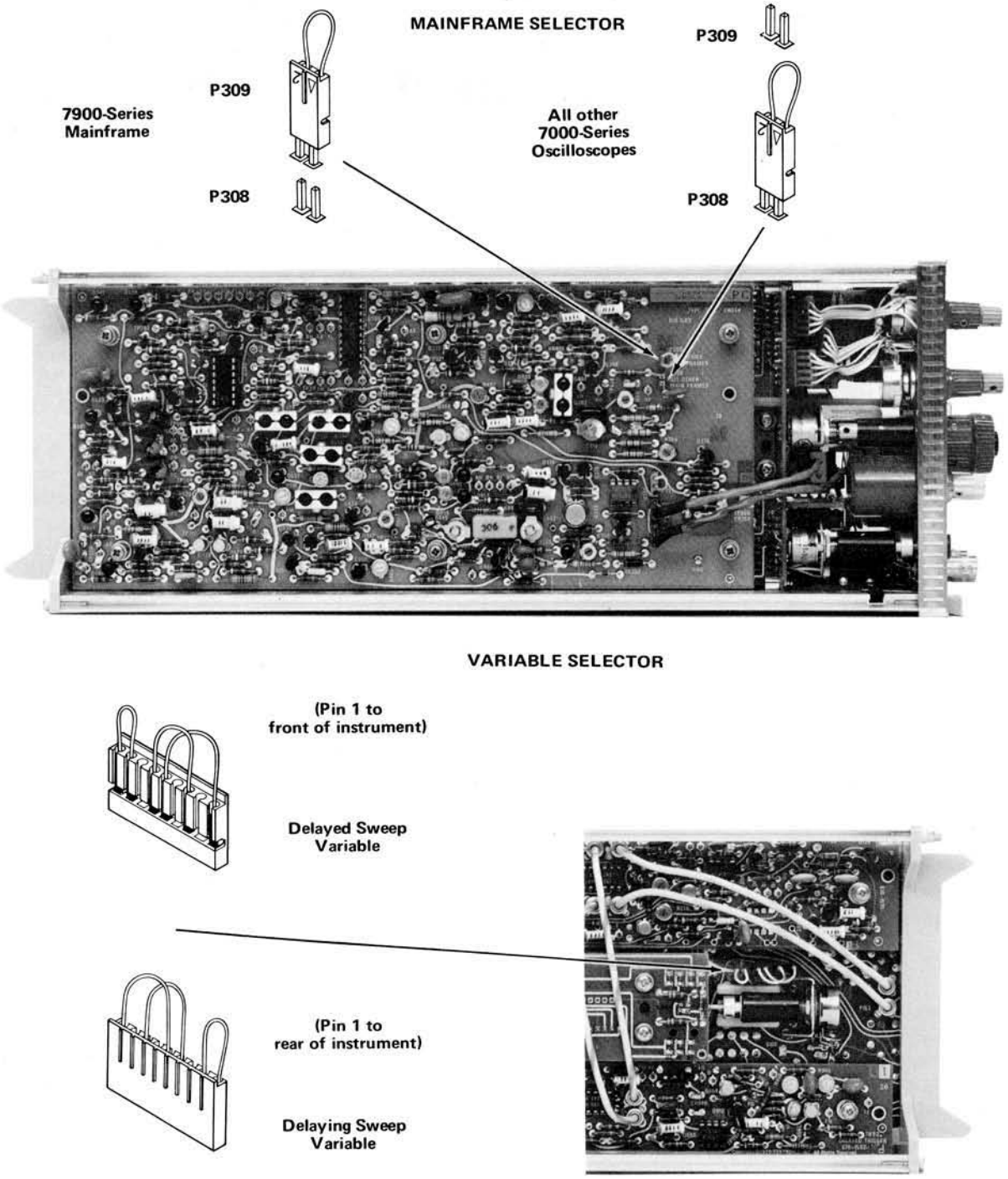


Fig. 1-1. Location of Variable Selector and Mainframe Selector multi-pin connectors.

SINGLE SWEEP—READY. After a sweep is displayed, further sweeps cannot be presented until the RESET button is pressed. Display is triggered as for NORM operation, using the MAIN TRIGGERING controls. The SINGLE SWEEP—READY light is illuminated when the RESET pushbutton is pressed, and remains on until a trigger is received and the sweep is completed.

RESET. When the RESET pushbutton is pressed (SINGLE SWEEP MODE), a single display is presented (with proper triggering) when the next trigger pulse is received. The SINGLE SWEEP—READY light remains on until a trigger is received and the sweep is completed. The RESET pushbutton must be pressed again before another sweep can be presented.

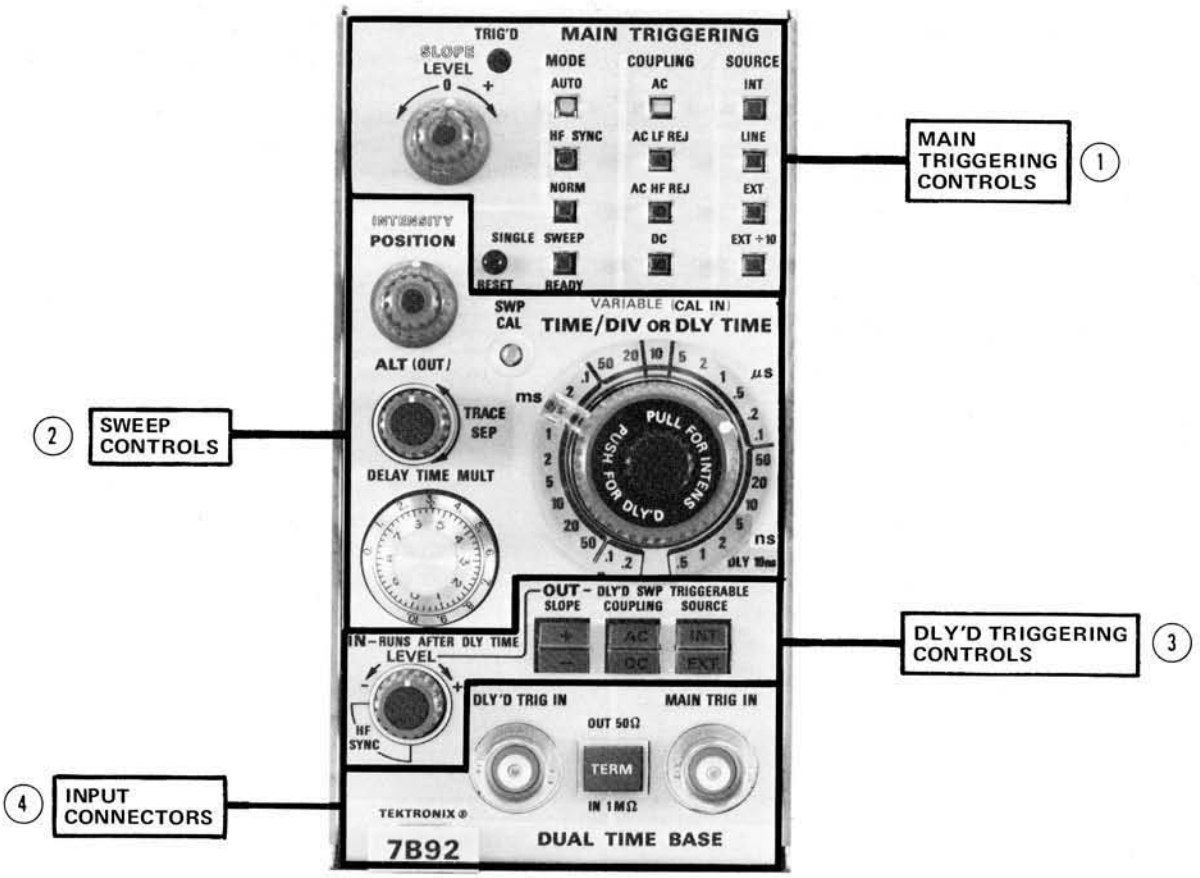


Fig. 1-2. Front-panel controls and connectors.

COUPLING. Four pushbutton switches to select trigger coupling. Selected coupling is indicated by lighted pushbutton.

AC. Rejects DC and attenuates AC signals below about 30 hertz. Accepts signals between 30 hertz and 500 megahertz.

AC LF REJ. Rejects DC and attenuates signals below about 30 kilohertz. Accepts signals between 30 kilohertz and 500 megahertz.

AC HF REJ. Rejects DC and attenuates signals above 50 kilohertz. Accepts signals from 30 hertz to 50 kilohertz.

DC. Accepts all signals from DC to 500 megahertz.

SOURCE. Four pushbutton switches that select the triggering source. Selected source is indicated by lighted pushbutton.

INT. Trigger signal obtained internally from vertical unit by way of associated oscilloscope.

LINE. Trigger signal obtained internally from a sample of the line voltage applied to the associated oscilloscope.

EXT. Trigger signal obtained from an external signal applied to the MAIN TRIG IN connector.

EXT ÷ 10. Trigger signal obtained from an external signal applied to the MAIN IN connector. In this position the external signal is attenuated 10 times before it is applied to the trigger circuit.

(2) Sweep Controls

TIME/DIV OR DLY TIME. Selects the basic sweep rate for Normal and ALT Sweep operation and selects the delay time (to be multiplied by the DELAY TIME MULT dial setting) when operating in the INTEN or DLY'D Sweep mode (see Fig. 1-3). The VARIABLE control must be in the CAL position for the indicated sweep rate.

DLY'D Time/Division. Selects the sweep rate of the delayed sweep generator for operation in the DLY'D Sweep, INTEN, and ALT Sweep Display Modes (see Fig. 1-3). The VARIABLE control must be in the CAL position for indicating the sweep rate.

VARIABLE. Two-position switch actuated by the VARIABLE control to select calibrated or uncalibrated sweep rates (see Fig. 1-3). In the CAL position (pressed in) the VARIABLE control is inoperative and the sweep rate is calibrated. When pressed and released, the knob moves out to activate the VARIABLE control for uncalibrated sweep rates. The sweep rate in each TIME/DIV switch position can be reduced at least to the sweep rate of the next slower position. The VARIABLE control can be switched to operate with either the delaying or delayed sweeps by means of the internal Variable Selector multi-pin connector.

Display Modes. Four display modes can be selected by the following switch settings:

NORMAL Sweep. A Normal Sweep (non-delayed) is selected when the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch are locked together at the same sweep rate (see Fig. 1-3). The DLY'D Time/Division switch and the Delayed Triggering LEVEL control must be pressed in for the Normal Sweep Mode. Calibrated sweep rates from 0.2 second/division to 0.5 nanosecond/division can be obtained.

INTEN. The INTEN mode, a function of the delaying and delayed sweeps is selected when the DLY'D Time/Division switch is pulled out and rotated clockwise (see Fig. 1-3). In this mode, a portion of the delaying sweep is intensified during the time that the delayed sweep generator runs.

DLY'D Sweep. The DLY'D Sweep Display Mode is selected when the DLY'D Time/Division switch is pulled out, rotated in the INTEN Display Mode for the desired delayed sweep rate, then pushed in (see Fig. 1-3). In this Display Mode, the delayed sweep is displayed, at a rate determined by the DLY'D Time/Division switch, at the end of each delay period, as selected by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial settings.

ALT Sweep. When the ALT switch is pressed and released to the OUT position, sweeps from both the delaying sweep generator (intensified sweep) and delayed sweep generator (delayed sweep) are displayed.

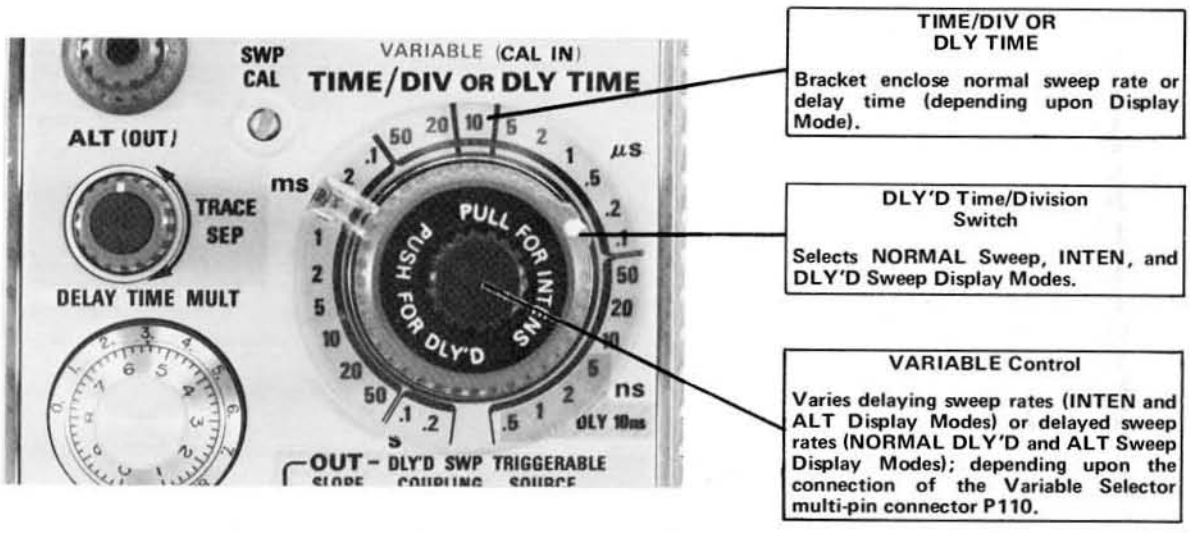


Fig. 1-3. Composite Time/Division switch.

The alternate sweep switches between generators at the end of each sweep. The TRACE SEP control is activated in this Display Mode.

TRACE SEP. When the ALT switch is OUT (ALT Sweep Display Mode), it serves as a trace separation control. This control vertically positions the trace (produced by the delaying sweep generator) up to four divisions with respect to the trace produced by the delayed sweep generator.

DELAY TIME MULT. Provides variable delay of 0 to 9.9 times the basic delay time selected by the TIME/DIV OR DLY TIME switch.

INTENSITY. Controls the intensity of the delaying sweep display only, when operating in the INTEN or ALT Sweep Display Modes.

SWP CAL. Screwdriver adjustment to set horizontal gain of unit. The SWP CAL is used to set the basic timing of the 7B92 and to compensate for differences in input sensitivity when changing oscilloscopes.

(3) Delayed Triggering Controls

LEVEL. Control determines delayed sweep mode, delayed trigger mode and delayed trigger level.

IN-RUNS AFTER DLY TIME. The delayed sweep runs immediately following the delay time selected by TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial. Delayed SLOPE, COUPLING, SOURCE, and HF SYNC functions are inoperative.

OUT-DLY'D SWP TRIGGERABLE. When the Delayed Triggering LEVEL control is pressed and released, the delayed sweep is triggerable. The Delayed Triggering LEVEL control can now be rotated to select the amplitude point on the trigger signal at which the delayed sweep is triggered, or it can be rotated counterclockwise (as marked on the instrument front panel) to select the HF SYNC Delayed Triggering Mode. In the OUT-DLY'D SWP TRIGGERABLE mode, the delayed SLOPE, COUPLING, and SOURCE functions are activated.

HF SYNC. The HF SYNC Delayed Triggering Mode is selected when the Delayed Triggering LEVEL control is pressed and released to the OUT-DLY'D SWP TRIGGERABLE position and rotated counterclockwise to HF SYNC, as marked on the instrument front panel. Sweep is initiated by trigger signals with repetition rates above 100 megahertz and within the range selected by the COUPLING switch. Stable display can be obtained when the LEVEL control adjusts the frequency of the trigger generator to the frequency (or subharmonic of the trigger signal frequency. When the LEVEL control is adjusted to frequencies between subharmonics, the sweep free-runs.

SLOPE. Two-position switch to select the portion of the trigger signal which starts the delayed sweep.

+. The delayed sweep can be triggered from the positive slope of the trigger signal.

−. The delayed sweep can be triggered from the negative slope of the trigger signal.

COUPLING. Two-position switch that determines the method of coupling the delayed trigger signal to the delayed trigger circuit.

AC. Rejects DC and attenuates signals below about 30 hertz. Accepts delayed trigger signals from 30 hertz to 500 megahertz.

DC. Accepts trigger signals from DC to 500 Megahertz.

SOURCE. Two-position switch that selects the source of the delayed trigger signal.

INT. The delayed trigger signal is obtained from the vertical amplifier unit by way of the associated oscilloscope.

EXT. The delayed trigger signal is obtained from an external signal applied to the DLY'D TRIG IN connector.

(4) Front-Panel Inputs

MAIN TRIG IN. When the SOURCE switch for MAIN TRIGGERING is set to EXT or EXT ÷ 10, this connector serves as an external trigger input for the main triggering circuit.

DLY'D TRIG IN. When the Delayed Triggering SOURCE switch is set to EXT, this connector serves as an external trigger input for the delayed triggering circuit.

TERM 50 Ω 1 MΩ. Two position switch to select 50 ohm or one megohm input impedance for the MAIN TRIG IN and DLY'D TRIG IN connectors.

CIRCUIT DESCRIPTION

The following discussion is provided to aid in understanding the overall concept of the 7B92. A basic block diagram of the 7B92 is shown in Fig. 2-1. Only the basic interconnections between the individual blocks are shown. The number on each block (enclosed in diamond) refers to the complete circuit diagram located at the rear of this manual.

Block Diagram Description

The Main Trigger Generator includes circuitry for selecting trigger source, type of coupling, triggering mode, and point on the trigger signal where triggering occurs. Also, regardless of the trigger signal, shape, or amplitude (within specification) the Main Trigger Generator provides a fast-rise uniform amplitude pulse to the Delaying Sweep Start Comparator. Termination of the gate pulse occurs at the rise of Delaying Sweep Holdoff.

The Delaying Sweep Start Comparator is activated by the positive gate from the Main Trigger Generator. The output gate, coupled to the Delaying Sweep Generator, is the same duration as the delaying sweep. This gate is also coupled to the Aux Sweep Gate connector and to Display Mode Switching for Alternate Sweep operation.

The delaying sweep sawtooth signal is generated when the gate from the Delaying Sweep Start Comparator is applied to the Delaying Sweep Generator. The sawtooth duration is determined by the gate duration; the rate of change of the sawtooth is set by Ct and Rt, selected by the TIME/DIV OR DLY TIME switch. The delaying sweep sawtooth signal is coupled to the Horizontal Output Amplifier, the Delaying Sweep Stop Comparator, the Delay Pickoff circuits, and the Delaying Sweep Out connector.

One side of the Delaying Sweep Stop Comparator is driven by the delaying sweep sawtooth signal and the other side is set by the Delaying Sweep Length adjustment. When the sawtooth waveform passes through the setting of the Delaying Sweep Length adjustment the output of the comparator switches to a positive level.

The positive level from the sweep stop comparator initiates the positive holdoff gate. The duration of the holdoff gate is variable, depending on the setting of the TIME/DIV switch. Holdoff timing capacitors are separate from sweep timing capacitors. Holdoff is longer for slower sweep rates. Output from the delaying sweep holdoff is coupled to the Main Trigger Generator, the Delayed Trigger Generator, and the Holdoff out connector. A sweep gate cannot be generated during the holdoff interval. When the holdoff falls, the trigger circuits are reset so that they are ready to receive a trigger signal.

The Lockout Amp processes mainframe logic signals (when operating the mainframe in the alternate or delaying Horizontal Modes) to provide a sweep disable pulse to the Main Trigger Generator.

The Horizontal Output amplifier provides positioning and amplification of the sawtooth signals. Display Mode Switching works in conjunction with the Horizontal Output to provide NORMAL Sweep, INTEN, DLY'D Sweep and ALT Sweep Display Modes.

The Delay Pickoff circuits produce a delay gate when the delaying sawtooth signal passes through the LEVEL selected by the DELAY TIME MULT dial. The gate ends with the delaying sawtooth signal. The output gate is coupled to the Delayed Trigger Generator.

The Delayed Trigger Generator includes circuitry for selecting delayed sweep mode, delayed trigger mode, delayed trigger source, type of coupling, and the point on the trigger signal where sweep triggering occurs. When the Delayed Trigger LEVEL is at the RUNS AFTER DLY TIME detent, the output sweep gate is generated as soon as the delay gate signal (from the Delay Pickoff circuits) is applied. When the Delayed Trigger LEVEL is in the DLY'D SWP TRIGGERABLE position, the output trigger is initiated by the next input trigger signal after the delay gate is applied. The delayed sweep trigger is terminated by the $\overline{\text{holdoff}}$ signal. The trigger signal is coupled to the Delayed Sweep Start Comparator.

The Delayed Sweep Start Comparator is activated by the signal from the Delayed Trigger Generator. The output gate coupled to the Delayed Sweep Generator, is the same duration as the delayed sweep. The delayed sweep gate signal is also coupled to the Sweep Gate Generator.

The delayed sweep sawtooth signal is developed by the Delayed Sweep Generator. The sawtooth is generated during the time that a gate is applied from the Delayed Sweep Start Comparator. Rate of change of the sawtooth is set by Ct and Rt, selected by the DLY'D TIME/DIV switch. The delayed sawtooth output is coupled to the Horizontal Output Amplifier and the Delayed Sweep Stop Comparator.

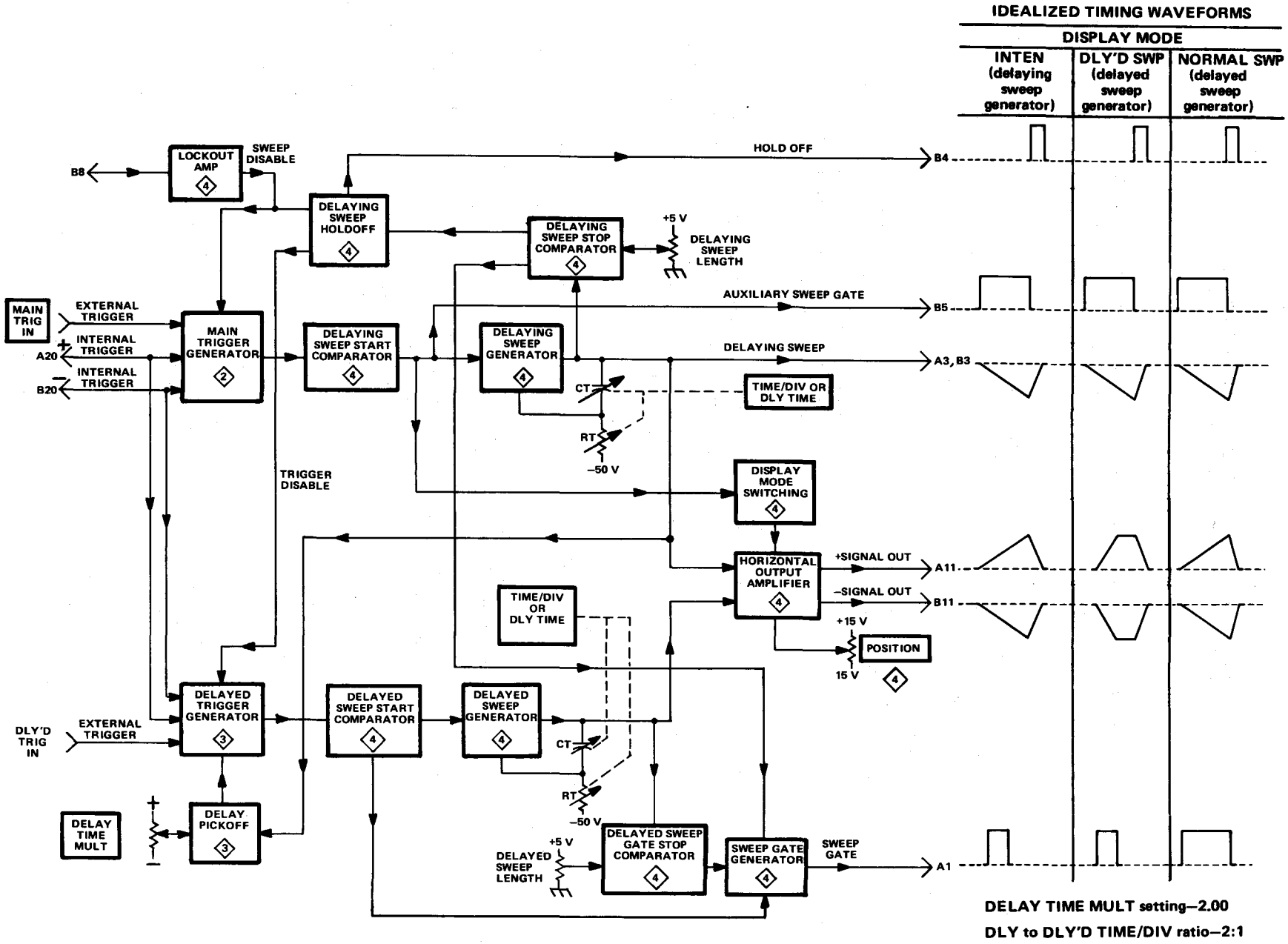


Fig. 2-1. 7B92 basic block diagram.

One side of the Delayed Sweep Stop Comparator is driven by the delaying sweep sawtooth signal; the other side is set by the Delayed Sweep Length Adjustment. When the delayed sawtooth waveform passes through the voltage set by the Delayed Sweep Length Adjustment, the comparator switches to a positive level. This positive level is coupled to the Sweep Gate Generator.

The Sweep Gate Generator produces an unblanking pulse for the associated oscilloscope. The Sweep Gate pulse is initiated by the gate from the Delayed Sweep Start Comparator and terminated by the pulse from the Delaying Sweep Stop Comparator or Delayed Sweep Stop Comparator (whichever occurs first).

MAINTENANCE

This section of the manual contains maintenance information for use in preventive maintenance, corrective maintenance, and troubleshooting of the 7B92.

PREVENTIVE MAINTENANCE

General

Preventive maintenance consists of cleaning, visual inspection, lubrication, etc. Preventive maintenance performed on a regular basis may prevent instrument breakdown and will improve the reliability of this instrument. The severity of the environment to which the 7B92 is subjected determines the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Cleaning

The 7B92 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 may also provide an electrical conduction path.

The covers of the oscilloscope reduce the amount of dust that reaches the interior of the 7B92. Operation of the system without the oscilloscope covers in place necessitates more frequent cleaning. When the 7B92 is not in use, it should be stored in a protected location, such as a dust-tight cabinet.

CAUTION

Avoid the use of chemical agents which might damage the plastics used in this instrument. Avoid chemicals which contain benzene, toluene, xylene, acetone, or similar solvents.

Exterior. Loose dust accumulated on the outside of the 7B92 can be removed with a soft cloth or small paint brush. The paint brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Interior. Dust in the interior of the instrument should be removed occasionally, due to its electrical conductivity under high-humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry low-velocity air. Remove any dirt that remains with a soft paint brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Visual Inspection

The 7B92 should be inspected occasionally for such defects as broken connections, broken or damaged circuit boards, improperly seated transistors or relays, and heat-damaged parts.

The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

Semiconductor Checks

Periodic checks of the transistors, FET's, and IC's used in the 7B92 are not recommended. The best indication of performance is the actual operation of the device in the circuit. Performance of the circuits is thoroughly checked during recalibration; substandard semiconductors will usually be detected at that time.

Recalibration

To ensure accurate measurements, check the calibration of this instrument each 1000 hours of operation or every six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. Calibration instructions are given in Section 4.

TROUBLESHOOTING

Introduction

The following information is provided to facilitate troubleshooting of the 7B92. Information contained in other sections of this manual should be used along with the following information to aid in locating the defective component. An understanding of the circuit operation is very helpful in locating troubles. See the Circuit Description section.

Troubleshooting Aids

Diagrams. Circuit diagrams are given on foldout pages in Section 6. The component number and electrical value of each component in this instrument is shown on the diagrams.

Circuit Boards. Fig. 6-2 (located in the diagrams section) shows the location of the circuit boards within this instrument along with the assembly numbers. The assembly numbers are used on the diagrams to aid in locating the boards. Pictures of the circuit boards are shown in the Diagrams section, on the back of the page opposite the circuit diagram, to aid in cross-referencing between the diagrams and the circuit-board pictures. Each electrical component on the boards is identified by its circuit number, as well as the interconnecting wire or connectors. The diagrams are outlined with a blue line to show which portions of the circuit are located on a circuit board.

Switch Cam Identification. Switch cam numbers shown on the diagrams indicate the position of the cam in the complete switch assembly. The switch cams are numbered from front to rear.

Diode Color Code. The cathode end of each glass encased diode is identified by a stripe, a series of stripes, or a dot. For most silicon or germanium diodes with a series of stripes, the color code also indicates the type of diode or identifies the Tektronix Part Number using the resistor color-code system (e.g., a diode color coded blue-or pink-brown-gray-green indicates Tektronix Part Number 152-0185-00). The cathode and anode ends of a metal encased diode can be identified by the diode symbol marked on the body.

Wiring Color Code and Multi-Connector Identification. Insulated wire and cable used in the 7B92 is color coded to aid circuit tracing. Multi-connector holders are keyed with two triangles (or a triangle and a dot), one on the connector holder and one on the circuit board. The triangle on the multi-connector holder must match with the triangle on the circuit board for normal circuit operation. In special cases where multi-connector holders are used as a switch, the triangles may not match (see Operating Instructions for special multi-connector holder functions). The color of the multi-connector holder corresponds to the last numeral of the circuit number, using the EIA color code (e.g., P22 is red).

Interface Connector Pin Locations. The Interface circuit board couples the 7B92 to the associated oscilloscope. Fig. 3-1 illustrates the locations of pins on the interface connector as shown on the Voltage Distribution and Output Connectors schematic in the diagrams section.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 7B92.

1. Transistor Tester

   Description: Tektronix Type 577 Transistor-Curve Tracer or a 7CT1N Curve Tracer plug-in unit and a 7000-Series Oscilloscope system.

   Purpose: To test semiconductors used in this instrument.

2. Volt-ohmmeter

   Description: 20,000 ohms/volt. 0-500 volts DC. Accurate within 3%

   Purpose: To measure voltages and resistance.

3. Test Oscilloscope

   Description: DC to 100 megahertz frequency response, five millivolts to five volts/division. Use a 10X probe.

   Purpose: To check the waveforms in the instrument.

4. Plug-In Extender

   Description: Rigid plug-in extender, Tektronix Part Number 067-0589-00.

   Purpose: Permits operation of the 7B92 outside the plug-in compartment of the oscilloscope for better access during troubleshooting.

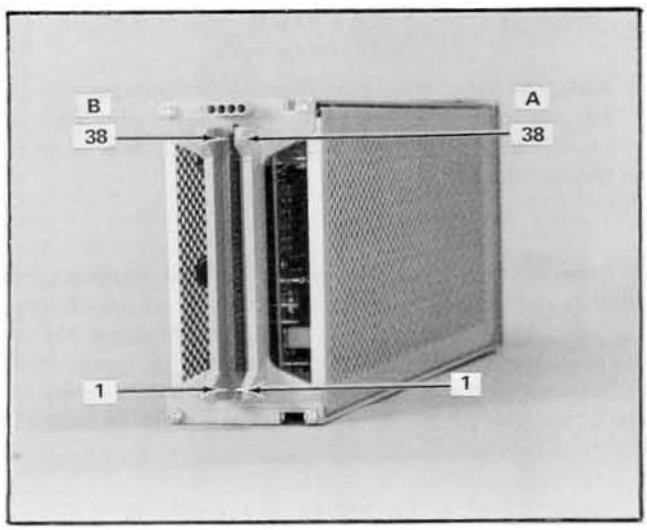


Fig. 3-1. Location of pins on Interface connector.

Troubleshooting Techniques

This troubleshooting procedure is arranged in an order which checks the simple trouble possibilities before proceeding with extensive troubleshooting. The first few checks ensure proper connection, operation, and calibration. If the trouble is not located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, it should be replaced 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, see the Operating Instructions.

2. Check Associated Equipment. Before proceeding with troubleshooting of the 7B92, check that the equipment used with this instrument is operating correctly. Check that the signal is properly connected and the probe (if used) is not defective. The oscilloscope and vertical plug-in unit can be checked for proper operation by substituting another time-base unit that is known to be operating properly (preferably another 7B92 or similar unit). If the trouble persists after substitution, the oscilloscope or vertical plug-in unit should be checked.

3. Check Instrument Calibration. Check the calibration of this instrument, or the affected circuit if the trouble exists in one circuit. The apparent trouble may only be a result of misadjustment that can be corrected by calibration. Complete calibration instructions are given in the Calibration section.

4. Visual Check. Visually check the portion of the instrument in which the trouble is located. Many troubles can be located by visual indications such as unsoldered connections, broken wires, damaged components, etc.

5. Isolate Trouble to a Circuit. To isolate a trouble to a particular circuit, note the trouble symptom. The symptom often indicates the circuit in which the trouble is located. For example, if stable triggering can be obtained in the INT position of the SOURCE switch and cannot be obtained in the EXT or LINE positions, the External Trigger Preamp or Trigger Source Switching circuits are probably at fault. When the trouble symptoms appear, use the front-panel controls and the CRT display to isolate the trouble to one circuit. Keep the amplifier unit and oscilloscope in mind when isolating the trouble. When trouble appears in more than one circuit, check all affected circuits by taking voltage and waveform measurements. Once the defective circuit has been located, proceed with steps 6 and 7 to locate the defective component(s).

6. Check Individual Components. The following procedures describe methods of checking individual components in the 7B92. Components that are soldered in place are best checked by disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

a. Relay. The eight pin relay used in the 7B92 is symmetrical and may be replaced in its socket facing either direction. This relay, which is plugged into the circuit board, may be removed and checked. Use an ohmmeter to check the 600 ohm resistance. The relay may also be actuated by placing the +15 volts across the coil. The internal connections are printed on the body of the relay.

b. Transistors. The best check of transistor operation is actual performance under operating conditions. If a transistor is suspected of being defective, it can best be checked by substituting a new component or one that has been checked previously. However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester (such as a Tektronix Type 577 or 7CT1N Curve Tracer plug-in unit and a 7000-Series Oscilloscope system.

c. Integrated Circuits. Integrated circuits should not be replaced unless they are actually defective. The best method for checking these devices is by direct substitution with a new component or one that is known to be good. Be sure that circuit conditions are not such that a replacement component might be damaged.

d. Diodes. A diode can be checked for an open or shorted condition by measuring the resistance between terminals. Using an ohmmeter scale having an internal source of between 800 millivolts and 3 volts, the resistance should be very high in one direction and very low when the leads are reversed.

CAUTION

Do not use an ohmmeter scale that has a high internal current. High currents may damage the diode.

e. Resistors. Resistors can be checked with an ohmmeter. Check the Electrical Parts List for the tolerance of the resistors used in this instrument. Resistors normally do not need to be replaced unless the measured value varies widely from the specified value.

f. Inductors. Check for open inductors by checking continuity with an ohmmeter. Shorted or partially shorted inductors can usually be found by checking the waveform response when high-frequency signals are passed through the circuit. Partial shorting often reduces high-frequency response.

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

7. Repair and Readjust the Circuit. If any defective parts are located, follow the replacement procedures given in this section. Be sure to check the performance of any circuit that has been repaired, or that has had any electrical components replaced.

CORRECTIVE MAINTENANCE

General

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

Obtaining Replacement Parts

All electrical and mechanical part replacements for the 7B92 can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating, and description.

NOTE

When selecting replacement parts, it is important to remember that the physical size and shape of a component may affect the performance in the instrument, particularly at high frequencies. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect instrument performance.

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.

Component Replacement

WARNING

Disconnect the equipment from the power source before replacing components.

Relay Replacement. The relay in the 7B92 is manufactured by Tektronix, Inc. If the relay fails, a replacement may be ordered from your local Tektronix Field Office or representative. The eight-pin DPDT relay may be replaced in its socket either way, since this relay is symmetrical.

Semiconductor Replacement. Semiconductor devices used in this instrument should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement may affect the calibration of this instrument. When a semiconductor is replaced, check the operation of the part of the instrument that may be affected.

Replacement devices should be of the original type or direct replacement. Re-install in the same manner as the original. Fig. 6-1 (located in diagrams section) shows the lead configurations of the semiconductor devices used in this instrument. When replacing, check the manufacturer's basing diagram for correct basing.

Interconnecting Pin Replacement. Two methods of interconnection are used in this instrument to 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 a socket on the board. Other interconnections are made with a pin soldered onto 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 that mates with the interconnecting pin. The following information provides the replacement procedure for the various interconnecting methods.

a. Coaxial-Type End-Lead Connectors.

Replacement of the coaxial-type end-lead connectors requires special tools and techniques; only experienced maintenance personnel should attempt replacement of these connectors. It is recommended that the cable or wiring harness be replaced as a unit. For cable or wiring harness part numbers, see the Mechanical Parts List. An alternate solution is to refer the replacement of the defective connector to your Tektronix Field Office or representative.

b. Circuit Board Pins and Pin Sockets.

CAUTION

The following procedures are recommended for single-layer circuit boards only. Pin and socket replacement on multi-layer circuit boards should be performed only by specialized service personnel. Refer to your local Tektronix Field Office or Service Center.

A circuit board pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. (Tektronix Part No. 040-0542-00). To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Then, unsolder the damaged pin and pull it out of the circuit board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat.

Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. Then, solder the pin on both sides of the circuit board. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

The pin sockets on the circuit boards are soldered to the rear of the board. To replace one of these sockets, first unsolder the pin socket (use a vacuum-type desoldering tool to remove the excess solder). Then straighten the tabs on the socket and remove it from the hole in the board. Place the 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 into the socket.

NOTE

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.

c. 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 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. To provide correct orientation of this multi-pin connector when it is replaced, an arrow (or dot) is stamped on the circuit board and a matching arrow is molded into the plastic housing of the multi-pin connector. Be sure that these arrows are aligned when the multi-pin connector is replaced. If the individual end-lead pin connectors are removed from the plastic holder, note the color of the individual wires for replacement.

Switch Replacement. Pushbutton switches and a cam-type switch are used in the 7B92. It is recommended that both switch types be replaced as a unit. Refer to Fig. 3-2 for cam-switch removal and to Fig. 3-3 for pushbutton switch removal.

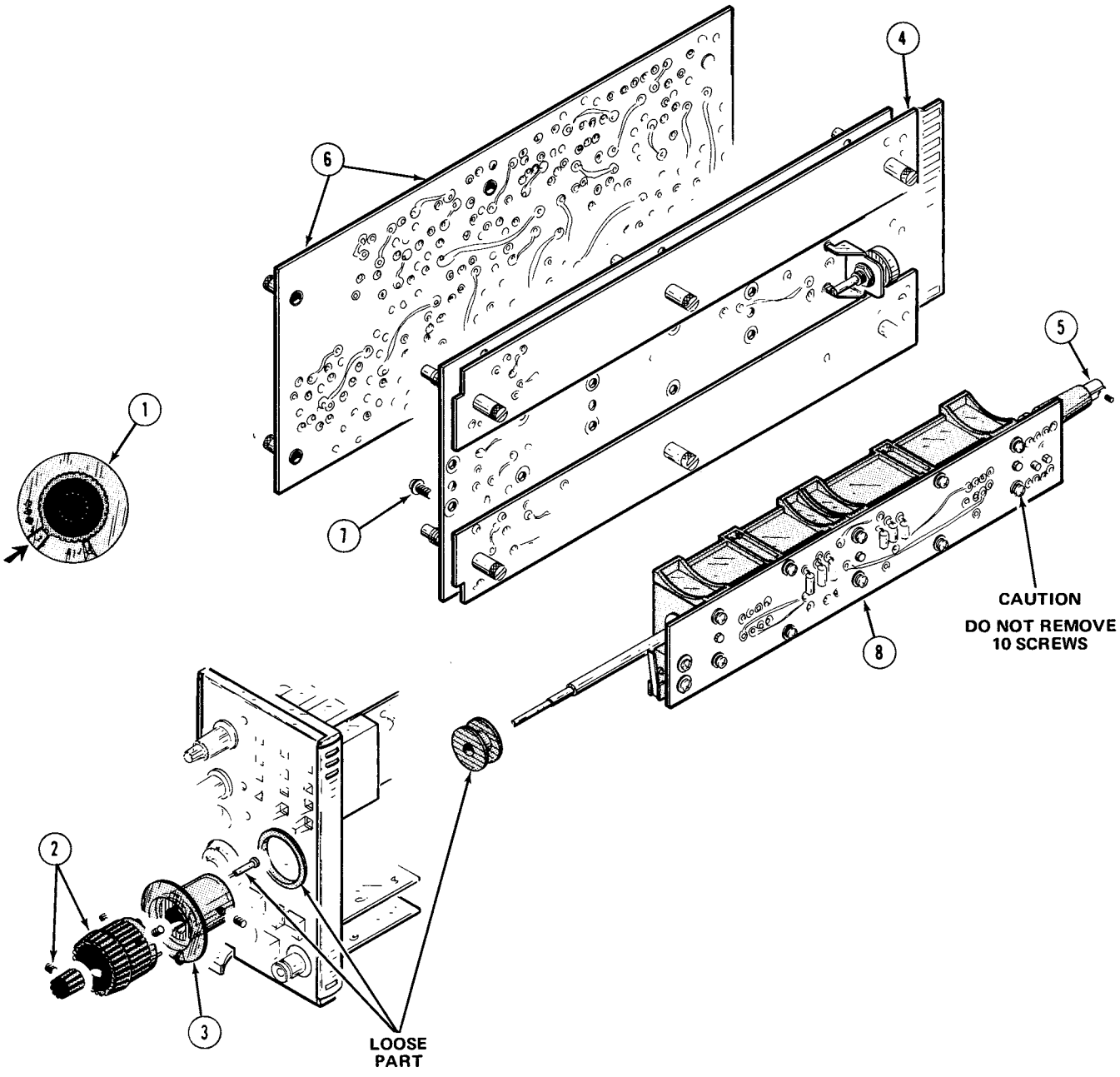


Fig. 3-2. Cam-switch removal.

CAUTION

Repair of the cam switch should only be undertaken by skilled maintenance personnel. Switch alignment and contact spacing must be carefully maintained for proper operation of the switch. The cam switch repair kit (Tektronix Part Number 040-0541-00) contains special alignment tools for use in repairing or replacing the cam and contacts. For information or assistance on maintenance of the cam switch, contact your local Tektronix Field Office or representative.

The cam switch (TIME/DIV OR DLY TIME and DLY'D Time/Division) consists of two rotating cams (front portion for TIME/DIV OR DLY TIME and rear portion for DLY'D Time/Division), which are turned by front-panel knobs and contacts mounted on the adjacent Interface board. These contacts are actuated by lobes on the cam as it is turned. The switch can be disassembled for inspection, cleaning, repair, or replacement; but it is recommended that the switch be removed from the instrument only as a unit.

NOTE

Before removing switch and control knobs, note the position of the knob to facilitate replacement and to assure proper alignment.

1. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to .2 s to provide easy access to the screw on the clear plastic flange (rear of subpanel) and to facilitate replacement of the switch.

2. Press in the DLY'D Time/Division switch. Loosen the set screws and remove the VARIABLE and DLY'D Time/Division knobs.

3. Remove the set screw from the rear of the front-subpanel and remove the clear plastic flange associated with the TIME/DIV OR DLY TIME assembly.

4. Disconnect the necessary cables from the Main Trigger circuit board to allow removal of the cam switch assembly.

5. Rotate the VARIABLE Time/Division switch to expose the set screw holding the shaft of R200. Loosen the set screw to allow cam switch removal.

6. Disconnect the two cables from the Sweep board and completely loosen the six screws holding the Sweep board. Carefully lift the sweep board from the instrument; do not bend pins from the Interface board to the Sweep board.

7. Remove the 10 set screws holding the cam switch to the Interface board. Hold the cam switch while removing the screws.

CAUTION

Do not remove ten screws holding Readout board to cam-switch.

8. Remove the cam switch assembly from the Interface board.

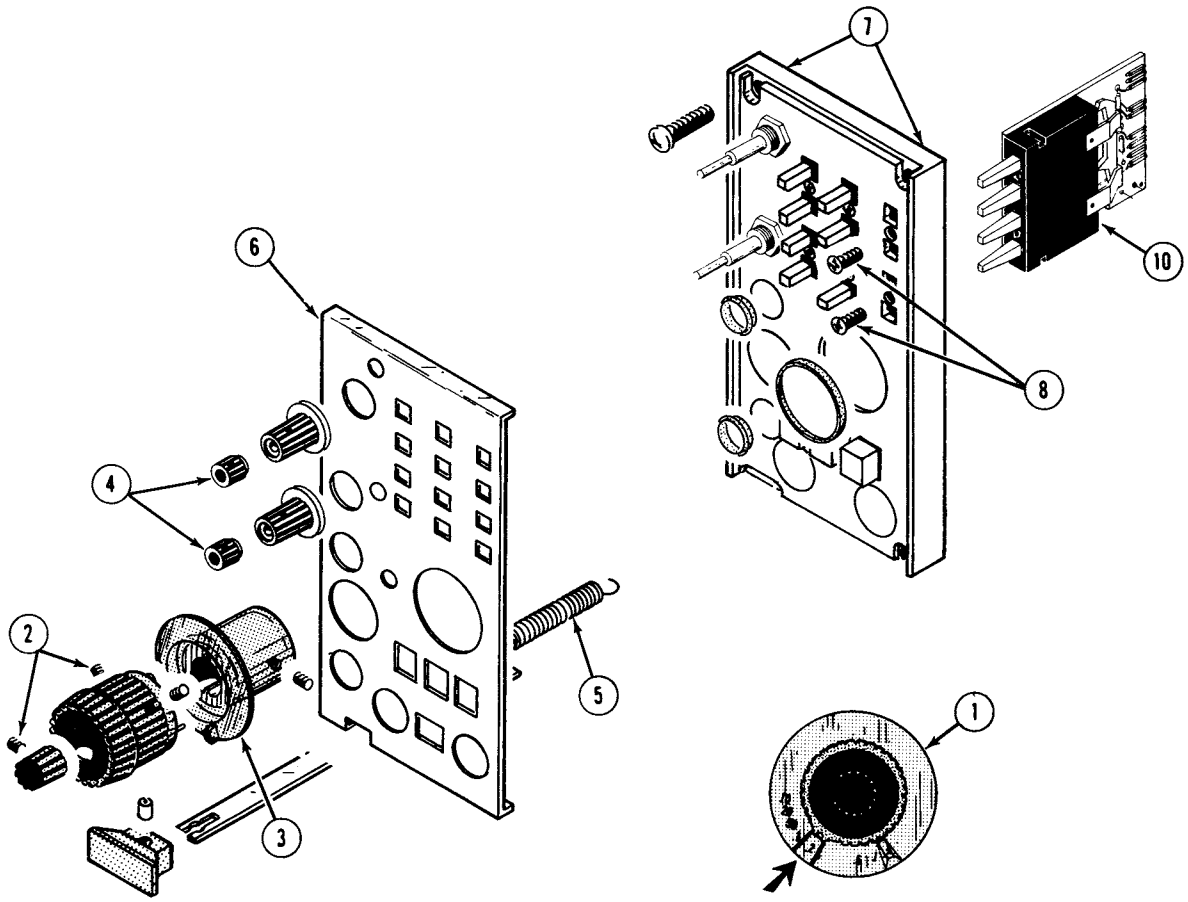
9. Follow the procedure as given in the switch repair kit to remove, replace, etc., the contacts on the Interface board.

10. To replace the cam switch, reverse the above procedure. Make sure that the clear plastic flange and the DLY'D Time/Division knob are replaced at the same switch position from which they were removed (.2 s/DIV with DLY'D Time/Division switch pushed in).

CAUTION

When replacing the 10 screws to the Interface board, tighten evenly. When replacing the Sweep board, do not apply much pressure until it is certain all pins from the Interface board have mated with the connectors on the Sweep board.

Fig. 3-2 (cont.)



NOTE

Before removing switch and control knobs, note the position of the knob to facilitate replacement and to assure proper alignment.

1. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to .2 s to provide easy access to the set screw on the clear plastic flange and to facilitate replacement of the time/division switches.

2. Press in the DLY'D Time/Division switch. Loosen the set screws and remove the VARIABLE and DLY'D Time/Division knobs.

3. Remove the set screw from the rear of the front-subpanel and remove the clear plastic flange associated with the TIME/DIV OR DLY TIME assembly.

4. Loosen the set screws and remove the SLOPE, LEVEL, INTENSITY, and POSITION knobs.

5. Remove the spring from the 7B92 release latch.

6. Remove the front panel.

7. Remove the four set screws (one in each corner of the subpanel) holding the front-subpanel to the chassis. Pull out the front-subpanel to allow removal of the switches.

8. Loosen the screws holding the switch (to be replaced) to the front-subpanel.

9. Loosen any multipin connector(s) associated with the switch being replaced and unsolder leads or components where necessary.

10. When the switch is clear from external connection, remove the complete switch assembly from the front-subpanel.

11. To replace a pushbutton switch, reverse the above procedure. Make sure that all switch knobs are replaced in the same position as when they were removed.

Fig. 3-3. Pushbutton switch removal.

CALIBRATION

Calibration Interval

To assure instrument accuracy, check the calibration of the 7B92 every 1000 hours of operation, or every six months if used infrequently. Before complete calibration, thoroughly clean and inspect this instrument as outlined in the Maintenance section.

Tektronix Field Service

Tektronix, Inc. provides complete instrument repair and recalibration at local Field Service Centers and the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Using This Procedure

General. This section provides several features to facilitate calibration of the 7B92. These are:

Index. An index is given preceding the calibration procedure to aid in locating steps.

Performance Check. The performance of this instrument can be checked by performing only the √ CHECK steps. The √ preceding a step indicates that performing this step checks the instrument against the tolerances listed as a Performance Requirement (see Specification section in Operators manual). Limits and tolerances given in other check steps are calibration guides and should not be interpreted as instrument specifications. Operator front-panel adjustments are adjusted as part of the Performance Check procedure.

Partial Calibration. A partial calibration is often desirable after replacing components, or to touch up the adjustment of a portion of the instrument between major recalibrations. To calibrate only part of the instrument, set the controls as given under Preliminary Control Settings and start with the nearest Equipment Required list preceding the desired portion. To prevent unnecessary recalibration of other parts of the instrument, readjust only if the tolerance given in the CHECK— part of the step is not met. If readjustment is necessary, also check the calibration of any steps listed in the INTERACTION or CALIBRATION part of the step.

Complete Calibration Procedure. Completion of each step in the complete Calibration procedure ensures that this instrument is correctly adjusted and performing within all given tolerances.

NOTE

All waveforms shown in this section were taken with a Tektronix oscilloscope camera system, unless otherwise stated.

TEST EQUIPMENT REQUIRED

General

The following test equipment and accessories, or its equivalent, is required for complete calibration of the 7B92. Specifications given for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All test equipment is assumed to be correctly calibrated and operating within the listed specifications. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Special Calibration Fixtures

Special Tektronix calibration fixtures are used in this procedure only where they facilitate instrument calibration. These special calibration fixtures are available from Tektronix, Inc. Order by part number through your local Tektronix Field Office or representative.

Calibration Equipment Alternatives

All of the listed test equipment, or its equivalent, is required to completely check and adjust this instrument. The Calibration procedure is based on the first item of equipment given as an example of applicable equipment. When other equipment is substituted, control settings or calibration setup may need to be altered slightly to meet the requirements of the substitute equipment. If the exact item of test equipment is not available, first check the Specifications column carefully to see if any other equipment is available which might suffice.

TEST EQUIPMENT

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Calibration Oscilloscope	Tektronix 7000-Series. 500 megahertz bandwidth.	Used throughout procedure to provide a display.	a. Tektronix 7904 Oscilloscope.
2. Amplifier Plug-in Unit	Tektronix 7A-Series. 50 millivolts to five volts/div deflection factor.	External trigger level range checks. Delayed sweep baseline adjustment.	a. 7A15A, 7A16, 7A18 Amplifier Units. b. Other 7A-Series plug-in units may be used.
3. Wide-Band Amplifier Plug-in Unit	Tektronix 7A-Series. 500 megahertz bandwidth.	Used throughout procedure to provide vertical input to oscilloscope system.	a. Tektronix 7A19 Amplifier.
4. 10X Passive Probe	Compatible with 7A-Series Amplifiers.	Line triggering check. Delayed sweep baseline adjustment.	a. Tektronix P6053 Probe.
5. Differential Sampling System	System risetime at least 350 picoseconds; pulse amplitude, 200 millivolts input; differential sensitivity, 100 millivolts.	Delay Pickoff TD bias adjustment. High-frequency linearity checks and adjustments.	a. Tektronix 7S12 TDR/Sampler plug-in Unit with S-1 Sampling Head and S-52 Pulse Generator Head, and a 7S11 vertical sampling plug-in unit with a S-1 Sampling Head.
6. Fast-Rise Pulse Generator	Pulse output; positive-going pulse with 200 millivolts amplitude. Risetime equal to or less than 70 picoseconds.	Delay pickoff TD bias adjustment.	a. Tektronix S-52 Pulse Generator Head used with 7S12 TDR/Sampler or Type 285 Power Supply. b. Tektronix Type 284 Pulse Generator.
7. Time-Mark Generator	Marker outputs, two nanoseconds to 0.5 second; marker accuracy, within 0.1%.	Sweep timing checks and adjustments. Sweep delay checks and adjustments.	a. Tektronix 2901 Time-Mark Generator. b. Tektronix Type 184 Time-Mark Generator.
8. Low-Frequency Sine-wave Generator	Frequency, 30 hertz to 50 kilohertz; output amplitude, variable from 50 millivolts to 10 volts.	Low-frequency triggering checks.	a. General Radio 1310-B Oscillator.
9. Medium-Frequency Constant-Amplitude Signal Generator	Frequency, 20 megahertz to 100 megahertz; output amplitude variable from 100 millivolts to 500 millivolts.	20 megahertz triggering checks.	a. Tektronix Type 191 Constant Amplitude Signal Generator.
10. High-Frequency Constant-Amplitude Signal Generator	Frequency, 100 megahertz to 500 megahertz; reference frequency, 10 megahertz or lower; output amplitude, variable from 0.5 to four volts; amplitude accuracy, constant within 1% of reference as output frequency changes.	Trigger TD bias and runs after sensitivity adjustments. HF SYNC operation checks. Trigger jitter checks.	a. Tektronix 067-0532-01 Calibration Fixture. b. Tektronix 067-0650-00 Calibration Fixture. c. General Radio 1362 UHF Oscillator with 1263-C Amplitude-Regulation Power Supply. d. Wiltron Model 610B Swept Frequency Generator with Model 6108B, 10 to 1220 megahertz plug-in.

TEST EQUIPMENT (cont)

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
11. Plug-In Extender	Provides access to 7B92 adjustments.	Used throughout procedure to provide access to internal adjustments and test points.	a. Tektronix 067-0589-00 Calibration Fixture.
12. Attenuator	Impedance, 50 ohms; attenuation, 5X; connector, GR874.	HF SYNC operation check.	a. Tektronix Part No. 017-0079-00.
13. T-Connector	Connectors, BNC.	External trigger checks. Trigger TD bias and runs after sensitivity adjustments. HF SYNC operation checks. Trigger jitter checks.	a. Tektronix Part No. 103-0030-00.
14. Cable (Three Required)	Impedance, 50 ohms; type RG-58/U; length, 42 inches; connectors, BNC.	Used throughout procedure for signal interconnection.	a. Tektronix Part No. 012-0057-01.
15. Adapter	Connectors, GR874 and BNC male.	Trigger TD bias and runs after sensitivity adjustments. HF SYNC operation checks. Trigger jitter checks.	a. Tektronix Part No. 017-0064-00.
16. Adapter (Two Required)	Connectors GR874 and BNC female.	20 megahertz triggering checks (one). High-frequency linearity checks and adjustments (two).	a. Tektronix Part No. 017-0063-00.
17. Adapter (Two Required)	Connectors, BNC female and BNC female.	High-frequency linearity checks and adjustments.	a. Tektronix Part No. 103-0028-00.
18. Adapter	Connectors, BSM female and BNC female.	High-frequency linearity checks and adjustments.	a. Tektronix Part No. 103-0036-00.
19. Adapter	SMA (3 mm) male to BNC female.	Delay pickoff TD bias adjustment.	a. Tektronix Part No. 015-1018-00.
20. Screwdriver	Three-inch shaft, 3/32 inch bit.	Used to adjust variable resistors.	a. Xcelite R-3323.
21. Low Capacitance Screwdriver	1-1/2 inch shaft.	Used to adjust variable capacitors.	a. Tektronix Part No. 003-0000-00.

CALIBRATION PROCEDURE

7B92 Serial No. _____

Calibration Date _____

Calibrated By _____

Introduction

The following procedure returns the 7B92 to correct calibration. All limits and tolerances given in this procedure are calibration guides, and should not be interpreted as instrument specifications except when listed as a performance requirement in the Specification section in the Operators Manual.

Index to Calibration Procedure

Preliminary Procedure

1. Install the 7A19 Amplifier unit into the Left Vert Compartment of the 7904 Oscilloscope.

2. Remove the side covers from the 7B92 and install it into the 067-0589-00 plug-in extender. Install the 7B92 and the plug-in extender into the B Horiz compartment of the 7904 Oscilloscope.

3. Remove the right side panel from the 7904 Oscilloscope.

4. Turn on the oscilloscope and allow at least 20 minutes warm-up before proceeding with calibration.

5. Set the oscilloscope system controls as follows:

7904 Oscilloscope

Vertical Mode	Left
B Trigger Source	Vert Mode
A Trigger Source	Vert Mode
Horizontal Mode	B
Focus	Adjust for well defined display
Intensity	As desired
Grat Illum	As desired

7B92 Time Base

Main Triggering	
SLOPE	(+)
MODE	AUTO
COUPLING	AC
SOURCE	INT
TERM	OUT—50 Ω
Delayed Triggering	
SLOPE	(+)
COUPLING	AC
SOURCE	INT
LEVEL	IN—RUNS AFTER DLY TIME
DELAY TIME MULT	0.00
TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	10 μs (pull out for INTEN Display Mode)
VARIABLE	CAL (press in)
Variable Selector (Internal)	Delaying Sweep Variable (see Operators Manual)
POSITION	For Centered Display
ALT	(press in)

7A19 Amplifier

Position	Midrange
Volts/Div	50 mV
Polarity	+Up
Input Coupling	DC

TRIGGER SYSTEM CALIBRATION

Equipment Required

1. 7904 Oscilloscope
2. 7A19 Amplifier
3. 7A15A Amplifier
4. Plug-in Extender
5. 10X probe
6. Low-frequency sine-wave generator
7. Constant amplitude signal generator (20 megahertz output)
8. Constant amplitude signal generator (100 to 500 megahertz)
9. 42-inch 50-ohm BNC cable (two)
10. BNC T-connector
11. GR to BNC female adapter
12. GR to BNC male adapter
13. GR 5X attenuator

NOTE

See Fig. 6-21 (located on pull-out page in the rear of the diagrams section) for location of Trigger System adjustments and test points.

Control Settings

Perform the Preliminary Procedure at the beginning of this section.

NOTE

If the 7B92 has been operating satisfactorily and it is desired to touch up instrument calibration for improved performance, complete steps 1(a) and 1(b), then proceed to calibration step 2. If the instrument has known operating problems, perform calibration steps 1(a) through 1(k), and then continue with calibration step 2.

1. Preliminary Trigger Adjustments (R740, R750, R940, R950, and R364)

a. Connect the low-frequency sine-wave generator to the 7A19 Input with a 42-inch 50-ohm BNC cable and BNC T-connector. Connect the output of the T-connector to the MAIN TRIG IN connector with a 42-inch BNC cable.

b. Set the low-frequency sine-wave generator for a two-division display at 50 kilohertz. Center the display vertically. Adjust the 7B92 INTENSITY control to view both the intensified and non-intensified portion of display.

c. Remove the 7B92 from the plug-in extender and install the 7B92 directly into the B Horiz compartment.

d. Preset the following control settings:

R364	Fully Counterclockwise
R750	Fully Counterclockwise
R940	Fully Counterclockwise
R950	Fully Counterclockwise

e. Rotate the MAIN TRIGGERING LEVEL control for a stable display. If a stable display cannot be obtained, adjust Intensity and Focus control for a well-defined free-running display and set the LEVEL control to 0.

f. ADJUST—R740, Main Arming TD Bias, fully counterclockwise, then adjust clockwise until a stable display is obtained. Adjust R740 an additional 10 degrees clockwise.

g. Press and release the Delayed Triggering LEVEL control to DLY'D SWP TRIGGERABLE (knob out). Rotate the Delayed Triggering LEVEL for a stable intensified display (do not rotate LEVEL control into HF SYNC area). Adjust the 7B92 and oscilloscope Intensity controls as necessary for an optimum intensified display.

h. ADJUST—R950, Delayed Sweep Start TD Bias, clockwise until the intensified portion of the sweep disappears. Adjust R950 an additional 10 degrees clockwise.

i. ADJUST—R940, Delayed Arming TD Bias, clockwise until a stable display of the intensified portion of the sweep appears. Rotate the Delayed Triggering LEVEL control as necessary.

j. Press the Delayed Triggering LEVEL control to the (knob in) RUNS AFTER DLY TIME position.

k. ADJUST—While rotating the DELAY TIME MULT dial, adjust R364, Delay Pickoff TD Bias, clockwise until the DELAY TIME MULT dial rotation affects the position of the intensified portion of the display.

l. Remove the 7B92 from the oscilloscope and install the 7B92 into the 067-0589-00 Plug-in extender. Install the 7B92 and the Plug-in extender into the B Horiz compartment.

2. Check/Adjust Main Trigger Level Sensitivity (R730)

a. Set the DELAY TIME MULT dial to 5.00.

b. CHECK—Rotate the MAIN TRIGGERING LEVEL control and check that the delaying sweep (non-intensified portion of the display) can be triggered at any point along the positive slope of the waveform.

c. ADJUST—R730, Trigger Level Sensitivity, to trigger the display (start of sweep) at any point along the positive slope of the waveform.

d. Change the MAIN TRIGGERING SLOPE switch to (—) and repeat steps b and c for the negative slope of the waveform.

3. Check/Adjust Main Triggering Internal and External DC Centering (R647, R602)

a. Set the low-frequency sine-wave generator for a 0.5 division display at 50 kilohertz. Vertically center the display.

b. Change the MAIN TRIGGERING MODE switch to NORM and rotate the MAIN TRIGGERING LEVEL

control for a stable display with the trigger point near the vertical center of the waveform (TRIG'D light on). Note the position of the sweep trigger point (start of non-intensified portion of sweep) with respect to CRT center.

c. Set the MAIN TRIGGERING COUPLING switch to DC.

d. CHECK—CRT for a triggered display with the position of the sweep trigger point the same as in part b.

e. ADJUST—R647, Internal DC Centering, for a triggered display with the position of the sweep trigger point the same as noted in part b.

f. Repeat the adjustment of R647 as necessary until the position of the sweep trigger remains the same in either the AC or DC positions of the MAIN TRIGGERING COUPLING switch. Return the COUPLING switch to AC.

g. Change the MAIN TRIGGERING SLOPE switch to (+). Repeat steps b through f for the positive slope of the waveform.

h. Set the low-frequency sine-wave generator for a two-division display (100 mV). Vertically center the display.

i. Rotate the MAIN TRIGGERING LEVEL control for a stable display with the trigger point of the non-intensified portion of the display near the center of the waveform. Note the position of the sweep trigger point with respect to CRT center.

j. Set the MAIN TRIGGERING SOURCE switch to EXT.

k. CHECK—CRT for triggered display with the position of the sweep trigger point the same as noted in part i.

l. ADJUST—R602, Main External DC Centering, for a triggered display with the position of the sweep trigger point the same as noted in part i.

m. Repeat the adjustment of R602 until the position of the sweep trigger point remains the same in either the INT or EXT positions of the MAIN TRIGGERING SOURCE switch. Return the MAIN TRIGGERING SOURCE switch to INT.

n. Change the MAIN TRIGGERING SLOPE switch to (—) and repeat steps i through m for the negative slope of the waveform.

4. Check/Adjust Delayed Trigger Sensitivity (R920)

a. Remove the BNC cable from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

b. Change the following control settings:

Main Triggering	
MODE	AUTO
LEVEL	Adjust for TRIG'D light on
TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	10 μs (Press in for DLY'D Sweep Display Mode)

c. Press and release the Delayed Triggering LEVEL control and rotate for a triggered delayed sweep display (oscilloscope Intensity may need to be increased).

d. CHECK—Rotate the Delayed Triggering LEVEL control and check that display can be triggered at any point along the positive slope of the waveform. CHECK that the display cannot be triggered at either end of the Delayed Triggering LEVEL rotation (the negative end of the Delayed Triggering LEVEL does not include the HF SYNC area).

e. ADJUST—R920, Delayed Trigger Level Sensitivity, to trigger the display at any point along the positive slope of the waveform with no display at either end of the Delayed Triggering LEVEL rotation (the negative end of the Delayed Triggering LEVEL control does not include the HF SYNC area).

f. Change the Delayed Triggering SLOPE switch to (—) and repeat steps d and e for the negative slope of the waveform.

5. Check/Adjust Delayed Triggering Internal and External DC Centering (R802)

a. Set the Delayed Triggering COUPLING switch to DC. Rotate the Delayed Triggering LEVEL control to trigger the display near the vertical center of the waveform.

b. Note the position of the sweep trigger point with respect to display center.

c. Set the Delayed Triggering SOURCE switch to EXT.

d. CHECK—CRT for triggered display with the position of the sweep trigger point the same as noted in part b.

e. ADJUST—R802, Delayed External DC Center, for a triggered display with the position of the sweep trigger point the same as noted in part b.

f. Repeat the adjustment of R802 until the position of the sweep trigger point remains the same in either the INT or EXT positions of the Delayed Triggering SOURCE switch.

g. Set the Delayed Triggering SOURCE switch to INT. Change the Delayed Triggering SLOPE switch to (+) and repeat parts a through f for the positive slope of the waveform.

√6. Check Main and Delayed Low-Frequency Triggering Operation

a. Disconnect the BNC cable from the DLY'D TRIG IN connector and connect it to the MAIN TRIG IN connector.

b. Change the following control settings:

Main Triggering	
COUPLING	AC
LEVEL	Adjust for TRIG'D light on
Delayed Triggering	
SLOPE	(+)
COUPLING	AC
SOURCE	INT
LEVEL	IN—RUNS AFTER DLY TIME
TIME/DIV OR DLY TIME	10 ms
DLY'D Time/Division	5 ms (Pull out for INTEN Display Mode)

c. Set the low-frequency sine-wave generator for a 0.5 division display at 30 hertz.

√d. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC HF REJ, and DC for both the (+) and (—) SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

e. Change the MAIN TRIGGERING SOURCE switch to EXT. Set the low-frequency sine-wave generator for a two-division display (100 mV) at 30 hertz.

√f. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC HF REJ, and DC for both the (+) and (—) SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

g. CALIBRATION—If the 7B92 does not meet the requirement given in parts d and f, check the adjustment of the Main Trigger Level Sensitivity (R730—Calibration step 2).

h. Disconnect the BNC cable from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

i. Change the following control settings:

Main Triggering	
LEVEL	TRIG'D light on
SOURCE	INT
Delayed Triggering	
LEVEL	OUT—DLY'D SWP TRIGGERABLE
SOURCE	EXT
DLY'D Time/Division	Press in for DLY'D Sweep Display Mode

√j. CHECK—Stable CRT display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the (+) and (—) SLOPE (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display). It may be necessary to adjust the 7B92 and oscilloscope Intensity controls to view the delayed sweep trace.

k. Change the Delayed Triggering SOURCE switch to INT.

l. Press the Delayed Triggering LEVEL control to RUNS AFTER DLY TIME (knob inward). Set the low-frequency sine-wave generator for a 0.5 division display at 30 hertz. Return the Delayed Triggering LEVEL control to DLY'D SWP TRIGGERABLE (knob out).

√m. CHECK—Stable CRT display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC for both the (+) and (—) SLOPE (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display).

n. CALIBRATION—If the 7B92 does not meet the requirement given in parts j and m, check the adjustment of the Delayed Trigger Level Sensitivity (R920—Calibration step 4).

√7. Check Delayed and Main Triggering External Level Range

a. Install the 7A15A Amplifier into the Right Vert compartment of the 7904 oscilloscope. Set the oscilloscope Vertical Mode switch to Right.

b. Remove the BNC T-connector and connections from the 7A19 Input and connect it to the 7A15A Input.

c. Set the 7A15A Input Coupling switch to DC and the Volts/Div switch to 1 V.

d. Change the following control settings:

TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	10 μs (Press in for DLY'D Sweep Display Mode)
Main Triggering	
LEVEL	Adjust for TRIG'D light on
SLOPE	(+)
TERM	IN—1 MΩ
Delayed Triggering	
SOURCE	EXT
SLOPE	(+)

e. Set the low-frequency sine-wave generator for a five division display (5 volts) at 50 kilohertz. Center the display vertically.

√f. CHECK—Rotate the Delayed Triggering LEVEL control throughout its range and check that all levels of the positive slope may be obtained (indicates an external delayed trigger level range of at least plus and minus 2.5 volts). CHECK that display is not triggered at either end of the LEVEL control rotation. (The negative end of the Delayed Triggering LEVEL does not include the HF SYNC area).

g. Change the Delayed Triggering SOURCE switch to (—).

√h. CHECK—Repeat step f for the negative slope of the waveform.

i. CALIBRATION—If the 7B92 does not meet the requirements given in part f, check the adjustment of the Delayed Trigger Level Sensitivity (R920—Calibration step 4).

j. Remove the BNC connector from the DLY'D TRIG IN connector and connect it to the MAIN TRIG IN connector.

k. Press the Delayed Triggering LEVEL control to IN—RUNS AFTER DLY TIME and pull out the DLY'D Time/Division switch for the INTEN Display Mode. Set the MAIN TRIGGERING SOURCE switch to EXT.

l. Set the low-frequency sine-wave generator for a seven division display at 50 kilohertz. Center the display vertically.

√m. CHECK—Rotate the MAIN TRIGGERING LEVEL control throughout its range and check that all levels of the positive slope may be obtained (indicates an external main triggering level range of at least plus and minus 3.5 volts). Check that display is not triggered at either end of the LEVEL control rotation.

n. Change the MAIN TRIGGERING SLOPE switch to (—).

√o. CHECK—Repeat step m for the negative slope of the waveform.

p. CALIBRATION—If the 7B92 does not meet the requirements given in part m, check the adjustment of the Main Trigger Level Sensitivity (R730—Calibration step 2).

q. Change the MAIN TRIGGERING SOURCE switch to EXT ÷10.

r. To check EXT ÷10 external level range, apply a 70-volt peak to peak signal through an attenuator, to the 7A15A Input and to the MAIN TRIG IN connector (non-attenuated).

√s. CHECK—Rotate the MAIN TRIGGERING LEVEL control throughout its range and check that all levels of the negative slope may be selected (indicates EXT ÷10 external main triggering level range of at least plus and minus 35 volts). Check that display is not triggered at either extreme of LEVEL control rotation.

t. Change the MAIN TRIGGERING SLOPE switch to (+).

√u. CHECK—Repeat step s for the positive slope of the waveform.

v. If the 7B92 does not meet the requirements given in part s, check the adjustment of the Main Trigger Level Sensitivity (R730—Calibration step 2).

√8. Check Main Triggering AC LF REJ Operation

a. Change the following control settings:

7A15A Amplifier

Volts/Div	1 V

7B92 Time Base

Main Triggering	
SOURCE	EXT
TIME/DIV OR	
DLY TIME	10 ms
DLY'D Time/Division	10 ms (press in for NORMAL Sweep Display Mode)

b. Set the low-frequency sine-wave generator for a three-division display (three volts) at 60 hertz.

c. Rotate the MAIN TRIGGERING LEVEL control for a stable display (TRIG'D light on).

d. Change the MAIN TRIGGERING COUPLING switch to AC LF REJ.

√e. CHECK—Rotate the MAIN TRIGGERING LEVEL control throughout its range and check that a stable display cannot be obtained (TRIG'D light off).

f. Change the MAIN TRIGGERING SOURCE switch to INT and the COUPLING switch to AC LF REJ.

g. Set the low-frequency sine-wave generator for an eight-division display at 60 hertz. Center the display vertically.

√h. CHECK—Rotate the MAIN TRIGGERING LEVEL control throughout its range and check that a stable display cannot be obtained (TRIG'D light off).

i. Disconnect all test equipment from the oscilloscope system.

√9. Check Line Triggering Operation

a. Change the following control settings:

7A15A Amplifier

Volts/Div	5 V

7B92 Time Base

Main Triggering	
COUPLING	AC
SOURCE	LINE

b. Connect the 10X probe to the 7A15A Input and the probe tip to the same line-voltage source which is connected to the oscilloscope.

√c. CHECK—Rotate the MAIN TRIGGERING LEVEL control and check that a stable display can be obtained (TRIG'D light on) for both the (+) and (—) SLOPE.

d. Disconnect all test equipment from the oscilloscope system.

√10. Check AUTO, NORM, and SINGLE SWEEP Modes

a. Change the following control settings:

7A19 Amplifier

Volts/Div	1 V

7904 Oscilloscope

Vertical Mode	Left

7B92 Time Base

Main Triggering	
SOURCE	INT
TIME/DIV OR	
DLY TIME	10 μs
DLY'D Time/Division	10 μs (press in for NORMAL Sweep Display Mode)

b. Connect the Output of the low-frequency sine-wave generator to the 7A19 Input with a 42-inch 50-ohm BNC cable. Set the low-frequency generator for a four-division display at 50 kilohertz.

c. Rotate the MAIN TRIGGERING LEVEL control for a free-running display (TRIG'D light off).

d. Set the MAIN TRIGGERING MODE switch to NORM.

√e. CHECK—CRT for no display (TRIG'D light off).

f. Set the MODE switch to AUTO. Rotate the MAIN TRIGGERING LEVEL to just trigger the display.

g. Set the MODE switch to NORM.

√h. CHECK—CRT for triggered display (TRIG'D light on).

i. Change the MAIN TRIGGERING MODE switch to SINGLE SWEEP.

√j. CHECK—CRT for no display.

k. Press the MAIN TRIGGERING RESET button.

√l. CHECK—CRT for one sweep as the RESET button is pressed (oscilloscope Intensity may need to be increased to view the single sweep display).

m. Remove the signal from the 7A19 Input, then press the RESET button.

√n. CHECK—CRT for no display and READY light on.

√o. CHECK—Reconnect the signal to the 7A19 Input. Check for one sweep as the signal is applied to the 7A19 and that the READY light is out after the completion of that sweep.

p. Disconnect all test equipment from the oscilloscope system.

√11. Check/Adjust Main Triggering TD Bias and Runs After Sensitivity—(R740, R750 and R959)

a. Remove the 7B92 and plug-in extender from the oscilloscope. Install the 7B92 directly into the B Horiz compartment.

b. Change the following control settings:

Main Triggering	
MODE	AUTO
TIME/DIV OR DLY TIME	.5 ns
DLY'D Time/Division	.5 ns (press in for NORMAL Sweep Display Mode)
DELAY TIME MULT	1.00
TERM	OUT—50 Ω
Delayed Triggering	
LEVEL	IN—RUNS AFTER DLY TIME
SLOPE	(+)
COUPLING	AC
SOURCE	INT

c. Connect the Output of the high-frequency constant-amplitude signal generator to the 7A19 Input with a GR-to-BNC male adapter and BNC T-connector. Connect the output of the T-connector to the MAIN TRIG IN connector with a 42-inch 50-ohm BNC cable. Set the high-frequency sine-wave generator for a one-division display at 500 megahertz.

√d. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the (+) and (—) SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

e. ADJUST—R740, Main Arming TD Bias, counter-clockwise until the sweep free-runs, then adjust clockwise until the sweep is triggered. Repeat part d.

f. Change the following control settings:

TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	.5 ns (press in for DLY'D Sweep Display Mode)
Main Triggering LEVEL	Adjust for TRIG'D light on

√g. CHECK—Rotate the DELAY TIME MULT dial from 1.00 to 9.00 and check for no double triggering or defocusing of sine waves.

h. ADJUST—Rotate the DELAY TIME MULT dial from 1.00 to 9.00 and adjust R959, Runs After Delay Time Sensitivity, and R750, Delaying Sweep Start TD Bias, for no double triggering or defocusing.

√i. CHECK—Vary the high frequency generator from 500 megahertz to 100 megahertz and from 100 megahertz to 500 megahertz. Check for stable CRT display with no

double triggering or defocusing of sine waves (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

j. ADJUST—Vary the high-frequency generator from 500 megahertz to 100 megahertz and from 100 megahertz to 500 megahertz. Repeat the adjustment of R740, R750, and R959 for a stable CRT display with no defocusing or double triggering.

k. INTERACTION—The adjustment of R959 may affect the adjustment of R940 and R950 (Calibration step 12) and R364 (Calibration steps 1 and 26).

l. Change the 7A19 Volts/Div switch to .1 V and set the MAIN TRIG SOURCE switch to EXT.

m. Set the high-frequency generator for a five-division display (500 millivolts) at 500 megahertz.

√n. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the (+) and (–) SLOPE.

√o. CHECK—Vary the high-frequency generator from 500 megahertz to 100 megahertz and from 100 megahertz to 500 megahertz. CHECK for stable CRT display with no double triggering or defocusing (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

p. CALIBRATION—If the 7B92 does not meet the requirements given in parts n and o, check the adjustments of R740, R750 and R959.

√12. Check/Adjust Delayed Triggering TD Bias (R940, R950)

a. Set the high-frequency generator and the 7A19 Volts/Division switch for a one-division display at 500 megahertz.

b. Change the following control settings:

7B92 Time Base

Main Triggering	
SOURCE	INT
LEVEL	Adjust for TRIG'D light on
Delayed Triggering	
LEVEL	OUT—DLY'D SWP TRIGGERABLE

c. Rotate the Delayed Triggering LEVEL control for a stable delayed sweep display.

NOTE

If a display cannot be obtained at any setting of the Delayed Triggering LEVEL control, check the preliminary adjustment of R940 and R950 (Calibration step 1) and R920 (Calibration step 4).

√d. CHECK—Stable delayed sweep display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC for both the (+) and (–) SLOPE (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display).

e. ADJUST—R950, Delayed Sweep Start TD Bias, to observe a slight shift or jump of the delayed sweep trace. Adjust R950 10 degrees clockwise from the observed shift.

f. ADJUST—R940, Delayed Arming TD Bias, to remove any double triggering or defocusing from the delayed sweep display.

√g. CHECK—Rotate the DELAY TIME MULT dial throughout its range and check for no double triggering or defocusing of sine waves.

h. INTERACTION—Repeat the adjustment of R940 and R950 as necessary. It may be necessary to check the adjustment of R920 Calibration step 4).

i. Remove the BNC cable from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

j. Set the 7A19 Volts/Division switch to .1 V. Set the high-frequency generator for a five-division display (500 mV) at 500 megahertz.

k. Change the Delayed Triggering SOURCE switch to EXT.

√l. CHECK—Stable delayed sweep display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC for both the (+) and (–) SLOPE (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display).

m. CALIBRATION—If the 7B92 does not meet the requirements given in part 1, check the adjustment of R940 and R950 (Calibration step 12) and R920 (Calibration step 4).

n. Disconnect all test equipment from the oscilloscope system.

√13. Check HF SYNC Operation

a. Connect the output of the high-frequency constant-amplitude sine-wave generator to the 7A19 Input with a 5X GR attenuator, GR-to-BNC male adapter, and BNC T-connector. Connect the output of the T-connector to the MAIN TRIG IN connector with a 42-inch BNC cable.

b. Change the following control settings:

Main Triggering	
MODE	HF SYNC
TIME/DIV OR	
DLY TIME	10 ns
DLY'D Time/Division	10 ns (press in for NORMAL Sweep Display Mode)
Delayed Triggering	
LEVEL	IN—RUNS AFTER DLY TIME
SLOPE	(+)
COUPLING	DC
SOURCE	INT

c. Set the high-frequency sine-wave generator and the 7A19 Volts/Div switch for a 0.5 division display at 100 megahertz.

√d. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC (Rotate the MAIN TRIGGERING LEVEL control for optimum display).

e. Set the high-frequency sine-wave generator for 0.5 division display at 500 megahertz. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to .5 ns (press in DLY'D Time/Division switch for Normal Display Mode).

√f. CHECK—Repeat part d.

g. Change the following control settings:

7A19 Amplifier	
Volts/Div	.1 V

7B92 Time Base	
Main Triggering	
SOURCE	EXT
TIME/DIV OR	
DLY TIME	10 ns
DLY'D Time/Division	10 ns (press in for NORMAL Sweep Display Mode)

h. Set the high-frequency sine-wave generator for a one-division display (100 mV) at 100 megahertz.

√i. CHECK—Repeat part d.

j. Change the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to .5 ns (press in DLY'D Time/Division switch for the NORMAL Display Mode).

k. Set the high-frequency sine-wave generator for a one-division display (100 mV at 500 megahertz).

√l. CHECK—Repeat part d.

m. CALIBRATION—If the 7B92 does not meet the requirements given in part d, check the adjustment of R740, R750, and R959 (Calibration step 11).

n. Remove the BNC cable from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

o. Change the following control settings:

Main Triggering	
SOURCE	INT
LEVEL	Adjust for TRIG'D light on
TIME/DIV OR	
DLY TIME	20 ns
DLY'D Time/Division	10 ns (press in for DLY'D Sweep Display Mode)

p. Set the high-frequency sine-wave generator and the 7A19 Volts/Div switch for a 0.5-division display at 100 megahertz. Press and release the Delayed Triggering LEVEL control to DLY'D SWP TRIGGERABLE (knob out).

√q. CHECK—Rotate the Delayed Triggering LEVEL control into the HF SYNC area. Check that a stable display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC (Rotate the Delayed Triggering

LEVEL control, within the HF SYNC area, as necessary for an optimum display).

r. Set the high-frequency sine-wave generator for a 0.5 division display at 500 megahertz. Set the TIME/DIV OR DLY TIME switch to .1 μs and the DLY'D Time/Division switch to .5 ns (press in DLY'D Time/Division switch for the DLY'D Sweep Display Mode).

√s. CHECK—Repeat part q.

t. Change the following control settings:

7A19 Amplifier

Volts/Div	.1 V

7B92 Time Base

TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	10 ns

u. Set the high-frequency generator for a one-division (100 mV) display at 100 megahertz. Set the Delayed Triggering SOURCE switch to EXT.

√v. CHECK—Repeat part q.

w. Set the high-frequency sine-wave generator for a one-division display at 500 megahertz. Set the TIME/DIV OR DLY TIME switch to .1 μs and the DLY'D Time/Division switch to .5 ns (press in DLY'D Time/Division switch for the DLY'D Display Mode).

√x. CHECK—Repeat part q.

y. CALIBRATION—If the 7B92 does not meet the requirements given in part q, check the adjustment of R940 and R950 (Calibration step 12).

√14. Check Main and Delayed Trigger Jitter

a. Change the following control settings:

Main Triggering	
MODE	AUTO
COUPLING	AC
TIME/DIV OR DLY TIME	.5 ns
DLY'D Time/Division	.5 ns (press in for NORMAL Sweep Display Mode)
Delayed Triggering	
SOURCE	INT
LEVEL	IN—RUNS AFTER DLY TIME

b. Rotate the MAIN TRIGGERING LEVEL control for a stable display.

√c. CHECK—CRT display for less than 0.1 division (50 picoseconds) of jitter. Disregard any slow drift.

d. Change the following control settings:

Main Triggering	
LEVEL	Adjust for stable display
TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	.5 ns (press in for DLY'D Sweep Display Mode)
Delayed Triggering	
LEVEL	OUT—DLY'D SWP TRIGGERABLE

e. Rotate the Delayed Triggering LEVEL control for a stable delayed sweep display.

√f. CHECK—Delayed sweep display for no more than 0.1 division of jitter (50 picoseconds). Disregard any slow drift.

g. Disconnect all test equipment from the oscilloscope system.

√15. Check 20 Megahertz Triggering

a. Change the following control settings:

7A19 Amplifier

Volts/Div	.2 V

7B92 Time Base

TIME/DIV OR DLY TIME	50 ns
DLY'D Time/Division	50 ns (press in for NORMAL Sweep Display Mode)
Delayed Triggering	
LEVEL	IN—RUNS AFTER DLY TIME

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b. Connect the output of the medium-frequency constant amplitude signal generator to the 7A19 Input with a GR-to-BNC female adapter, 42-inch 50-ohm BNC cable and BNC T-connector. Connect the output of the T-connector to the MAIN TRIG IN connector. Set the Type 191 for a 0.5 division (100 mV) display at 20 megahertz.

√c. CHECK—Stable CRT display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the (+) and (—) SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

d. Change the MAIN TRIGGERING SOURCE switch to EXT.

√e. CHECK—Repeat part c.

f. CALIBRATION—If the 7B92 does not meet the requirements given in part c, check the adjustment of R730 (Calibration step 2).

g. Remove the BNC cable from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

h. Change the following control settings:

Main Triggering	
SOURCE	INT
LEVEL	Adjust for TRIG'D light on
TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	50 ns (press in for DLY'D Sweep Display Mode)
Delayed Triggering	
LEVEL	OUT—DLY'D SWP TRIGGERABLE
SOURCE	EXT

√i. CHECK—Stable delayed sweep display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC for both the (+) and (—) SLOPE (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display).

j. Change the Delayed Triggering SOURCE switch to INT.

√k. CHECK—Repeat part i.

l. CALIBRATION—If the 7B92 does not meet the requirements given in part i, check the adjustment of R920 (Calibration step 4).

m. Disconnect all test equipment from oscilloscope system.

HORIZONTAL SYSTEM CALIBRATION

Equipment Required

1. 7904 Oscilloscope
2. 7A19 Amplifier
3. 7A15A Amplifier
4. 10X probe
5. 7S11 Sampling Unit
6. 7S12 Sampling Unit
7. S1 Sampling Head (two)
8. S52 Pulse Generator Head
9. Time-Mark Generator
10. Plug-in extender
11. 42-inch 50-ohm BNC cable (three)
12. GR to BNC female adapter (two)
13. BNC female to BNC female adapter (two)
14. BSM female to BNC female adapter
15. SMA male to BNC female

NOTE

See Fig. 6-22 (located on pull-out page in the rear of the diagrams section) for location of Horizontal System adjustments and test points.

Control Settings

Set the controls as given in the Preliminary Procedure.

16. Check/Adjust Delayed Sweep Baseline (R452)

a. Install the 7A15A Amplifier unit into the Right Vert Compartment of the 7904 Oscilloscope.

b. Change the following control settings:

7904 Oscilloscope

Vert Mode	Right

7B92 Time Base

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms (pull out for INTEN Display Mode)

c. To establish a ground reference, set the 7A15A input coupling to Gnd (7A15A installed in Right Vert compartment). Position the trace to start at CRT center with the 7A15A and 7B92 Position controls.

d. Connect a 10X probe from the 7A15A Input to (TP) 462.

e. Set the 7A15A input coupling to DC and adjust the Volts/Div to 50 mV.

f. CHECK—CRT trace must start at CRT center.

g. ADJUST—R452, Dly'd Swp Baseline, to start display at CRT center (see Fig. 4-1).

h. INTERACTION—The adjustment of R452 may affect the adjustment of R560 (Calibration step 20) and R364 (Preliminary adjustment Calibration step 1).

i. Disconnect all test equipment from the oscilloscope system.

17. Check/Adjust SWP CAL (front-panel)

a. Set the 7904 Vertical Mode switch to Left.

b. Connect the marker output of the time-mark generator to the 7A19 Amplifier Input with a 42-inch 50-ohm BNC cable. Set the time-mark generator for one-millisecond markers and adjust the 7A19 Volts/Div switch for about two divisions of display.

c. Rotate the MAIN TRIGGERING LEVEL control for a stable display and rotate the POSITION control to horizontally center the trace.

d. CHECK—CRT display, for one-millisecond marker each major division over the center eight divisions of display.

e. ADJUST—Front-panel SWP CAL (screwdriver adjustment R260), for one-millisecond marker each division over the center eight divisions of display. Use the POSITION control as necessary to horizontally align the display with the vertical graticule lines.

√18. Check Display Modes

a. Press in the DLY'D Time/Division switch for the NORMAL Sweep Display Mode.

√b. Rotate the MAIN TRIGGERING LEVEL control for a stable display. Increase the oscilloscope Intensity as necessary. Rotate the DELAY TIME MULT dial and note that it has no effect on the display.

c. Pull out the DLY'D Time/Division switch for the INTEN Display Mode and rotate to .2 ms.

√d. CHECK—CRT display for non-intensified trace (delaying sweep) with an intensified portion (delayed sweep). Adjust the 7B92 and oscilloscope Intensity controls for an optimum intensified trace.

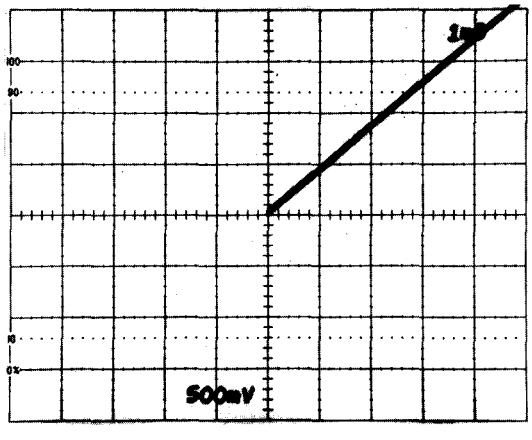


Fig. 4-1. Typical display for adjustment of Dly'd Swp Baseline (R452).

√e. CHECK—Rotate the DELAY TIME MULT dial and note that the amount of delay time before the intensified portion is controlled by the DELAY TIME MULT dial.

f. Press in the DLY'D Time/Division switch for the DLY'D Sweep Display Mode.

√g. CHECK—CRT for magnified display (one complete cycle in five divisions). The oscilloscope Intensity may need to be increased to view the delayed sweep display.

h. Press and release the ALT switch for ALT Sweep Display Mode and rotate (TRACE SEP) in a clockwise direction to separate the traces.

√i. CHECK—CRT display for both an intensified trace and a delayed sweep trace (vertically position the trace as necessary). The intensified trace provides an intensified portion on the delaying sweep (delaying sweep rate determined by the TIME/DIV OR DLY TIME switch) during the time that the delayed sweep runs. The delayed sweep trace displays the intensified portion, as viewed on the intensified trace, at the sweep rate indicated by the DLY'D Time/Division switch.

√j. CHECK—Rotate the TRACE SEP control fully clockwise and check that the intensified trace is positioned approximately four divisions vertically with respect to the delayed sweep trace.

√k. CHECK—Rotate the TRACE SEP control fully counterclockwise and check that the two traces are vertically positioned together. Rotate the TRACE SEP control fully clockwise.

l. Set the oscilloscope Intensity control to midrange.

√m. CHECK—Rotate the 7B92 INTENSITY control throughout its range. Check that the brightness of the non-intensified portion, of the intensified trace, can be varied with respect to the intensified portion.

19. Check/Adjust Delay Start and Delay Stop (R402, R350)

a. Change the following control settings:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	10 μs (pull out for INTEN Display Mode)
DELAY TIME MULT	1.00

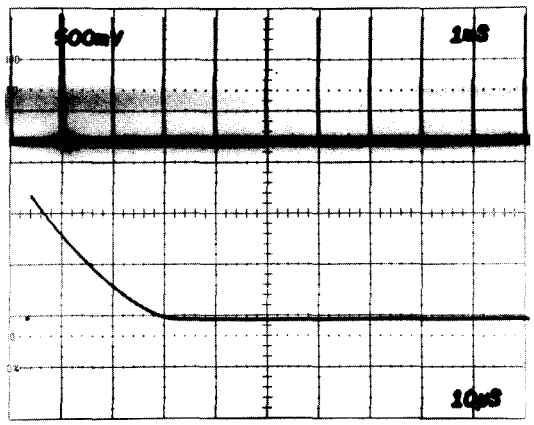
b. Adjust the 7B92 and oscilloscope Intensity controls for the desired alternate trace display.

NOTE

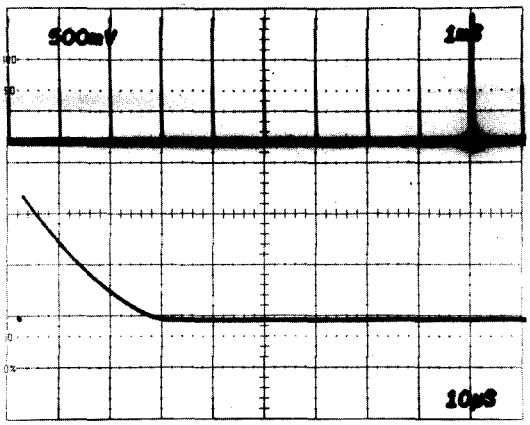
Rough adjustments of the Delay Start and Delay Stop adjustments will be made by viewing the intensified trace, followed by fine adjustments viewing the delayed sweep trace.

c. CHECK—The intensified sweep starts on the second one-millisecond marker of the intensified trace (see Fig. 4-2).

d. ADJUST—R402, Dly Start, to start the intensified sweep on the second one-millisecond marker, then further adjust R402 to start the delayed sweep (delayed sweep trace) at the bottom of the marker (see Fig. 4-2).



(a) Correct adjustment of Delay Start (R402)



(b) Correct adjustment of Delay Stop (R350)

Fig. 4-2. Typical CRT display for adjustment of Dly Start and Dly Stop.

e. CHECK—Rotate the DELAY TIME MULT dial to 9.00 and check that the intensified sweep starts on the tenth one-millisecond marker (see Fig. 4-2).

f. ADJUST—R350, Dly Stop, to start the intensified sweep on the tenth one-millisecond marker, then further adjust R350 to start the delayed sweep (delayed sweep trace) at the bottom of the marker (see Fig. 4-2).

g. INTERACTION—Repeat the adjustment of R402 and R350 as necessary. The adjustment of R402 and R350 may affect the adjustment of R340 (Calibration step 23) and R364 (preliminary adjustment, Calibration step 1; final adjustment, Calibration step 26).

20. Check/Adjust Position and Sweep Registration (R516, R560)

a. Change the following control settings:

Main Triggering	
LEVEL	Adjust for stable display
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms
DELAY TIME MULT	0.00

b. Rotate the TRACE SEP control to position the delaying sweep trace about one-half division above the delayed sweep trace (see Fig. 4-3).

c. CHECK—While rotating the POSITION control throughout its range, check for no horizontal shift between traces.

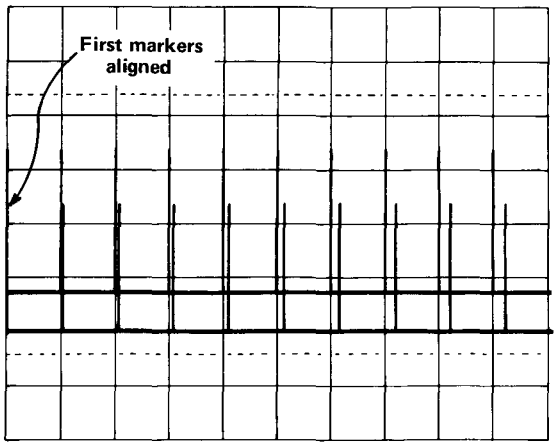


Fig. 4-3. Sweep Registration correctly adjusted (R560).

d. ADJUST—R516, Position Registration, for minimum shift between traces.

e. CHECK—First marker of both traces must be aligned.

f. ADJUST—R560, Sweep Registration, to align the first marker of both traces (see Fig. 4-3).

g. INTERACTION—Repeat the adjustment of R516 and R560 as necessary. The adjustment of R516 and R560 may affect the adjustment of R452 (Calibration step 16), R523 (Calibration step 22), and R364 (Preliminary adjustment in Calibration step 1, final adjustment in Calibration step 26).

21. Check/Adjust Delaying Sweep Calibration (R511)

a. CHECK—Rotate the POSITION control to view the tenth one-millisecond marker and check that the tenth marker of both traces are aligned.

b. ADJUST—R511, Delaying Sweep Cal, to align the tenth one-millisecond marker of both traces.

c. CHECK—CRT display for both traces horizontally aligned with one one-millisecond marker each graticule division over the center eight graticule divisions.

d. INTERACTION—Repeat the adjustment of R511 and the front-panel SWP CAL adjustment (Calibration step 17) as necessary.

22. Check/Adjust Position Centering (R523)

a. Rotate the front-panel POSITION control fully counterclockwise.

b. CHECK—That the second one-millisecond marker can be positioned to the left past the first graticule line.

c. ADJUST—R523, Position Centering, to position the second one-millisecond marker on the first graticule line.

d. CHECK—Rotate the POSITION control fully clockwise and check that the display can be positioned to the right of graticule center.

23. Check/Adjust Delaying and Delayed Sweep Length (R340, R465)

a. Set the time-mark generator for one-millisecond and .1 millisecond markers.

b. Adjust the MAIN TRIGGERING LEVEL control to trigger both traces on the one-millisecond markers.

c. Rotate the TRACE SEP control fully clockwise and rotate the POSITION control to place the second one-millisecond marker on the first graticule line (see Fig. 4-4).

d. CHECK—Delayed sweep trace for sweep length of 10.4 divisions (within 0.3 divisions) as shown by one to seven 0.1 millisecond markers to the right of the tenth vertical graticule line. The lower trace is the delayed sweep trace (see Fig. 4-4).

e. ADJUST—R465, Delayed Sweep Length, for four 0.1 millisecond markers to the right of the tenth graticule line (see Fig. 4-4).

f. CHECK—Delaying sweep trace for sweep length of 10.4 divisions (within 0.3 divisions) as shown by one to seven 0.1 millisecond markers to the right of the tenth vertical graticule line. The upper trace is the delaying sweep trace (see Fig. 4-4).

g. ADJUST—R340, Delaying Sweep Length, for four 0.1 millisecond markers to the right of the tenth graticule line (see Fig. 4-4).

h. INTERACTION—Repeat the adjustment of R340 and R465 as necessary. Check the adjustment of R402 (Calibration step 19) and R452 (Calibration step 16).

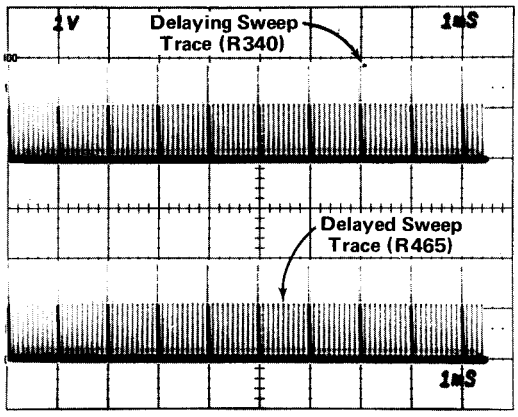


Fig. 4-4. Typical display when adjusting delaying and delayed sweep length (R340, R465).

24. Check/Adjust Delayed Sweep 20 Nanosecond Timing (C449)

a. Set the time-mark generator for 10 nanosecond markers.

b. Change the following control settings:

TIME/DIV OR DLY TIME	20 ns
DLY'D Time/Division	20 ns
POSITION	Adjust to horizontally center the display
Main Triggering LEVEL	Adjust for stable display

c. CHECK—Delayed sweep trace (lower trace) for two complete cycles each graticule division over the center eight divisions.

d. ADJUST—C449, Dly'd 20 ns Timing, for two complete cycles each graticule division over the center eight divisions of the delayed sweep trace.

25. Check/Adjust One-Microsecond Timing (C414, C443)

a. Set the time-mark generator for one-microsecond markers.

b. Change the following control settings:

TIME/DIV OR DLY TIME	1 μs
DLY'D Time/Division	1 μs
Main Triggering LEVEL	Adjust for a stable display

c. CHECK—Delayed sweep trace (bottom trace) for one one-microsecond marker each graticule division.

d. ADJUST—C443, Delayed One-Microsecond Timing, for one one-microsecond marker each graticule division of the delayed sweep trace (bottom trace).

e. CHECK—Delaying sweep trace (upper trace) for one one-microsecond marker each graticule division.

f. ADJUST—C414, Delaying One-Microsecond Timing, for one one-microsecond marker each graticule division of the delaying sweep trace (upper trace).

g. INTERACTION–Repeat the adjustment of C443, C414, and C449 (Calibration step 24) as necessary.

h. Change the following control settings:

TIME/DIV OR DLY TIME	1 μs
DLY'D Time/Division	0.1 μs
Main Triggering LEVEL	Adjust for a stable display

i. Rotate the DELAY TIME MULT dial to 1.00. If necessary, further rotate the dial to start the delayed sweep (lower trace) on the second 1 μs marker.

j. Note the exact DELAY TIME MULT dial setting.

k. Rotate the DELAY TIME MULT dial exactly 8.00 divisions from the setting noted in part j.

l. CHECK–That the delayed sweep starts on the tenth 1 μs marker.

m. ADJUST–C414, Delaying One Microsecond Timing, to start the delayed sweep trace on the tenth 1 μs marker.

26. Check/Adjust Delay Pickoff TD Bias (R364)

a. Set the time-mark generator for two-nanosecond markers.

b. Change the following control settings:

DELAY TIME MULT	Fully counterclockwise
TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	2 ns (press in for DLY'D Sweep Display Mode)
POSITION	Fully clockwise
ALT	(Press in)

c. Set the 7A19 Volts/Div switch for approximately two divisions of display. Position the display as necessary.

d. Rotate the MAIN TRIGGERING LEVEL control to trigger the display near the zero volt level. Do not change this LEVEL control setting.

e. Disconnect the time-mark signal from the 7A19 Input.

f. Remove the 7A15A Amplifier unit from the Right Vert compartment of the oscilloscope. Install the 7S12 TDR/Sampler (with S-1 Sampling Head and S-52 Pulse Generator Head) into the center two compartments of the oscilloscope.

g. Connect the Pulse Output of the S-52 Pulse Generator Head to the 7A19 Input with a SMA (3 mm) male-to-BNC female adapter and a 42-inch BNC cable.

h. Set the 7A19 Volts/Div switch for approximately two divisions of display.

i. CHECK–CRT display for leading edge of the pulse between the sixth and seventh graticule lines.

j. ADJUST–R364, Delay Pickoff TD Bias, fully counterclockwise. Then adjust R364 clockwise until the leading edge of the pulse is between the sixth and seventh graticule lines.

k. Remove the 7B92 and plug-in extender from the oscilloscope, then install the 7B92 directly into the B Horizontal compartment.

l. CHECK–CRT display for leading edge of the pulse between the seventh and eighth graticule lines.

m. INTERACTION–If the requirements in step l cannot be met, install the 7B92 and plug-in extender into the B Horizontal compartment and repeat steps i through l. The adjustment of R364, given in step j, may need to be varied slightly to meet requirements given in step l.

27. Check/Adjust High-Frequency Linearity (C557, C565, C572)

a. Remove the 7A19 Amplifier unit and the 7B92 Time Base unit from the oscilloscope.

b. Install the 7S11 Sampling unit (with S1 Sampling Head) into the Left Vert compartment of the 7904 Oscilloscope.

c. Disconnect the BNC cables from connectors A 11 and B 11 of the 067-0589-00 plug-in extender. Install the 7B92 and plug-in extender into the B Horizontal compartment of the oscilloscope.

d. Connect the + and − outputs of the 7B92 (plug-in extender cables A 11 and B 11) differentially to the sampling system inputs. Specifically, connect the + signal from plug-in extender cable A 11 to the 7S12 Input (by way of S-1 Sampling Head) with a BNC female-to-female adapter, 42-inch BNC cable, and BNC female-to-GR adapter. Connect the − signal from plug-in extender cable B 11 to the 7S11 Input (by way of S-1 Sampling Head) with a BNC female-to-female adapter, 42-inch BNC cable, and BNC female-to-GR adapter. Install a 42-inch BNC cable, with BSM female-to-BNC female adapter, from the S-52 Pretrig Out connector (S-52 pulse generator head is installed in the 7SI2 TDR Sampler) to the 7B92 MAIN TRIG IN connector.

e. Change the following control settings:

7904 Oscilloscope

Vertical Mode	Add
Horizontal Mode	A

7B92 Time Base

Main Triggering	
SOURCE	EXT
TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	50 ns (press in for DLY'D Sweep Display Mode)

7S11 Sampling Unit

+ Up/Invert	Invert
mVolts/Div	100
Variable	Cal In
Dot Response	Normal

7S12 TDR/Sampler

mV/mp (pushbutton)	mV
mVolts/Div	100
Variable Volts/Div	Cal In
Time/Div	.1 μs
REP (pushbutton)	(Press in for repetitive scan display)

f. Rotate the 7B92 MAIN TRIGGERING LEVEL control for the TRIG'D light on.

g. Rotate the 7S11 and 7S12 DC Offset controls to vertically position the display on the CRT.

h. Set the 7904 Vertical Mode to Chop. Rotate the 7S11 and 7S12 DC Offset controls and the 7S11 Delay Control to position both traces together.

i. Repeat steps g and h until the display is vertically positioned on the CRT when the 7904 is in the Add Vertical Mode, and both traces are positioned together when the 7904 is in the Chop Vertical Mode.

j. Set the 7904 Vertical Mode to ADD.

k. Press and release the 7S12 Time/Division Variable control for variable sweep rates, and adjust for a ramp display of five vertical divisions in five horizontal divisions. Rotate the DELAY TIME MULT dial to approximately midrange and rotate the 7S12 Time Distance control to horizontally position the trace.

NOTE

The sampling system display is now calibrated to the 50 nanosecond sweep rate of the 7B92 under calibration. Do not change the 7S12 Time/Div Variable and Time Distance control.

l. Change the following control settings:

7B92 Time Base

TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	2 ns (press in for DLY'D Sweep Display Mode)

7S11 Sampling Unit

mVolts/Div	200

7S12 Sampling Unit

mVolts/Div	200
Time/Div	10 ns

n. Rotate the 7B92 DELAY TIME MULT dial to horizonally position the trace.

o. CHECK—CRT display for a smooth and linear ramp with slight preshoot (see Fig. 4-5).

p. ADJUST—C557, Sweep Linearity, for peak amplitude on leading edge, C565 and C572 for a slight preshoot with as smooth and linear ramp as possible.

q. INERACTION—Repeat the adjustment of C557, C565, and C572 as necessary.

r. Disconnect all test equipment and remove all plug-in units from the oscilloscope.

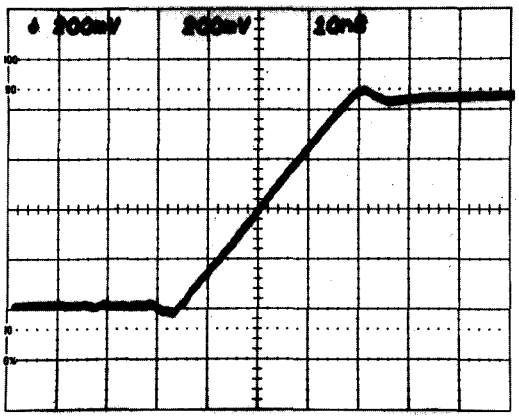


Fig. 4-5. Typical CRT display when adjusting high-frequency linearity (C557, C565, C572).

28. Check/Adjust High-Frequency Timing (R244, R246, R567)

a. Install the 7A19 Amplifier directly into the Left Vert compartment of the 7904 Oscilloscope and 7B92 Time Base directly into the B Horiz compartment.

b. Connect the output of the time-mark generator to the 7A19 Input with a 42-inch 50-ohm BNC cable. Set the time-mark generator for 2 ns markers.

c. Change the following control settings:

7904 Oscilloscope

Vertical Mode	Left Vert
Horizontal Mode	B

7B92 Time Base

Main Triggering	
SOURCE	INT
LEVEL	Adjust for stable display
TIME/DIV OR DLY TIME	.1 μs
DLY'D Time/Division	.5 ns (press in for DLY'D Sweep Display Mode)

d. Adjust the 7A19 Volts/Division switch for about two divisions of display. Adjust the 7B92 and oscilloscope Intensity controls as necessary. Center the display on the CRT with the 7A19 and 7B92 POSITION controls.

NOTE

Timing checks must be made with the 7B92 installed directly into the oscilloscope. Adjustment of R567 can be made by reaching into the center two compartments of the oscilloscope (be certain that the 7A19 side covers are on). R244 and R246 can be adjusted through the top plug-in housing or by removing the 7B92 from the oscilloscope.

e. CHECK—CRT display for two complete cycles over the center eight graticule divisions.

f. ADJUST—R567, .5 ns Timing, for two complete cycles over the center eight graticule divisions.

g. Change the DLY'D Time/Division switch to 1 ns.

h. CHECK—CRT display for one complete cycle in two graticule divisions.

i. ADJUST—R246, 1 ns Timing, for one complete cycle in two graticule divisions.

j. Change the DLY'D Time/Division switch to 2 ns.

k. CHECK—CRT display for one complete cycle each division over the center eight divisions of the graticule.

l. ADJUST—R244 for one complete cycle each division over the center eight divisions of the graticule.

NOTE

If R244, R246, or R567 cannot be adjusted to the given tolerances, repeat calibration step 27.

√29. Check Delaying and Delayed Sweep Timing Accuracy

NOTE

The tolerance in steps 29 and 30 are for an ambient temperature range of +15°C to +35°C. If outside this range, see Specifications in the 7B92 Operator's Manual for applicable tolerances.

a. Change the following control settings:

ALT	OUT (TRACE SEP fully clockwise)
DELAY TIME MULT	0.00

b. Set the 7B92 and oscilloscope Intensity controls for an optimum ALT Sweep Display. Position the display as necessary.

√c. CHECK—Using the Time/Division switch settings and the time-mark generator settings given in Table 4-1, check delaying and delayed sweep timing to the tolerance given in Table 4-1. Make timing checks in the ALT Sweep Display Mode. The upper trace is the delaying sweep trace and the lower trace is the delayed sweep trace.

d. CALIBRATION—If the 7B92 does not meet the requirements given in part c, check the adjustment of the front-panel SWP CAL (Calibration step 17) and R511 (Calibration step 21). If the adjustment of R511 and the front-panel SWP CAL does not correct the 7B92 timing accuracy, check Calibration steps 24 through 28.

√30. Check Delaying and Delayed Sweep Linearity

a. Change the following settings:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms (Pull out for INTEN Display Mode)
ALT	IN

b. Set the time-mark generator for one-millisecond markers. Center the display vertically and rotate the MAIN TRIGGERING LEVEL control for a stable display.

c. Position the second marker to the second graticule line.

TABLE 4-1

Delaying and Delayed Sweep Timing

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Markers	CRT Display (markers/division)	Tolerance (+15°C to +35°C)	
				Delaying Sweep	Delayed Sweep
.2 s	.2 s	.1 s	2	±0.32 div	±0.32 div
.1 s	.1 s	.1 s	1	±0.24 div	±0.24 div
50 ms	50 ms	50 ms	1		
20 ms	20 ms	10 ms	2		
10 ms	10 ms	10 ms	1		
5 ms	5 ms	5 ms	1		
2 ms	2 ms	1 ms	2		
1 ms	1 ms	1 ms	1		
.5 ms	.5 ms	.5 ms	1		
.2 ms	.2 ms	.1 ms	2		
.1 ms	.1 ms	.1 ms	1		
50 µs	50 µs	50 µs	1		
20 µs	20 µs	10 µs	2		
10 µs	10 µs	10 µs	1		
5 µs	5 µs	5 µs	1		
2 µs	2 µs	1 µs	2		
1 µs	1 µs	1 µs	1		
.5 µs	.5 µs	.5 µs	1		
.2 µs	.2 µs	.1 µs	2		
.1 µs	.1 µs	.1 µs	1		
50 ns	50 ns	50 ns	1		
20 ns	20 ns	10 ns	2		±0.32 div (Exclude the first 2 div of delayed sweep)
10 ns	10 ns	10 ns	1		
10 ns	5 ns	5 ns	1		
	2 ns	2 ns	1		
	1 ns	2 ns	1 cycle/2 div		±0.32 div (Exclude the first 5 div of delayed sweep)
	.5 ns	2 ns	1 cycle/4 div		±0.4 div (Exclude the first 10 divisions of delayed sweep)

√d. CHECK—Fourth marker is within 0.1 division (5%) of the fourth graticule line.

e. Position the third marker to the third graticule line.

√f. CHECK—Fifth marker is within 0.1 division (5%) of the fifth graticule line.

√g. CHECK—Continue linearity check for each two division portion of the sweep within the center eight divisions of display.

h. Change the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 10 ns (INTEN Display Mode). Set the time-mark generator for 10 nanosecond markers.

√i. CHECK—Using the procedure outlined in steps c through g, check that delaying sweep linearity is within 0.1 division (5%).

j. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 1 ms (press in DLY'D Time/Division switch for NORMAL Sweep Display Mode). Set the time-mark generator for one-millisecond markers.

√k. CHECK—Using the procedure outlined in steps c through g, check that delayed sweep linearity is within 0.1 division (5%).

l. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 10 ns (press in DLY'D Time/Division switch for NORMAL Sweep Display Mode). Set the time-mark generator for ten nanosecond markers.

√m. CHECK—Using the procedure outlined in steps c through g, check that delayed sweep linearity is within 0.2 division (10%).

n. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 2 ns (press in DLY'D Time/Division switch for NORMAL Sweep Display Mode). Set the time-mark generator for two nanosecond markers.

√o. CHECK—Using the procedure outlined in steps c through g, check that delayed sweep linearity is within 0.2 division (10%). Exclude the first two divisions of delayed sweep.

√31. Check Delaying and Delayed Sweep Variable Control Range

a. Set the time-mark generator for ten-microsecond markers.

b. Change the following control settings:

TIME/DIV OR DLY TIME	2 μs
DLY'D Time/Division	2 μs (pull out for INTEN Display Mode)
Variable Time/Division Selector (P110)	Set for Delaying Sweep Variable (see Operator's Manual)

c. Adjust the MAIN TRIGGERING LEVEL control for a stable display. Press and release the VARIABLE Time/Division control for variable delaying sweep rates.

√d. CHECK—Rotate the VARIABLE control fully counterclockwise. Check CRT display for no more than two major divisions between ten-microsecond markers. (This indicates continuously variable sweep rates between calibrated steps.)

e. Set the Variable Time/Division Selector for variable delayed sweep rates. Press in the DLY'D Time/Division switch for the DLY'D Sweep Display Mode.

√f. CHECK—Repeat part d.

√32. Check Differential Delay Time Multiplier Accuracy

a. Set the time-mark generator for 1 ms markers.

b. Change the following control settings:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	10 μs (press in for DLY'D Sweep Display Mode)
VARIABLE	CAL (IN)
MAIN TRIGGERING LEVEL	Set for stable display

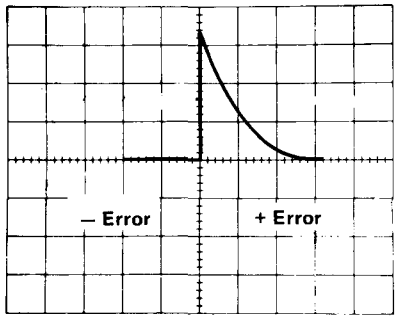
NOTE

The following steps check delay time multiplier accuracy. Two factors must be determined: the maximum error allowable to be within the specifications, and the actual error of the measurement.

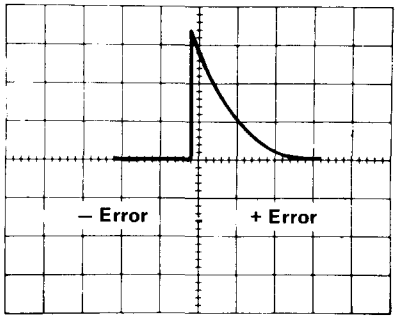
Ⓐ

c. Rotate the DELAY TIME MULT dial to 1.00. If necessary, further rotate the dial to place a 1 ms marker on the CRT. To provide a reference point, position the 1 ms marker to graticule center with the 7B92 POSITION control (see Fig. 4-6). Note the exact DELAY TIME MULT dial setting.

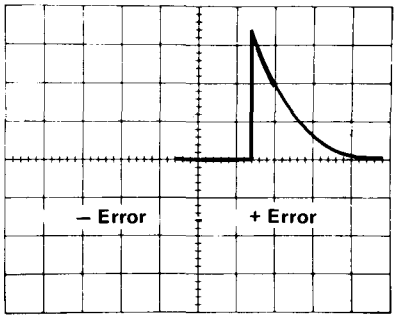
Measurement Error as Viewed from CRT Display



Second time-marker positioned to graticule center for reference.



Time-marker showing –0.2% error.



Time-marker showing +1.4% error.

NOTE

With the delayed sweep rate 1/100 of the main sweep rate (e.g. TIME/DIV or DLY TIME switch at 1 ms; DLY'D Time/division switch at 10 μs), each major horizontal graticule division represents 1% error.

Fig. 4-6. Typical delay time error measurement.

d. Rotate the DELAY TIME MULT dial to major division points from the dial setting noted in part c (e.g. if the DELAY TIME MULT dial setting noted in part c is 1.02, major division points will be 2.02, 3.02, 4.02 through 9.02). Check and record the position of each time marker (with respect to the reference point established to graticule center) at each major division over the center eight divisions. See Fig. 4-6 for error measurement and Fig. 4-7 for typical delay time error figures.

√e. CHECK—Scan the figures recorded in step d for all difference readings over the center eight divisions (see Fig. 4-7). Find the maximum error over any one division measurement. Check that it is within the allowable error (see Fig. 4-8).

Example. Refer to the curve in Fig. 4-8 for the 0.1 s/DIV to 0.1 μs/DIV delay time range. For any one-division measurement the allowable error is 3.7%. At the same delay time range, for any five division measurement the allowable error is 1.3%.

√f. CHECK—Scan the figures recorded in step d for difference reading over the center eight divisions of display (see Fig. 4-7). Find the maximum error over any two-division measurement, divider by two, and check that it is within the allowable error given in Fig. 4-8.

√g. CHECK—Scan the figures recorded in step d for difference readings over the center eight divisions (see Fig. 4-7). Find the maximum error over any four division measurement, divide by four, and check that it is within the allowable error given in Fig. 4-8.

√h. CHECK—Scan the figures recorded in step d (see Fig. 4-7). Find the maximum error over an eight-division measurement, divide by eight, and check that it is within the allowable error given in Fig. 4-8.

i. Set the time-mark generator for .1 s markers.

j. Change the following control settings:

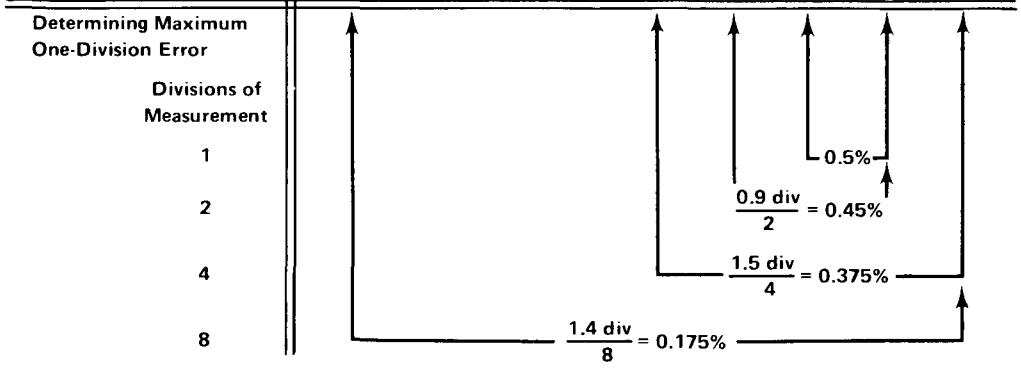
TIME/DIV OR DLY TIME	.2 s
DLY'D Time/Division	2 ms (press in for DLY'D Sweep Display Mode)
Main Triggering LEVEL	Set for stable display

√k. CHECK—Repeat steps c through h. Refer to the curve in Fig. 4-8 for .2 s accuracy.

l. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 50 ns.

Recorded Error of Each Major
DELAY TIME MULT Dial Division

Typical DELAY TIME MULT Dial Setting	1.02	2.02	3.02	4.02	5.02	6.02	7.02	8.02	9.02
Typical Recorded Error (div/%)	0	−0.4	−0.3	−0.2	−0.1	+0.3	+0.7	+1.2	+1.4



NOTE: Percentage figures apply only when delayed sweep rate is 1/100 of the main sweep rate.

Fig. 4-7. Typical delay time error figures.

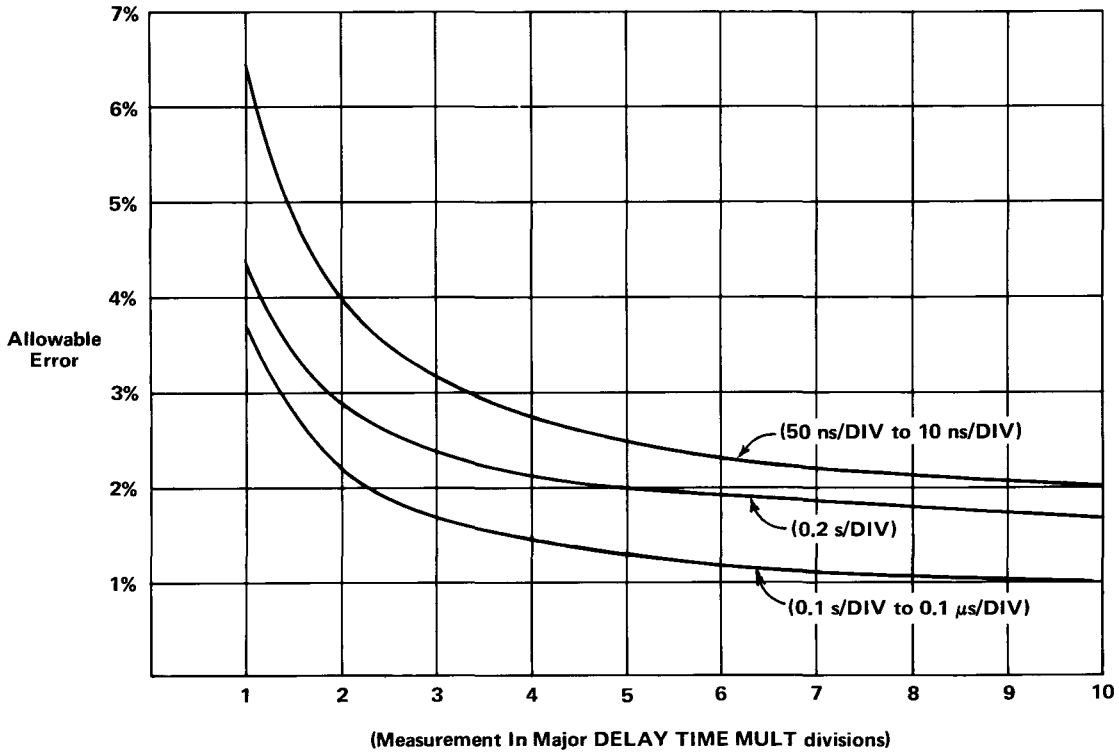
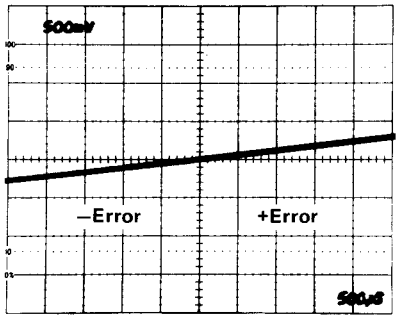


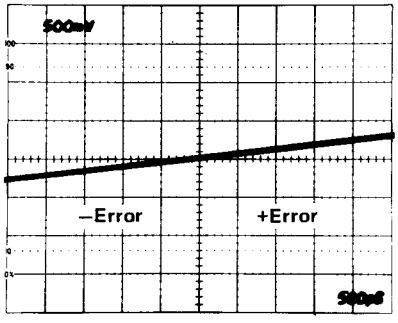
Fig. 4-8. Allowable delay time error.

m. Set the time-mark generator for 50 ns markers. Center the display vertically on the CRT. Do not change the Amplifier unit Position control for the remainder of this step.

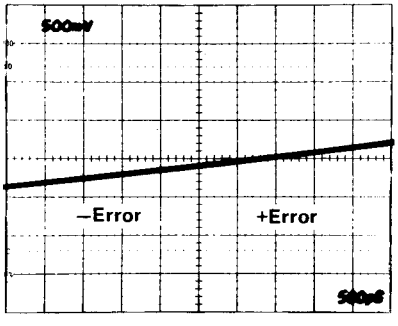
n. Set the TIME/DIV OR DLY TIME switch to 50 ns and the DLY'D Time/Division switch to .5 ns (press in the DLY'D Time/Division switch for the DLY'D Sweep Display Mode).



Second time-marker positioned to graticule center for reference.



Time-marker showing –0.2% error.



Time-marker showing +1.4% error.

NOTE

With the delayed sweep rate 1/100 of the main sweep rate (e.g. TIME/DIV or DLY TIME switch at 50 ns DLY'D Time/division switch at .5 ns), each major horizontal graticule division represents 1% error.

Fig. 4-9. Typical delay time error measurement.

o. Rotate the DELAY TIME MULT dial to 1.00. If necessary, further rotate the dial to place the positive slope of the time-mark waveform at CRT center (see Fig. 4-9). Note the exact DELAY TIME MULT dial setting.

NOTE

The point that the positive slope of the time mark crosses graticule center, provides a timing reference point.

√p. CHECK—Repeat parts c through h. Refer to Fig. 4-9 for error measurement of the 50 ns time mark and refer to the curve in Fig. 4-8 for 50 ns/DIV to 10 ns/DIV accuracy.

√33. Check Absolute Delay Time Accuracy

a. Press and release the ALT pushbutton for the ALT Sweep Display Mode and rotate fully clockwise (TRACE SEP).

b. Adjust the 7A19 Volts/Division switch for approximately a two-division display of each trace. Center the display vertically.

√c. CHECK—Using the TIME/DIV OR DLY TIME switch settings, DLY'D Time/Division switch settings, and time-mark generator settings given in Table 4-2, check absolute delay time accuracy. Set the DELAY TIME MULT dial to 0.00. Rotate the 7B92 POSITION control to reference a point on the delayed sweep waveform (lower trace) to the center vertical graticule line. Rotate the DELAY TIME MULT dial to move the waveform (delayed sweep trace) one or two complete cycles (number of cycles given in Table 4-2) to the left with the same point referenced to the center vertical graticule line. Check that the DELAY TIME MULT dial setting is 1.00 within the tolerance given in Table 4-2.

NOTE

The delayed sweep trace (lower trace) provides the best indication of the sweep starting point while the intensified trace indicates the marker on which the sweep starts.

√34. Check Delay-Time Jitter

a. Set the time-mark generator for 1 millisecond markers.

TABLE 4-2

Absolute Delay Time Measurements

TIME/DIV OR DLY TIME Switch	DLY'D Time/ Division Switch (DLY'D SWP Display Mode)	Time-Mark Generator Setting	Measurement (cycles or markers)	Allowable Error
.2 s	2 ms	.1 s	2	±8 minor dial divisions
.1 s	10 ms	.1 s	1	±7.5 minor dial divisions
50 ms	5 ms	50 ms	1	
20 ms	2 ms	10 ms	2	
10 ms	1 ms	10 ms	1	
5 ms	.5 ms	5 ms	1	
2 ms	.2 ms	1 ms	2	
1 ms	.1 ms	1 ms	1	
.5 ms	50 μs	.5 ms	1	
.2 ms	20 μs	.1 ms	2	
.1 ms	10 μs	.1 ms	1	
50 μs	5 μs	50 μs	1	
20 μs	2 μs	10 μs	2	
10 μs	1 μs	10 μs	1	
5 μs	.5 μs	5 μs	1	
2 μs	.2 μs	1 μs	2	
1 μs	.1 μs	1 μs	1	
.5 μs	50 ns	.5 μs	1	±17.5 minor dial divisions
.2 μs	20 ns	.1 μs	2	±32.5 minor dial divisions
.1 μs	20 ns	.1 μs	1	±57.5 minor dial divisions
50 ns	20 ns	50 ns	1	±31 minor dial divisions
20 ns	5 ns	10 ns	2	±61 minor dial divisions
10 ns	5 ns	10 ns	1	±111 minor dial divisions

b. Change the following control settings:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 μs (press in for DLY'D Sweep Display Mode)
ALT	IN
DELAY TIME MULT	1.00

c. Position the pulse to the center of CRT display area with the DELAY TIME MULT dial.

√d. CHECK–Jitter in the leading edge of the pulse should not exceed 0.2 division (one part in 50,000). Disregard any slow drift.

e. Rotate the DELAY TIME MULT dial to about 9.00 and adjust the pulse to the center of the CRT display area.

√f. CHECK–Jitter on the leading edge of the pulse should not exceed 0.2 division (one part in 50,000). Disregard any slow drift.

SECTION 5
ELECTRICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

ABBREVIATIONS AND REFERENCE DESIGNATORS

A	Assembly, separable or repairable	FL	Filter	PTM	paper or plastic, tubular molded
AT	Attenuator, fixed or variable	H	Heat dissipating device (heat sink, etc.)	R	Resistor, fixed or variable
B	Motor	HR	Heater	RT	Thermistor
BT	Battery	J	Connector, stationary portion	S	Switch
C	Capacitor, fixed or variable	K	Relay	T	Transformer
Cer	Ceramic	L	Inductor, fixed or variable	TP	Test point
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	U	Assembly, inseparable or non-repairable
CRT	cathode-ray tube	M	Meter	V	Electron tube
DL	Delay line	Q	Transistor or silicon-controlled rectifier	Var	Variable
DS	Indicating device (lamp)	P	Connector, movable portion	VR	Voltage regulator (zener diode, etc.)
Elect.	Electrolytic	PMC	Paper, metal cased	WW	wire-wound
EMC	electrolytic, metal cased	PT	paper, tubular	Y	Crystal
EMT	electrolytic, metal tubular				
F	Fuse				

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLIES				
A1	670-1588-00			MODE SWITCH Circuit Board Assembly
A2	670-1587-00			COUPLING SWITCH Circuit Board Assembly
A3	670-1589-00			SOURCE SWITCH Circuit Board Assembly
A4	670-1585-00			DELAYED TRIGGER SWITCH Circuit Board Assembly
A5	670-1593-00			DISTRIBUTION Circuit Board Assembly
A6	670-1584-00	B010100	B039999	MAIN INTERFACE Circuit Board Assembly
A6	670-1584-01	B040000		MAIN INTERFACE Circuit Board Assembly
A7	670-1586-00			EXT INPUT Circuit Board Assembly
A8	670-1591-00			MAIN TRIGGER Circuit Board Assembly
A9	670-1592-00			DELAYED TRIGGER Circuit Board Assembly
A10	670-1583-00			SWEEP Circuit Board Assembly
A11	670-1590-00			READOUT Circuit Board Assembly
CAPACITORS				
C3	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C9	290-0246-00			3.3 µF, Elect., 15 V, 10%
C30	283-0000-00			0.001 µF, Cer, 500 V, Cer, +100%-0%
C54	283-0160-00			1.5 µF, Cer, 50 V, 10%
C57	283-0140-00			4.7 pF, Cer, 50 V, 5%
C59	283-0140-00			4.7 pF, Cer, 50 V, 5%
C62	281-0544-00			5.6 pF, Cer, 500 V, 10%
C63	281-0653-00			3.3 pF, Cer, 200 V, ±1 pF
C73	281-0544-00			5.6 pF, Cer, 500 V, 10%
C78	281-0653-00			3.3 pF, Cer, 200 V, ±1 pF
C79	283-0068-00			0.01 µF, Cer, 500 V, +100%-0%
C84	283-0160-00			1.5 pF, Cer, 50 V, 10%
C86	281-0618-00			4.7 pF, Cer, 200 V, ±0.5 pF
C141	283-0111-00			0.1 µF, Cer, 50 V
C150	290-0246-00			3.3 µF, Elect., 15 V, 10%
C151	281-0605-00			200 pF, Cer, 500 V

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C161	283-0239-00			0.022 µF, Cer, 50 V, 10%
C207	283-0164-00			2.2 µF, Cer, 25 V, 20%
C208	283-0239-00			0.022 µF, Cer, 50 V, 10%
C212	290-0525-00	B010100	B019999	4.7 µF, Elect., 50 V, 20%
C212	283-0212-00	B020000		2 µF, Cer, 50 V, 20%
C216[1] [3]	295-0145-00			0.01 µF
C217[1]				1 µF
C248	290-0525-00	B010100	B019999	4.7 µF, Elect., 50 V, 20%
C248	283-0212-00	B020000		2 µF, Cer, 50 V, 20%
C255[2] [3]	295-0145-00			0.01 µF
C256[2]				1 µF
C267	290-0522-00			1 µF, Elect., 50 V, 20%
C277	281-0630-00			390 pF, Cer, 500 V, 5%
C278	281-0580-00			470 pF, Cer, 500 V, 10%
C280	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C281	283-0111-00			0.1 µF, Cer, 50 V
C284	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C285	283-0111-00			0.1 µF, Cer, 50 V
C293	283-0111-00			0.1 µF, Cer, 50 V
C294	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C295	283-0111-00	XB020000		0.1 µF, Cer, 50 V
C297	283-0111-00			0.1 µF, Cer, 50 V
C298	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C300	290-0522-00			1 µF, Elect., 50 V, 20%
C304	290-0522-00			1 µF, Elect., 50 V, 20%
C307	283-0054-00			150 pF, Cer, 200 V, 5%
C308	283-0108-00			220 pF, Cer, 200 V, 10%
C309	290-0536-00			10 µF, Elect., 25 V, 20%
C314	290-0535-00			33 µF, Elect., 10 V, 20%
C330	290-0519-00			100 µF, Elect., 20 V, 20%
C335	281-0605-00			200 pF, Cer, 500 V
C337	281-0523-00			100 pF, Cer, 350 V, 20%
C349	281-0524-00	B010100	B029999	150 pF, Cer, 500 V, 20%
C349	281-0543-00	B030000		270 pF, Cer, 500 V, 10%
C351	290-0522-00			1 µF, Elect., 50 V, 20%
C356	290-0536-00			10 µF, Elect., 25 V, 20%
C361	290-0517-00			6.8 µF, Elect., 35 V, 20%
C370	281-0504-00			10 pF, Cer, 500 V, 10%
C380	290-0522-00			1 µF, Elect., 50 V, 20%
C382	290-0532-00			150 µF, Elect., 6 V, 20%
C383	281-0523-00			100 pF, Cer, 350 V, 20%

[1]Furnished as a unit with C255 and C256.
[2]Furnished as a unit with C216 and C217.
[3]Individual timing capacitors in this assembly must be ordered by the 9 digit part number, letter suffix and tolerance printed on the timing capacitor to be replaced.
Example:

285-XXXX-XX F-

The letter suffix and the tolerance should be the same for all of the timing capacitors in the assembly.

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C390	281-0658-00			6.2 pF, Cer, 500 V, ±0.25 pF
C400	281-0523-00			100 pF, Cer, 350 V, 20%
C408	283-0111-00			0.1 µF, Cer, 50 V
C409	290-0522-00			1 µF, Elect., 50 V, 20%
C413	283-0632-00			87 pF, Mica, 100 V, 1%
C414	281-0166-00			1.9-15.7 pF, Var, Air, 250 V
C425	281-0519-00			47 pF, Cer, 500 V, 10%
C432	281-0524-00			150 pF, Cer, 500 V, 20%
C441	281-0550-00			120 pF, Cer, 500 V, 10%
C443	281-0166-00			1.9-15.7 pF, Var, Air, 250 V
C444	283-0633-00			77 pF, Mica, 100 V, 1%
C448	281-0519-00			47 pF, Cer, 500 V, 10%
C449	281-0166-00			1.9-15.7 pF, Var, Air, 250 V
C452	290-0517-00			6.8 µF, Elect., 35 V, 20%
C457	290-0522-00			1 µF, Elect., 50 V, 20%
C460	283-0111-00			0.1 µF, Cer, 50 V
C462	290-0522-00			1 µF, Elect., 50 V, 20%
C463	290-0517-00			6.8 µF, Elect., 35 V, 20%
C472	281-0544-00			5.6 pF, Cer, 500 V, 10%
C475	281-0651-00			47 pF, Cer, 200 V, 5%
C484	281-0523-00			100 pF, Cer, 350 V, 20%
C486	290-0517-00			6.8 µF, Elect., 35 V, 20%
C488	283-0079-00			0.01 µF, Cer, 25 V, 20%
C506	281-0519-00			47 pF, Cer, 500 V, 10%
C508	281-0542-00			18 pF, Cer, 500 V, 10%
C528	281-0519-00			47 pF, Cer, 500 V, 10%
C541	281-0525-00			470 pF, Cer, 500 V, 20%
C557	281-0158-00			7-45 pF, Var, Cer, 50 V
C565	281-0158-00			7-45 pF, Var, Cer, 50 V
C572	281-0122-00			2.5-9 pF, Var, Cer, 100 V
C581	290-0536-00			10 µF, Elect., 25 V, 20%
C582	283-0001-00			0.005 µF, Cer, 500 V
C584	290-0536-00			10 µF, Elect., 25 V, 20%
C585	283-0001-00			0.005 µF, Cer, 500 V
C590	290-0536-00			10 µF, Elect., 25 V, 20%
C591	283-0001-00			0.005 µF, Cer, 500 V
C601	290-0522-00			1 µF, Elect., 50 V, 20%
C609	281-0658-00			6.2 pF, Cer, 500 V, ±0.25 pF
C612	283-0186-00			27 pF, Cer, 50 V, 5%
C654	283-0191-00			0.022 µF, Cer, 50 V, 20%
C658	283-0191-00			0.022 µF, Cer, 50 V, 20%
C672	283-0001-00			0.005 µF, Cer, 500 V
C683	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)				
C702	281-0524-00			150 pF, Cer, 500 V, 20%
C706	281-0504-00			10 pF, Cer, 500 V, 10%
C710	283-0116-00			820 pF, Cer, 500 V, 5%
C712	283-0116-00			820 pF, Cer, 500 V, 5%
C739	290-0522-00			1 µF, Elect., 50 V, 20%
C741	281-0523-00			100 pF, Cer, 350 V, 20%
C744	283-0139-00			150 pF, Cer, 50 V, 20%
C746	283-0204-00			0.01 µF, Cer, 50 V, 20%
C749	290-0517-00			6.8 µF, Elect., 35 V, 20%
C755	283-0116-00			820 pF, Cer, 500 V, 5%
C760	283-0156-00			1000 pF, Cer, 200 V, +100%-0%
C761	283-0156-00			1000 pF, Cer, 200 V, +100%-0%
C791	290-0522-00			1 µF, Elect., 50 V, 20%
C793	290-0522-00			1 µF, Elect., 50 V, 20%
C795	290-0522-00			1 µF, Elect., 50 V, 20%
C801	290-0522-00			1 µF, Elect., 50 V, 20%
C804	290-0534-00			1 µF, Elect., 35 V, 20%
C807	281-0717-00			7.8 pF, Cer, 500 V
C812	281-0512-00			27 pF, Cer, 500 V, 10%
C836	283-0108-00	B010100	B010468	220 pF, Cer, 200 V, 10%
C836	281-0523-00	B010469		100 pF, Cer, 350 V, 20%
C838	283-0191-00			0.022 µF, Cer, 50 V, 20%
C841	283-0108-00	B010100	B010468	220 pF, Cer, 200 V, 10%
C841	281-0523-00	B010469		100 pF, Cer, 350 V, 20%
C848	283-0191-00			0.022 µF, Cer, 50 V, 20%
C885	283-0000-00			0.001 µF, Cer, 500 V, +100%-0%
C912	283-0156-00			1000 pF, Cer, 200 V, +100%-0%
C939	290-0517-00			6.8 µF, Elect., 35 V, 20%
C941	281-0564-00			24 pF, Cer, 5%
C945	283-0139-00			150 pF, Cer, 50 V, 20%
C947	283-0204-00			0.01 µF, Cer, 50 V, 20%
C949	290-0517-00			6.8 µF, Elect., 35 V, 20%
C961	283-0204-00			0.01 µF, Cer, 50 V, 20%
C991	290-0522-00			1 µF, Elect., 50 V, 20%
C993	290-0522-00			1 µF, Elect., 50 V, 20%
C995	290-0522-00			1 µF, Elect., 50 V, 20%
DIODES				
CR9	152-0141-02			Silicon, replaceable by 1N4152
CR10	152-0141-02	XB010200		Silicon, replaceable by 1N4152
CR102	152-0141-02			Silicon, replaceable by 1N4152
CR135	152-0141-02			Silicon, replaceable by 1N4152
CR140	152-0141-02			Silicon, rpelaceable by 1N4152
CR145	152-0141-02			Silicon, replaceable by 1N4152
CR146	152-0141-02			Silicon, replaceable by 1N4152
CR147	152-0141-02			Silicon, replaceable by 1N4152

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR150	152-0141-02			Silicon, replaceable by 1N4152
CR198	152-0141-02			Silicon, replaceable by 1N4152
CR205	152-0322-00			Silicon, replaceable by A1108
CR219	152-0075-00			Germanium, replaceable by GD238 or ED48
CR257	152-0075-00			Germanium, replaceable by GD238 or ED48
CR259	152-0141-02			Silicon, replaceable by 1N4152
CR271	152-0141-02			Silicon, replaceable by 1N4152
CR309	152-0141-02			Silicon, replaceable by 1N4152
CR310	152-0141-02			Silicon, replaceable by 1N4152
CR311	152-0141-02			Silicon, replaceable by 1N4152
CR312	152-0141-02			Silicon, replaceable by 1N4152
CR315	152-0141-02			Silicon, replaceable by 1N4152
CR319	152-0141-02			Silicon, replaceable by 1N4152
CR322	152-0141-02			Silicon, replaceable by 1N4152
CR323	152-0141-02			Silicon, replaceable by 1N4152
CR334	152-0141-02			Silicon, replaceable by 1N4152
CR345	152-0141-02			Silicon, replaceable by 1N4152
CR348	152-0075-00			Germanium, replaceable by GD238 or ED48
CR358	152-0141-02			Silicon, replaceable by 1N4152
CR359	152-0141-02			Silicon, replaceable by 1N4152
CR364	152-0182-00			Tunnel, replaceable by 1N3719
CR365	152-0141-02	B010100	B029999X	Silicon, replaceable by 1N4152
CR381	152-0141-02			Silicon, replaceable by 1N4152
CR388	152-0075-00			Germanium, replaceable by GD238 or ED48
CR390	152-0141-02			Silicon, replaceable by 1N4152
CR404	152-0141-02			Silicon, replaceable by 1N4152
CR406	152-0141-02			Silicon, replaceable by 1N4152
CR444	152-0141-02	XB010200		Silicon, replaceable by 1N4152
CR445	152-0322-00			Silicon, replaceable by A1108
CR446	152-0322-00			Silicon, replaceable by A1108
CR451	152-0141-02			Silicon, replaceable by 1N4152
CR456	152-0141-02			Silicon, replaceable by 1N4152
CR457	152-0153-00			Silicon, replaceable by FD7003 or CD5574
CR471	152-0141-02			Silicon, replaceable by 1N4152
CR474	152-0141-02			Silicon, replaceable by 1N4152
CR487	152-0141-02			Silicon, replaceable by 1N4152
CR488	152-0153-00			Silicon, replaceable by FD7003 or CD5574
CR489	152-0153-00			Silicon, replaceable by FD7003 or CD5574
CR490	152-0141-02			Silicon, replaceable by 1N4152
CR494	152-0141-02			Silicon, replaceable by 1N4152
CR495	152-0141-02	XB030000		Silicon, replaceable by 1N4152
CR498	152-0141-02			Silicon, replaceable by 1N4152
CR499	152-0141-02			Silicon, replaceable by 1N4152
CR501	152-0141-02			Silicon, replaceable by 1N4152

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (cont)				
CR502	152-0322-00			Silicon, replaceable by A1108
CR504	152-0322-00			Silicon, replaceable by A1108
CR505	152-0322-00			Silicon, replaceable by A1108
CR512	152-0141-02			Silicon, replaceable by 1N4152
CR526	152-0141-02			Silicon, replaceable by 1N4152
CR565	152-0141-02			Silicon, replaceable by 1N4152
CR600	152-0141-02	XB010200		Silicon, replaceable by 1N4152
CR631	152-0141-02			Silicon, replaceable by 1N4152
CR632	152-0141-02			Silicon, replaceable by 1N4152
CR660	152-0141-02			Silicon, replaceable by 1N4152
CR684	152-0141-02			Silicon, replaceable by 1N4152
CR720	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR720	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10 mA
CR736	152-0141-02			Silicon, replaceable by 1N4152
CR740	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR740	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10 mA
CR750	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR750	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10mA
CR752	152-0141-02			Silicon, replaceable by 1N4152
CR821	152-0141-02			Silicon, replaceable by 1N4152
CR824	152-0141-02			Silicon, replaceable by 1N4152
CR827	152-0141-02			Silicon, replaceable by 1N4152
CR828	152-0141-02			Silicon, replaceable by 1N4152
CR833	152-0141-02			Silicon, replaceable by 1N4152
CR861	152-0141-02			Silicon, replaceable by 1N4152
CR880	152-0141-02			Silicon, replaceable by 1N4152
CR883	152-0141-02			Silicon, replaceable by 1N4152
CR920	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR920	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10 mA
CR924	152-0141-02			Silicon, replaceable by 1N4152
CR940	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR940	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10 mA
CR950	152-0177-00	B010100	B019999	Tunnel, replaceable by GESMTD708, 10 mA
CR950	152-0177-02	B020000		Tunnel, replaceable by GESMTD708, 10 mA
CR952	152-0141-02			Silicon, replaceable by 1N4152
CR968	152-0141-02			Silicon, replaceable by 1N4152
CR969	152-0141-02			Silicon, replaceable by 1N4152
CR1000	152-0141-02			Silicon, replaceable by 1N4152
CR1003	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1005	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1007	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1009	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1011	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1013	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1015	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1023	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1025	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1027	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1029	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1031	152-0075-00			Germanium, replaceable by GD238 or ED48
CR1033	152-0075-00			Germanium, replaceable by GD238 or ED48
VR1	152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR2	152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%

ELECTRICAL PARTS LIST (CONT)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
DIODES (CONT)					
VR200		152-0149-00			Zener, replaceable by 1N961B, 0.4 w, 10 V, 5%
VR210		152-0166-00			Zener, replaceable by 1N753A, 0.4 W, 6.2 V, 5%
VR352		152-0461-00			Zener, replaceable by 1N821, 0.4 W, 6.2 V, 5%
VR408		152-0278-00			Zener, replaceable by 1N4372A, 0.4 W, 3 V, 5%
VR462		152-0278-00			Zener, replaceable by 1N4372A, 0.4 W, 3 V, 5%
VR473		152-0243-00			Zener, replaceable by 1N965B, 0.4 W, 15 V, 5%
VR600		152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR660		152-0326-00			Zener, selected from 1N775A, 0.4 W, 7.5 V, 5%
VR800		152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR860		152-0326-00			Zener, selected from 1N775A, 0.4 W, 7.5 V, 5%
BULBS					
DS1		150-0048-01			Incandescent, #683, selected
DS2		150-0048-01			Incandescent, #683, selected
DS3		150-0048-01			Incandescent, #683, selected
DS5		150-0048-01			Incandescent, #683, selected
DS7		150-0048-01			Incandescent, #683, selected
DS8		150-0048-01			Incandescent, #683, selected
DS9		150-0048-01			Incandescent, #683, selected
DS11		150-0048-01			Incandescent, #683, selected
CONNECTORS					
J50		131-0106-02			Receptacle, electrical, BNC
J70		131-0106-02			Receptacle, electrical, BNC
J601		131-1003-00			Receptacle, coaxial cable
J613		131-1003-00			Receptacle, coaxial cable
J614		131-1003-00			Receptacle, coaxial cable
J683		131-1003-00			Receptacle, coaxial cable
J684		131-1003-00			Receptacle, coaxial cable
J801		131-1003-00			Receptacle, coaxial cable
J863		131-1003-00			Receptacle, coaxial cable
J864		131-1003-00			Receptacle, coaxial cable
P163		131-1003-00			Receptacle, coaxial cable
P164		131-1003-00			Receptacle, coaxial cable
RELAYS					
K10		108-0358-00			Reed, drive, 12 V, single
K10S1		260-0721-00			Reed, SPST
K445		148-0034-00			Armature, DPDT
K600		148-0034-00			Armature, DPDT
INDUCTORS					
L52		108-0170-01			0.5 µH
L82		108-0170-01			0.5 µH
L190		276-0507-00			Core, ferramic suppressor
L280		120-0382-00			Toroid, 14 turns, single
L282		108-0538-00			2.7 µH
L283		108-0538-00			2.7 µH
L285		120-0382-00			Toroid, 14 turns, single
L287		108-0538-00			2.7 µH
L288		108-0588-00			2.7 µH
L291		108-0538-00			2.7 µH
L292		108-0538-00			2.7 µH
L293		120-0382-00			Toroid, 14 turns, single
L298		120-0382-00			Toroid, 14 turns, single

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
INDUCTORS (cont)				
L449	108-0569-00			0.12 µH
L462	276-0507-00			Core, ferramic suppressor
L514	276-0507-00			Core, ferramic suppressor
L555	276-0507-00			Core, ferramic suppressor
L557	276-0507-00			Core, ferramic suppressor
L558	276-0507-00			Core, ferramic suppressor
L559	276-0507-00			Core, ferramic suppressor
L626	108-0331-00			0.75 µH
L627	276-0543-00	XB010469		Core, ferrite
L628	108-0331-00			0.75 µH
L639	108-0331-00			0.75 µH
L640	108-0331-00			0.75 µH
L641	276-0543-00	XB030000		Core, ferrite
L654	108-0170-01			0.5 µH
L656	108-0537-00			200 µH
L658	108-0170-01			0.5 µH
L660	108-0331-00			0.75 µH
L662	108-0331-00			0.75 µH
L714	108-0057-00			8.8 µH
L720	276-0507-00			Core, ferramic suppressor
L722	276-0543-00			Core, ferrite
L727	276-0507-00			Core, ferramic suppressor
L728	276-0507-00			Core, ferramic suppressor
L760	276-0557-00			Core, toroid ferrite
L824	108-0331-00			0.75 µH
L825	108-0331-00			0.75 µH
L826	276-0543-00			Core, ferrite
L833	108-0331-00			0.75 µH
L834	108-0331-00			0.75 µH
L835	276-0543-00	XB030000		Core, ferrite
L836	276-0507-00	XB010469		Core, ferramic suppressor
L841	276-0507-00	XB010469		Core, ferramic suppressor
L859	108-0331-00			0.75 µH
L861	108-0331-00			0.75 µH
L890	108-0057-00			8.8 µH
L910	276-0507-00			Core, ferramic suppressor
L922	276-0543-00			Core, ferrite
L934	276-0507-00			Core, ferramic suppressor
L935	276-0507-00			Core, ferramic suppressor
L961	276-0557-00			Core, toroid ferrite
L963	276-0507-00			Core, ferramic suppressor
LR295	108-0520-00	XB020000		2.2 µH (wound on a 22 Ω, 1/4 W, 5% resistor)
TRANSISTORS				
Q102	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q104	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q106	151-0190-01			Silicon, NPN, replaceable by 2N3904 or TE3904
Q108	151-0190-01			Silicon, NPN, replaceable by 2N3904 or TE3904
Q132	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q134	151-0216-00			Silicon, PNP, replaceable by MPS6523
Q144	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q146	151-0190-01			Silicon, NPN, replaceable by 2N3904 or TE3904
Q148	151-0207-00			Silicon, NPN, replaceable by 2N3415
Q152	151-0192-00			Silicon, NPN, selected from MPS6521
Q154	151-0192-00			Silicon, NPN, selected from MPS6521
Q162	151-0192-00			Silicon, NPN, selected from MPS6521
Q164	151-0192-00			Silicon, NPN, selected from MPS6521
Q172	151-0188-00			Silicon, PNP, replaceable by 2N3906
Q174	151-0188-00			Silicon, PNP, replaceable by 2N3906 Ⓑ

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q182	151-0192-00			Silicon, NPN, selected from MPS6521
Q184	151-0192-00			Silicon, NPN, selected from MPS6521
Q188	151-0192-00			Silicon, NPN, selected from MPS6521
Q192	151-0188-00			Silicon, PNP, replaceable by 2N3906
Q194	151-0192-00			Silicon, NPN, selected from MPS6521
Q202	151-0207-00			Silicon, NPN, replaceable by 2N3415
Q304	151-0301-00			Silicon, PNP, replaceable by 2N2907
Q312	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q314	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q315	151-0198-00			Silicon, NPN, replaceable by MPS918
Q322	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q326	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q330	151-0225-00			Silicon, NPN, selected from 2N3563 or replaceable by CS23366
Q336	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q343	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q346	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q348	151-0219-00			Silicon, PNP, replaceable by 2N4250
Q349	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q359A,B	151-0353-00			Silicon, NPN, replaceable by QD100, dual
Q363	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q368	151-0198-00	B010100	B029999X	Silicon, NPN, replaceable by MPS918
Q374	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q376	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q378	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q382	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q392	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q395	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q398	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q402, Q404	151-1042-00			Silicon, FET, selected from 2N5245, matched pair
Q406	151-0222-00			Silicon, NPN, selected from 2N4251
Q408	151-0222-00			Silicon, NPN, selected from 2N4251
Q422	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q424	151-0190-00	B010100	B010449	Silicon, NPN, replaceable by 2N3904 or TE3904
Q424	151-0190-02	B010450		Silicon, NPN, replaceable by 2N3904, checked
Q426	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q432	151-0325-00			Silicon, PNP, replaceable by 2N4258
Q434	151-0325-00			Silicon, PNP, replaceable by 2N4258
Q440	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q450, 0454	151-1042-00			Silicon, FET, selected from 2N5245, matched pair
Q456	151-0222-00			Silicon, NPN, selected from 2N4251
Q462	151-0222-00			Silicon, NPN, selected from 2N4251
Q468	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q472	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q475	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q480	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q486	151-0269-00			Silicon, NPN, replaceable by SE3005
Q494	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q498	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q501	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)				
Q503	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q508	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q514	151-0325-00			Silicon, PNP, replaceable by 2N4258
Q517	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q520	151-0190-00	B010100	B029999	Silicon, NPN, replaceable by 2N3904 or TE3904
Q520	151-0190-01	B030000		Silicon, NPN, replaceable by 2N3904 or TE3904
Q524	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q530	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q533	151-0325-00			Silicon, PNP, replaceable by 2N4258
Q546	151-0190-00	B010100	B029999	Silicon, NPN, replaceable by 2N3904 or TE3904
Q546	151-0190-01	B030000		Silicon, NPN, replaceable by 2N3904 or TE3904
Q550	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q552	151-0220-00			Silicon, PNP, replaceable by 2N4122
Q555	151-0271-00			Silicon, PNP, replaceable by SAB4113
Q559	151-0271-00			Silicon, PNP, replaceable by SAB4113
Q562	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q568	151-0192-00			Silicon, NPN, replaceable by 2N4275
Q594	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q596	151-0216-00			Silicon, PNP, replaceable by MPS6523
Q600A,B	151-1011-00			Silicon, FET, replaceable by FD1167 or D/2N3822, dual
Q602	151-0333-00			Silicon, NPN, selected from MPS918
Q604	151-0333-00			Silicon, NPN, selected from MPS918
Q614	151-0333-00			Silicon, NPN, selected from MPS918
Q618	151-0333-00			Silicon, NPN, selected from MPS918
Q684	151-0188-00			Silicon, PNP, replaceable by 2N3906
Q702	151-0198-00			Silicon, NPN, replaceable by MPS918
Q704	151-0192-00			Silicon, NPN, selected from MPS6521
Q708	151-0192-00			Silicon, NPN, selected from MPS6521
Q714	151-0269-00			Silicon, NPN, replaceable by SE3005
Q718	151-0269-00			Silicon, NPN, replaceable by SE3005
Q722	151-0294-00			Silicon, PNP, replaceable by MMT4161 or SKH1029
Q724	151-0269-00			Silicon, NPN, replaceable by SE3005
Q726	151-0269-00			Silicon, NPN, replaceable by SE3005
Q728	151-0188-00			Silicon, PNP, replaceable by 2N3906
Q744	151-0293-00			Silicon, NPN, replaceable by MMT3960A
Q748	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q754	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q755	151-0221-00			Silicon, PNP, replaceable by 2N4258
Q800A,B	151-1011-00			Silicon, FET, replaceabel by FD-1167 or D/2N3822
Q802	151-0333-00			Silicon, NPN, selected from MPS918
Q804	151-0333-00			Silicon, NPN, selected from MPS918
Q814	151-0333-00			Silicon, NPN, selected from MPS918
Q818	151-0333-00			Silicon, NPN, selected from MPS918
Q908	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
Q910	151-0188-00			Silicon, PNP, replaceable by 2N3906
Q914	151-0269-00			Silicon, NPN, replaceable by SE3005
Q918	151-0269-00			Silicon, NPN, replaceable by SE3005
Q922	151-0294-00			Silicon, PNP, replaceable by MMT4261 or SKH1029
Q932	151-0269-00			Silicon, NPN, replaceable by SE3005
Q934	151-0269-00			Silicon, NPN, replaceable by SE3005
Q944	151-0293-00			Silicon, NPN, replaceable by MMT3960A
Q948	151-0223-00			Silicon, NPN, replaceable by 2N4275
Q954	151-0223-00			Silicon, NPN, replaceable by 2N4275

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS				
R2	311-1068-00			5 kΩ, Var
R3	317-0244-00			240 kΩ, 1/8 W, 5%
R4	311-1068-00			5 kΩ, Var
R5	317-0103-00			10 kΩ, 1/8 W, 5%
R6[1]	311-1192-00			10 kΩ, Var
R7	317-0682-00			6.8 kΩ, 1/8 W, 5%
R8	317-0331-00			330 Ω, 1/8 W, 5%
R10	317-0103-00			10 kΩ, 1/8 W, 5%
R14	315-0622-00			6.2 kΩ, 1/4 W, 5%
R16	315-0123-00	B010100	B029999	12 kΩ, 1/4 W, 5%
R16	315-0123-00	B030000		12 kΩ, (nominal value), selected
R20	311-1191-00			10 kΩ, Var
R22				10 kΩ,
R25	311-0946-00			50 kΩ, Var
R50	303-0680-00			68 Ω, 1 W, 5%
R52	315-0201-00			200 Ω, 1/4 W, 5%
R54	317-0680-00			68 Ω, 1/8 W, 5%
R55	315-0361-00			360 Ω, 1/4 W, 5%
R57	317-0911-00			910 Ω, 1/8 W, 5%
R58	317-0101-00			100 Ω, 1/8 W, 1%
R60	317-0201-00			200 Ω, 1/8 W, 5%
R63	317-0153-00			15 kΩ, 1/8 W, 5%
R65	315-0754-00			750 kΩ, 1/4 W, 5%
R71	317-0201-00			200 Ω, 1/8 W, 5%
R73	315-0754-00			750 kΩ, 1/4 W, 5%
R75	317-0103-00			10 kΩ, 1/8 W, 5%
R76	317-0103-00			10 kΩ, 1/8 W, 5%
R78	317-0153-00			15 kΩ, 1/8 W, 5%
R81	303-0680-00			68 Ω, 1 W, 5%
R82	315-0201-00			200 Ω, 1/4 W, 5%
R84	317-0680-00			68 Ω, 1/8 W, 5%
R86	315-0361-00			360 Ω, 1/4 W, 5%
R102	315-0431-00			430 Ω, 1/4 W, 5%
R104	315-0362-00			3.6 kΩ, 1/4 W, 5%
R105	315-0751-00			750 Ω, 1/4 W, 5%
R106	315-0751-00			750 Ω, 1/4 W, 5%
R107	315-0821-00			820 Ω, 1/4 W, 5%
R108	321-0229-00			2.37 kΩ, 1/8 W, 1%
R109	315-0361-00			360 Ω, 1/4 W, 5%
R110	315-0153-00			15 kΩ, 1/4 W, 5%
R131	315-0102-00			1 kΩ, 1/4 W, 5%
R133	315-0242-00			2.4 kΩ, 1/8 W, 5%
R135	315-0431-00			430 Ω, 1/4 W, 5%
R137	321-0229-00			2.37 kΩ, 1/8 W, 1%
R138	321-0222-00			2 kΩ, 1/8 W, 1%
R141	315-0101-00			100 Ω, 1/4 W, 5%
R142	315-0362-00			3.6 kΩ, 1/4 W, 5%
R144	315-0202-00			2 kΩ, 1/4 W, 5%
R145	315-0153-00			15 kΩ, 1/4 W, 5%
R146	315-0472-00			4.7 kΩ, 1/4 W, 5%
R147	315-0392-00			3.9 kΩ, 1/4 W, 5%
R148	315-0103-00			10 kΩ, 1/4 W, 5%
R149	315-0241-00			240 Ω, 1/4 W, 5%

[1]Furnished as a unit with S6.

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R151	315-0302-00			3 kΩ, 1/4 W, 5%
R153	315-0161-00			160 Ω, 1/4 W, 5%
R154	315-0161-00			160 Ω, 1/4 W, 5%
R156	315-0752-00			7.5 kΩ, 1/4 W, 5%
R157	315-0911-00			910 Ω, 1/4 W, 5%
R158	315-0511-00			510 Ω, 1/4 W, 5%
R159	315-0272-00			2.7 kΩ, 1/4 W, 5%
R161	315-0472-00			4.7 kΩ, 1/4 W, 5%
R165	315-0472-00			4.7 kΩ, 1/4 W, 5%
R166	315-0303-00			30 kΩ, 1/4 W, 5%
R167	315-0512-00			5.1 kΩ, 1/4 W, 5%
R171	315-0102-00			1 kΩ, 1/4 W, 5%
R173	315-0272-00			2.7 kΩ, 1/4 W, 5%
R176	315-0202-00			2 kΩ, 1/4 W, 5%
R177	315-0622-00			6.2 kΩ, 1/4 W, 5%
R180	315-0302-00			3 kΩ, 1/4 W, 5%
R183	315-0161-00			160 Ω, 1/4 W, 5%
R184	315-0331-00			330 Ω, 1/4 W, 5%
R185	315-0161-00			160 Ω, 1/4 W, 5%
R186	315-0752-00			7.5 kΩ, 1/4 W, 5%
R188	315-0103-00			10 kΩ, 1/4 W, 5%
R189	315-0112-00			1.1 kΩ, 1/4 W, 5%
R191	315-0392-00			3.9 kΩ, 1/4 W, 5%
R192	315-0303-00			30 kΩ, 1/4 W, 5%
R194	315-0152-00			1.5 kΩ, 1/4 W, 5%
R195	315-0202-00			2 kΩ, 1/4 W, 5%
R196	315-0112-00			1.1 kΩ, 1/4 W, 5%
R198	315-0562-00			5.6 kΩ, 1/4 W, 5%
R199	315-0472-00			4.7 kΩ, 1/4 W, 5%
R200	311-0959-00			10 kΩ, Var
R201	315-0103-00			10 kΩ, 1/4 W, 5%
R203	315-0242-00			2.4 kΩ, 1/4 W, 5%
R204	315-0242-00			2.4 kΩ, 1/4 w, 5%
R207	315-0103-00			10 kΩ, 1/4 W, 5%
R208	317-0101-00	XB010310	B039999X	100 Ω, 1/8 W, 5%
R211	315-0472-00			4.7 kΩ, 1/4 W, 5%
R212	315-0101-00			100 Ω, 1/4 W, 5%
R215A	323-0794-07			11.17 kΩ, 1/2 W, 1/10%
R215B	323-0795-07			22.34 kΩ, 1/2 W, 1/10%
R215C	323-0785-07			55.85 kΩ, 1/2 W, 1/10%
R215D	323-0786-07			111.7 kΩ, 1/2 W, 1/10%
R215E	323-0787-07			223.4 kΩ, 1/2 W, 1/10%
R215F	323-0788-07			558.5 kΩ, 1/2 W, 1/10%
R215G	323-0789-07			1.117 MΩ, 1/2 W, 1/10%
R215H	323-0789-07			1.117 MΩ, 1/2 W, 1/10%
R215J	325-0080-00			3.351 MΩ, 1/2 W, 1%
R215K	325-0081-00			11.17 MΩ, 1/2 W, 1%
R215L	325-0081-00			11.17 MΩ, 1/2 W, 1%
R216	315-0470-00			47 Ω, 1/4 W, 5%
R219	315-0133-00			13 kΩ, 1/4 W, 5%
R221	315-0154-00			150 kΩ, 1/4 W, 5%
R222	321-0344-00			37.4 kΩ, 1/8 W, 1%

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R223	315-0154-00			150 kΩ, 1/4 W, 5%
R224	321-0344-00			37.4 kΩ, 1/8 W, 1%
R226	315-0154-00			150 kΩ, 1/4 W, 5%
R227	315-0513-00			51 kΩ, 1/4 W, 5%
R228	315-0154-00			150 kΩ, 1/4 W, 5%
R229	315-0513-00			51 kΩ, 1/4 W, 5%
R231	315-0753-00			75 kΩ, 1/4 W, 5%
R232	315-0753-00			75 kΩ, 1/4 W, 5%
R233	315-0154-00			150 kΩ, 1/4 W, 5%
R234	315-0154-00			150 kΩ, 1/4 W, 5%
R235	315-0154-00			150 kΩ, 1/4 W, 5%
R236	315-0154-00			150 kΩ, 1/4 W, 5%
R238	315-0753-00			75 kΩ, 1/4 W, 5%
R239	315-0753-00			75 kΩ, 1/4 W, 5%
R242A	325-0081-00			11.17 MΩ, 1/2 W, 1%
R242B	325-0081-00			11.17 MΩ, 1/2 W, 1%
R242C	325-0080-00			3.351 MΩ, 1/2 W, 1%
R242D	323-0789-07			1.117 MΩ, 1/2 W, 1/10%
R242E	323-0789-07			1.117 MΩ, 1/2 W, 1/10%
R242F	323-0788-07			558.5 kΩ, 1/2 W, 1/10%
R242G	323-0787-07			223.4 kΩ, 1/2 W, 1/10%
R242H	323-0786-07			111.7 kΩ, 1/2 W, 1/10%
R242J	323-0785-07			55.85 kΩ, 1/2 W, 1/10%
R242K	323-0317-00			19.6 kΩ, 1/2 W, 1%
R242L	323-0280-00			8.06 kΩ, 1/2 W, 1%
R244	311-1282-00			5 kΩ, Var
R246	311-1281-00			2.5 kΩ, Var
R248	315-0101-00			100 Ω, 1/4 W, 5%
R251	315-0512-00			5.1 kΩ, 1/4 W, 5%
R252	315-0432-00			4.3 kΩ, 1/4 W, 5%
R255	315-0470-00			47 Ω, 1/4 W, 5%
R257	315-0753-00			75 kΩ, 1/4 W, 5%
R258	315-0753-00			75 kΩ, 1/4 W, 5%
R259	315-0362-00			3.6 kΩ, 1/4 W, 5%
R260	311-1300-00			200 Ω, Var
R261	315-0752-00			7.5 kΩ, 1/4 W, 5%
R262	321-0097-00			100 Ω, 1/8 W, 1%
R263	315-0752-00			7.5 kΩ, 1/4 W, 5%
R267	315-0512-00			5.1 kΩ, 1/4 W, 5%
R269	315-0822-00			8.2 kΩ, 1/4 W, 5%
R271	315-0752-00			7.5 kΩ, 1/4 W, 5%
R274	315-0470-00			47 Ω, 1/4 W, 5%
R277	315-0203-00			20 kΩ, 1/4 W, 5%
R278	315-0203-00			20 kΩ, 1/4 W, 5%
R280	315-0101-00			100 Ω, 1/4 W, 5%
R285	315-0101-00			100 Ω, 1/4 W, 5%
R293	315-0101-00			100 Ω, 1/4 W, 5%
R296	315-0202-00			2 kΩ, 1/4 W, 5%
R298	315-0101-00			100 Ω, 1/4 W, 5%
R300	315-0124-00	B010100	B010468	120 kΩ, 1/4 W, 5%
R300	315-0184-00	B010469		180 kΩ, 1/4 W, 5%

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ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R302	315-0102-00			1 kΩ, 1/4 W, 5%
R303	315-0103-00			10 kΩ, 1/4 W, 5%
R304	315-0100-00			10 Ω, 1/4 W, 5%
R305	315-0301-00	XB010200		300 Ω, 1/4 W, 5%
R306	315-0472-00			4.7 kΩ, 1/4 W, 5%
R307	315-0241-00			240 Ω, 1/4 W, 5%
R308	315-0184-00			180 kΩ, 1/4 W, 5%
R309	315-0393-00			39 kΩ, 1/4 W, 5%
R310	315-0622-00			6.2 kΩ, 1/4 W, 5%
R311	315-0472-00			4.7 kΩ, 1/4 W, 5%
R312	315-0472-00			4.7 kΩ, 1/4 W, 5%
R313	315-0103-00			10 kΩ, 1/4 W, 5%
R314	315-0100-00			10 Ω, 1/4 W, 5%
R315	315-0472-00			4.7 kΩ, 1/4 W, 5%
R317	315-0472-00			4.7 kΩ, 1/4 W, 5%
R320	315-0471-00			470 Ω, 1/4 W, 5%
R321	315-0390-00			39 Ω, 1/4 W, 5%
R322	315-0202-00			2 kΩ, 1/4 W, 5%
R323	315-0102-00	B010100	B019999	1 kΩ, 1/4 W, 5%
R323	315-0122-00	B020000		1.2 kΩ, 1/4 W, 5%
R324	323-0190-00			931 Ω, 1/2 W, 1%
R325	315-0332-00			3.3 kΩ, 1/4 W, 5%
R326	315-0241-00			240 Ω, 1/4 W, 5%
R327	315-0153-00			15 kΩ, 1/4 W, 5%
R328	321-0146-00			324 Ω, 1/8 W, 1%
R330	315-0101-00			100 Ω, 1/4 W, 5%
R332	315-0822-00			8.2 kΩ, 1/4 W, 5%
R333	315-0471-00			470 Ω, 1/4 W, 5%
R334	315-0362-00			3.6 kΩ, 1/4 W, 5%
R335	315-0202-00			2 kΩ, 1/4 W, 5%
R337	315-0471-00			470 Ω, 1/4 W, 5%
R339	315-0202-00			2 kΩ, 1/4 W, 5%
R340	311-0634-00			500 Ω, Var
R341	315-0202-00			2 kΩ, 1/4 W, 5%
R343	315-0332-00			3.3 kΩ, 1/4 W, 5%
R345	315-0153-00			15 kΩ, 1/4 W, 5%
R346	315-0153-00			15 kΩ, 1/4 W, 5%
R347	315-0471-00			470 Ω, 1/4 W, 5%
R348	315-0203-00			20 kΩ, 1/4 W, 5%
R349	315-0472-00			4.7 kΩ, 1/4 W, 5%
R349A	315-0392-00			3.9 kΩ, 1/4 W, 5%
R350	311-0607-00			10 kΩ, Var
R351	321-0306-00			15 kΩ, 1/8 W, 1%
R352	321-0198-00			1.13 kΩ, 1/8 W, 1%
R354	315-0102-00			1 kΩ, 1/4 W, 5%
R356	315-0102-00			1 kΩ, 1/4 W, 5%
R357	315-0301-00			300 Ω, 1/4 W, 5%
R358	315-0301-00			300 Ω, 1/4 W, 5%
R360	321-0239-00			3.01 kΩ, 1/8 W, 1%
R361	321-0331-00			27.4 kΩ, 1/8 W, 1%
R362	321-0271-00			6.49 kΩ, 1/8 W, 1%
R363	315-0201-00	XB030000		200 Ω, 1/4 W, 5%
R364	311-0607-00	B010100	B029999	10 kΩ, Var
R364	311-0609-00	B030000		2 kΩ, Var
R365	315-0302-00	B010100	B029999	3 kΩ, 1/4 W, 5%
R365	315-0182-00	B030000		1.8 kΩ, 1/4 W, 5%

ELECTRICAL PARTS LIST (CONT)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (CONT)					
R366		315-0151-00	XB030000		150 Ω, 1/4 W, 5%
R367		315-0151-00			150 Ω, 1/4 W, 5%
R368		315-0331-00	B010100	B029999	330 Ω, 1/4 W, 5%
R368		315-0910-00	B030000		91 Ω, 1/4 W, 5%
R370		315-0102-00			1 kΩ, 1/4 W, 5%
R371		315-0102-00			1 kΩ, 1/4 W, 5%
R373		315-0242-00			2.4 kΩ, 1/4 W, 5%
R374		315-0681-00			680 Ω, 1/4 W, 5%
R375		321-0280-00			8.06 kΩ, 1/8 W, 1%
R376		315-0101-00			100 Ω, 1/4 W, 5%
R377		321-0222-00			2 kΩ, 1/8 W, 1%
R379		321-0280-00			8.06 kΩ, 1/8 W, 1%
R380		315-0102-00			1 kΩ, 1/4 W, 5%
R381		315-0102-00			1 kΩ, 1/4 W, 5%
R382		315-0100-00			10 Ω, 1/4 W, 5%
R383		315-0471-00			470 Ω, 1/4 W, 5%
R385		315-0102-00			1 kΩ, 1/4 W, 5%
R386		315-0102-00			1 kΩ, 1/4 W, 5%
R388		315-0103-00			10 kΩ, 1/4 W, 5%
R389		315-0102-00			1 kΩ, 1/4 W, 5%
R390		315-0103-00			10 kΩ, 1/4 W, 5%
R392		315-0822-00			8.2 kΩ, 1/4 W, 5%
R393		315-0391-00			390 Ω, 1/4 W, 5%
R395		315-0390-00			39 Ω, 1/4 W, 5%
R396		315-0153-00			15 kΩ, 1/4 W, 5%
R397		315-0201-00			200 Ω, 1/4 W, 5%
R398		315-0151-00			150 Ω, 1/4 W, 5%
R400		315-0330-00			33 Ω, 1/4 W, 5%
R402		311-1035-00			50 kΩ, Var
R403		315-0153-00			15 kΩ, 1/4 W, 5%
R406		301-0152-00			1.5 kΩ, 1/2 W, 5%
R408		315-0101-00			100 Ω, 1/4 W, 5%
R409		315-0510-00			51 Ω, 1/4 W, 5%
R410		301-0202-00			2 kΩ, 1/2 W, 5%
R412		315-0201-00			200 Ω, 1/4 W, 5%
R420		315-0390-00			39 Ω, 1/4 W, 5%
R422		322-0210-00			1.5 kΩ, 1/4 W, 1%
R424		315-0122-00			1.2 kΩ, 1/4 W, 5%
R425		315-0331-00			330 Ω, 1/4 W, 5%
R427		315-0472-00			4.7 kΩ, 1/4 W, 5%
R428		315-0301-00			300 Ω, 1/4 W, 5%
R430		315-0390-00			39 Ω, 1/4 W, 5%
R432		315-0201-00			200 Ω, 1/4 W, 5%
R433		315-0201-00			200 Ω, 1/4 W, 5%
R434		322-0193-00			1 kΩ, 1/4 W, 1%
R436		315-0103-00			10 kΩ, 1/4 W, 5%
R437		315-0301-00			300 Ω, 1/4 W, 5%
R438		315-0201-00			200 Ω, 1/4 W, 5%
R439		315-0102-00			1 kΩ, 1/4 W, 5%
R441		315-0300-00			30 Ω, 1/4 W, 5%
R447		321-0126-00			200 Ω, 1/8 W, 1%
R448		315-0390-00			39 Ω, 1/4 W, 5%
R451		315-0153-00			15 kΩ, 1/4 W, 5%
R452		311-1035-00			50 kΩ, Var

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R455	301-0431-00			430 Ω, 1/2 W, 5%
R457	315-0392-00			3.9 kΩ, 1/4 W, 5%
R458	315-0392-00			3.9 kΩ, 1/4 W, 5%
R460	315-0101-00			100 Ω, 1/4 W, 5%
R461	315-0470-00			47 Ω, 1/4 W, 5%
R462	315-0390-00			39 Ω, 1/4 W, 5%
R463	315-0152-00			1.5 kΩ, 1/4 W, 5%
R465	311-0634-00			500 Ω, Var
R466	315-0202-00			2 kΩ, 1/4 W, 5%
R467	315-0102-00			1 kΩ, 1/4 W, 5%
R468	315-0332-00			3.3 kΩ, 1/4 W, 5%
R470	315-0202-00			2 kΩ, 1/4 W, 5%
R471	315-0102-00			1 kΩ, 1/4 W, 5%
R472	315-0102-00			1 kΩ, 1/4 W, 5%
R473	315-0202-00			2 kΩ, 1/4 W, 5%
R474	315-0202-00			2 kΩ, 1/4 W, 5%
R475	315-0102-00			1 kΩ, 1/4 W, 5%
R476	315-0391-00			390 Ω, 1/4 W, 5%
R477	315-0561-00			560 Ω, 1/4 W, 5%
R478	315-0101-00			100 Ω, 1/4 W, 5%
R480	315-0202-00			2 kΩ, 1/4 W, 5%
R482	315-0822-00			8.2 kΩ, 1/4 W, 5%
R483	315-0202-00			2 kΩ, 1/4 W, 5%
R484	315-0161-00			160 Ω, 1/4 W, 5%
R486	315-0471-00			470 Ω, 1/4 W, 5%
R487	315-0471-00			470 Ω, 1/4 W, 5%
R488	315-0152-00			1.5 kΩ, 1/4 W, 5%
R489	315-0470-00			47 Ω, 1/4 W, 5%
R490	315-0243-00			24 kΩ, 1/4 W, 5%
R491	315-0472-00			4.7 kΩ, 1/4 W, 5%
R492	315-0203-00			20 kΩ, 1/4 W, 5%
R494	315-0302-00			3 kΩ, 1/4 W, 5%
R495	315-0152-00	XB030000		1.5 kΩ, 1/4 W, 5%
R496	315-0152-00			1.5 kΩ, 1/4 W, 5%
R497	315-0102-00			1 kΩ, 1/4 W, 5%
R498	315-0472-00			4.7 kΩ, 1/4 W, 5%
R500	315-0102-00			1 kΩ, 1/4 W, 5%
R501	315-0102-00			1 kΩ, 1/4 W, 5%
R504	315-0102-00			1 kΩ, 1/4 W, 5%
R506	315-0102-00			1 kΩ, 1/4 W, 5%
R508	315-0681-00			680 Ω, 1/4 W, 5%
R510	321-0168-00			549 Ω, 1/8 W, 1%
R511	311-0622-00			100 Ω, Var
R512	321-0115-00			154 Ω, 1/8 W, 1%
R513	321-0246-00			3.57 kΩ, 1/8 W, 1%
R515	321-0089-00			82.5 Ω, 1/8 W, 1%
R516	311-1007-00			20 Ω, Var
R518	315-0162-00			1.6 kΩ, 1/4 W, 5%
R519	315-0821-00			820 Ω, 1/4 W, 5%
R521	315-0102-00			1 kΩ, 1/4 W, 5%
R523	311-0609-00			2 kΩ, Var
R524	321-0614-00			10.1 kΩ, 1/8 W, 1%
R526	315-0103-00			10 kΩ, 1/4 W, 5%
R528	321-0224-00			2.1 kΩ, 1/8 W, 1%

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R530		315-0302-00			3 kΩ, 1/4 W, 5%
R532		315-0102-00			1 kΩ, 1/4 W, 5%
R534		315-0620-00			62 Ω, 1/4 W, 5%
R536		322-0202-00			1.24 kΩ, 1/4 W, 1%
R538		322-0202-00			1.24 kΩ, 1/4 W, 1%
R540		321-0143-00			301 Ω, 1/8 W, 1%
R542		321-0260-00			4.99 kΩ, 1/8 W, 1%
R543		321-0260-00			4.99 kΩ, 1/8 W, 1%
R545		315-0102-00			1 kΩ, 1/4 W, 5%
R547		315-0821-00			820 Ω, 1/4 W, 5%
R548		315-0162-00			1.6 kΩ, 1/4 W, 5%
R552		315-0102-00			1 kΩ, 1/4 W, 5%
R553		315-0302-00			3 kΩ, 1/4 W, 5%
R555		315-0620-00			62 Ω, 1/4 W, 5%
R558		321-0094-00			93.1 Ω, 1/8 W, 1%
R560		311-0635-00			1 kΩ, Var
R561		321-0233-00			2.61 kΩ, 1/8 W, 1%
R563		315-0222-00			2.2 kΩ, 1/4 W, 5%
R565		321-0122-00			182 Ω, 1/8 W, 1%
R566		321-0230-00			2.43 kΩ, 1/8 W, 1%
R567		311-0635-00			1 kΩ, Var
R568		315-0472-00			4.7 kΩ, 1/4 W, 5%
R569		321-0193-00			1 kΩ, 1/8 W, 1%
R571		315-0183-00			18 kΩ, 1/4 W, 5%
R572		321-0172-00			604 Ω, 1/8 W, 1%
R592		321-0260-00			4.99 kΩ, 1/8 W, 1%
R593		321-0289-00			10 kΩ, 1/8 W, 1%
R595		315-0103-00			10 kΩ, 1/4 W, 5%
R600		317-0101-00	XB010302		100 Ω, 1/8 W, 5%
R601		315-0331-00			330 Ω, 1/4 W, 5%
R602		311-0635-00			1 kΩ, Var
R603		315-0561-00			560 Ω, 1/4 W, 5%
R604		317-0101-00	XB010302		100 Ω, 1/8 W, 5%
R605		315-0910-00			91 Ω, 1/4 W, 5%
R606		315-0512-00			5.1 kΩ, 1/4 W, 5%
R607		315-0224-00			220 kΩ, 1/4 W, 5%
R608		315-0243-00			24 kΩ, 1/4 W, 5%
R610		315-0242-00			2.4 kΩ, 1/4 W, 5%
R612		315-0750-00			75 Ω, 1/4 W, 5%
R614		315-0242-00			2.4 kΩ, 1/4 W, 5%
R616		315-0151-00			150 Ω, 1/4 W, 5%
R617		315-0510-00			51 Ω, 1/4 W, 5%
R618		315-0510-00			51 Ω, 1/4 W, 5%
R619		315-0151-00			150 Ω, 1/4 W, 5%
R621		315-0101-00			100 Ω, 1/4 W, 5%
R623		315-0101-00			100 Ω, 1/4 W, 5%
R624		315-0510-00			51 Ω, 1/4 W, 5%
R629		315-0510-00	B010100	B049999	51 Ω, 1/4 W, 5%
R629		315-0101-00	B050000		100 Ω, 1/4 W, 5%
R630		315-0203-00			20 kΩ, 1/4 W, 5%
R631		315-0203-00			20 kΩ, 1/4 W, 5%
R633		315-0241-00			240 Ω, 1/4 W, 5%
R634		315-0241-00			240 Ω, 1/4 W, 5%
R636		317-0753-00			75 kΩ, 1/8 W, 5%

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R637	317-0471-00			470 Ω, 1/8 W, 5%
R641	317-0753-00			75 kΩ, 1/8 W, 5%
R642	317-0471-00			470 Ω, 1/8 W, 5%
R644	315-0201-00			200 Ω, 1/4 W, 5%
R645	315-0201-00			200 Ω, 1/4 W, 5%
R647	311-0613-00			100 kΩ, Var
R648	315-0274-00			270 kΩ, 1/4 W, 5%
R650	315-0202-00			2 kΩ, 1/4 W, 5%
R652	315-0202-00			2 kΩ, 1/4 W, 5%
R654	315-0510-00			51 Ω, 1/4 W, 5%
R655	315-0100-00			10 Ω, 1/4 W, 5%
R657	315-0100-00			10 Ω, 1/4 W, 5%
R658	315-0510-00			51 Ω, 1/4 W, 5%
R660	315-0133-00			13 kΩ, 1/4 W, 5%
R662	315-0472-00			4.7 kΩ, 1/4 W, 5%
R664	315-0472-00			4.7 kΩ, 1/4 W, 5%
R665	315-0111-00			110 Ω, 1/4 W, 5%
R666	315-0111-00			110 Ω, 1/4 W, 5%
R668	315-0431-00			430 Ω, 1/4 W, 5%
R669	315-0431-00			430 Ω, 1/4 W, 5%
R671	315-0102-00			1 kΩ, 1/4 W, 5%
R673	315-0102-00			1 kΩ, 1/4 W, 5%
R680	315-0512-00			5.1 kΩ, 1/4 W, 5%
R682	315-0512-00			5.1 kΩ, 1/4 W, 5%
R683	315-0244-00			240 kΩ, 1/4 W, 5%
R685	315-0152-00			1.5 kΩ, 1/4 W, 5%
R687	315-0823-00			82 kΩ, 1/8 W, 5%
R700	317-0151-00			150 Ω, 1/8 W, 5%
R701	315-0202-00			2 kΩ, 1/4 W, 5%
R703	315-0621-00			620 Ω, 1/4 W, 5%
R705	315-0103-00			10 kΩ, 1/4 W, 5%
R706	315-0302-00			3 kΩ, 1/4 W, 5%
R707	315-0820-00			82 Ω, 1/4 W, 5%
R708	315-0122-00			1.2 kΩ, 1/4 W, 5%
R709	315-0122-00			1.2 kΩ, 1/4 W, 5%
R711	315-0102-00			1 kΩ, 1/4 W, 5%
R712	315-0102-00			1 kΩ, 1/4 W, 5%
R714	315-0332-00			3.3 kΩ, 1/4 W, 5%
R715	317-0101-00			100 Ω, 1/8 W, 5%
R717	315-0512-00			5.1 kΩ, 1/4 W, 5%
R718	315-0561-00			560 Ω, 1/4 W, 5%
R719	315-0330-00			33 Ω, 1/4 W, 5%
R721	317-0152-00			1.5 kΩ, 1/8 W, 5%
R722	317-0101-00			100 Ω, 1/8 W, 5%
R724	317-0510-00			51 Ω, 1/8 W, 5%
R725	315-0241-00			240 Ω, 1/4 W, 5%
R726	315-0102-00			1 kΩ, 1/4 W, 5%
R727	315-0241-00			240 Ω, 1/4 W, 5%
R729	315-0391-00			390 Ω, 1/4 W, 5%
R730	311-0609-00			2 kΩ, Var

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R731		315-0112-00			1.1 kΩ, 1/4 W, 5%
R732		321-0242-00			3.24 kΩ, 1/8 W, 1%
R733		321-0222-00			2 kΩ, 1/8 W, 1%
R734		315-0103-00			10 kΩ, 1/4 W, 5%
R736		317-0101-00			100 Ω, 1/8 W, 5%
R738		317-0510-00			51 Ω, 1/8 W, 5%
R739		315-0220-00			22 Ω, 1/4 W, 5%
R740		311-0634-00			500 Ω, Var
R741		315-0102-00			1 kΩ, 1/4 W, 5%
R742		317-0391-00			390 Ω, 1/8 W, 5%
R744		317-0510-00			51 Ω, 1/8 W, 5%
R745		317-0153-00			15 kΩ, 1/8 W, 5%
R746		317-0101-00			100 Ω, 1/8 W, 5%
R748		315-0102-00			1 kΩ, 1/4 W, 5%
R749		315-0101-00			100 Ω, 1/4 W, 5%
R750		311-0634-00			500 Ω, Var
R751		315-0132-00			1.3 kΩ, 1/4 W, 5%
R752		317-0101-00			100 Ω, 1/8 W, 1%
R754		315-0102-00			1 kΩ, 1/4 W, 5%
R755		315-0102-00			1 kΩ, 1/4 W, 5%
R756		315-0471-00			470 Ω, 1/4 W, 5%
R757		315-0471-00			470 Ω, 1/4 W, 5%
R759		317-0201-00			200 Ω, 1/8 W, 5%
R763		317-0510-00			51 Ω, 1/8 W, 5%
R765		317-0510-00			51 Ω, 1/8 W, 5%
R800		317-0101-00	XB010302		100 Ω, 1/8 W, 5%
R801		315-0331-00			330 Ω, 1/4 W, 5%
R802		311-0635-00			1 kΩ, Var
R803		315-0561-00			560 Ω, 1/4 W, 5%
R804		317-0101-00	XB010302		100 Ω, 1/8 W, 5%
R805		315-0910-00			91 Ω, 1/4 W, 5%
R807		315-0274-00			270 Ω, 1/4 W, 5%
R810		315-0242-00			2.4 kΩ, 1/4 W, 5%
R812		315-0750-00			75 Ω, 1/4 W, 5%
R814		315-0242-00			2.4 kΩ, 1/4 W, 5%
R816		315-0151-00			150 Ω, 1/4 W, 5%
R817		315-0510-00			51 Ω, 1/4 W, 5%
R818		315-0510-00			51 Ω, 1/4 W, 5%
R819		315-0151-00			150 Ω, 1/4 W, 5%
R821		315-0272-00			2.7 kΩ, 1/4 W, 5%
R823		315-0510-00	B010100	B049999	51 Ω, 1/4 W, 5%
R823		315-0101-00	B050000		100 Ω, 1/4 W, 5%
R826		315-0510-00			51 Ω, 1/4 W, 5%
R828		315-0101-00			100 Ω, 1/4 W, 5%
R829		315-0101-00			100 Ω, 1/4 W, 5%
R831		315-0241-00			240 Ω, 1/4 W, 5%
R832		315-0241-00			240 Ω, 1/4 W, 5%
R833		315-0272-00			2.7 kΩ, 1/4 W, 5%
R835		315-0753-00			75 kΩ, 1/4 W, 5%
R836		315-0471-00			470 Ω, 1/4 W, 5%
R837		315-0560-00			56 Ω, 1/4 W, 5%
R840		315-0753-00			75 kΩ, 1/4 W, 5%
R841		315-0471-00			470 Ω, 1/4 W, 5%
R842		315-0560-00			56 Ω, 1/4 W, 5%
R844		315-0201-00			200 Ω, 1/4 W, 5%

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R846	315-0201-00			200 Ω, 1/4 W, 5%
R851	315-0431-00			430 Ω, 1/4 W, 5%
R853	315-0431-00			430 Ω, 1/4 W, 5%
R854	315-0101-00			100 Ω, 1/4 W, 5%
R855	315-0101-00			100 Ω, 1/4 W, 5%
R856	315-0472-00			4.7 kΩ, 1/4 W, 5%
R858	315-0472-00			4.7 kΩ, 1/4 W, 5%
R862	315-0133-00			13 kΩ, 1/4 W, 5%
R881	315-0823-00			82 kΩ, 1/4 W, 5%
R883	315-0302-00			3 kΩ, 1/4 W, 5%
R885	315-0244-00			240 kΩ, 1/4 W, 5%
R887	315-0512-00			5.1 kΩ, 1/4 W, 5%
R889	315-0512-00			5.1 kΩ, 1/4 W, 5%
R890	315-0332-00			3.3 kΩ, 1/4 W, 5%
R905	315-0473-00			47 kΩ, 1/4 W, 5%
R907	321-0242-00			3.24 kΩ, 1/8 W, 1%
R908	321-0222-00			2 kΩ, 1/8 W, 1%
R913	315-0330-00			33 Ω, 1/4 W, 5%
R914	315-0561-00			560 Ω, 1/4 W, 5%
R916	315-0512-00			5.1 kΩ, 1/4 W, 5%
R919	317-0101-00			100 Ω, 1/8 W, 5%
R920	311-0609-00			2 kΩ, Var
R921	315-0152-00			1.5 kΩ, 1/4 W, 5%
R922	317-0101-00			100 Ω, 1/8 W, 5%
R924	317-0101-00			100 Ω, 1/8 W, 5%
R926	315-0241-00			240 Ω, 1/4 W, 5%
R927	315-0102-00			1 kΩ, 1/4 W, 5%
R928	315-0241-00			240 Ω, 1/4 W, 5%
R930	317-0510-00			51 Ω, 1/8 W, 5%
R932	315-0152-00			1.5 kΩ, 1/4 W, 5%
R935	315-0103-00			10 kΩ, 1/4 W, 5%
R937	317-0510-00			51 Ω, 1/8 W, 5%
R939	315-0220-00			22 Ω, 1/4 W, 5%
R940	311-0634-00			500 Ω, Var
R941	315-0102-00			1 kΩ, 1/4 W, 5%
R943	317-0391-00			390 Ω, 1/8 W, 5%
R944	317-0201-00			200 Ω, 1/8 W, 5%
R945	317-0510-00			51 Ω, 1/8 W, 5%
R946	317-0153-00			15 kΩ, 1/8 W, 5%
R947	315-0101-00			100 Ω, 1/4 W, 5%
R949	315-0101-00			100 Ω, 1/4 W, 5%
R950	311-0634-00			500 Ω, Var
R951	315-0162-00			1.6 kΩ, 1/4 W, 5%
R952	317-0101-00			100 Ω, 1/8 W, 5%
R953	315-0681-00			680 Ω, 1/4 W, 5%
R954	315-0152-00			1.5 kΩ, 1/4 W, 5%
R955	315-0102-00			1 kΩ, 1/4 W, 5%
R957	315-0751-00			750 Ω, 1/4 W, 5%
R958	315-0151-00			150 Ω, 1/4 W, 1%
R959	311-0634-00			500 Ω, Var
R963	317-0510-00			51 Ω, 1/8 W, 5%

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)				
R967	315-0471-00			470 Ω, 1/4 W, 5%
R968	315-0471-00			470 Ω, 1/4 W, 5%
R1001	315-0332-00			3.3 kΩ, 1/4 W, 5%
R1003	315-0154-00			150 kΩ, 1/4 W, 5%
R1005	315-0753-00			75 kΩ, 1/4 W, 5%
R1007	315-0154-00			150 kΩ, 1/4 W, 5%
R1009	321-0344-00			37.4 kΩ, 1/8 W, 1%
R1011	315-0154-00			150 kΩ, 1/4 W, 5%
R1013	315-0753-00			75 kΩ, 1/4 W, 5%
R1015	315-0513-00			51 kΩ, 1/4 W, 5%
R1021	315-0332-00			3.3 kΩ, 1/4 W, 5%
R1023	315-0753-00			75 kΩ, 1/4 W, 5%
R1025	315-0154-00			150 kΩ, 1/4 W, 5%
R1027	321-0344-00			37.4 kΩ, 1/8 W, 1%
R1029	315-0154-00			150 kΩ, 1/4 W, 5%
R1031	315-0753-00			75 kΩ, 1/4 W, 5%
R1033	315-0154-00			150 kΩ, 1/4 W, 5%
SWITCHES				
S1[1]	670-1588-00			Pushbutton, MODE
S2[1]	260-0516-00			Push, ALT
S3[1]	670-1587-00			Pushbutton, COUPLING
S4[1]	260-0516-00			Push, DLY'D TRIGGER LEVEL
S5[2]	670-1589-00			Pushbutton, SOURCE
S6[3]				
S7	260-1133-00			Pushbutton, DLY'D TRIGGER SLOPE
S8	260-0735-01			Pushbutton, RESET
S9[4]	260-1133-00			Pushbutton, DLY'D TRIGGER COUPLING
S10[5]	260-1132-00			Pushbutton, TERM
S11	260-1133-00			Pushbutton, DLY'D TRIGGER SOURCE
S140	260-0960-01			Slide, DLY'D DELAYING
S200	214-1136-00			Slide, CAL IN
S240A	105-0267-00			Cam, TIME/DIV or DLY TIME
S240B	105-0266-00			Cam, DLY'D TIME/DIV
S352	260-1309-00			Push, SWEEP COINCIDENCE
S1000	260-0960-01			Slide, READOUT
INTEGRATED CIRCUITS				
U277	156-0067-00			Operational amplifier, replaceable by UA741C
U310	155-0049-00	B010100	B039999	Monolithic, sweep control
U310	155-0049-01	B040000		Monolithic, sweep control
U355	156-0067-00			Operational amplifier, replaceable by UA741C
U380	156-0041-00			Dual 15 MHz D-type pos-edge trig flip-flop, replaceable by SN7474N
U620	155-0061-01			Channel switch, selected

[1]See Mechanical Parts List for replacement parts.
[2]Furnished as a unit with R6.
[3]Furnished as a unit with S9 and S11.
[4]Furnished as a unit with S7 and S11.
[5]Furnished as a unit with S7 and S9.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
INTEGRATED CIRCUIT (cont)					
U640		155-0061-01			Channel switch, selected
U660		155-0061-02			Channel switch, selected
U680		156-0067-00			Operational amplifier, replaceable by UA741C
U820		155-0061-01			Channel switch, selected
U840		155-0061-01			Channel switch, selected
U860		155-0061-01			Channel switch, selected
U880		156-0067-00			Operational amplifier, replaceable by UA741C

SECTION 6

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

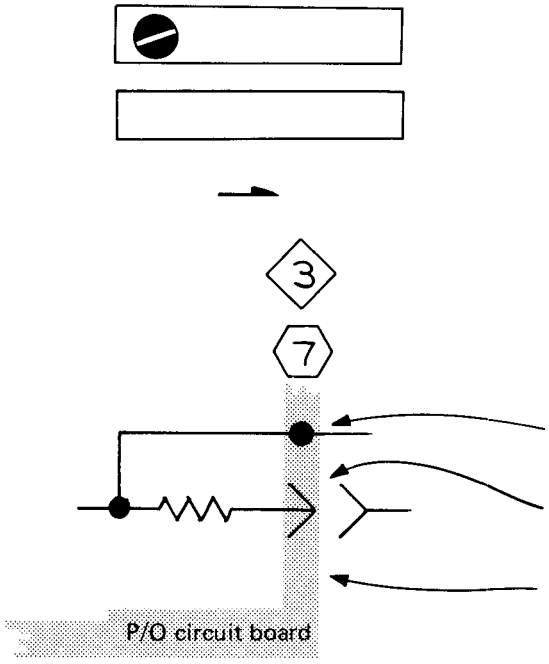
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

Symbols used on the diagrams are based on USA Standard Y32.2-1967.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



External Screwdriver adjustment.

External control or connector.

Clockwise control rotation in direction of arrow.

Refer to diagram number indicated in diamond.

Refer to waveform number indicated in hexagon.

Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

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

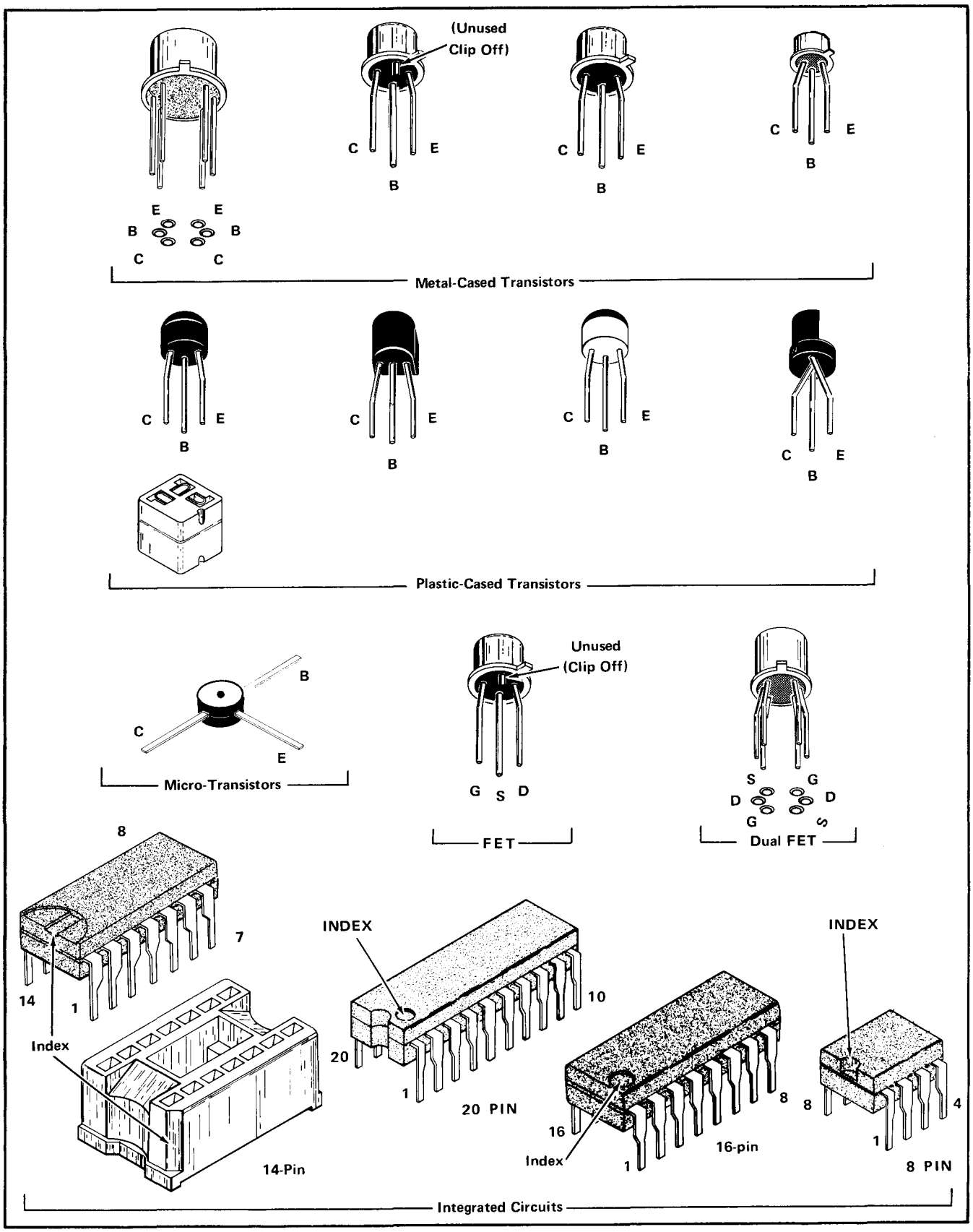


Fig. 6-1. Electrode configuration for semiconductors in this instrument.

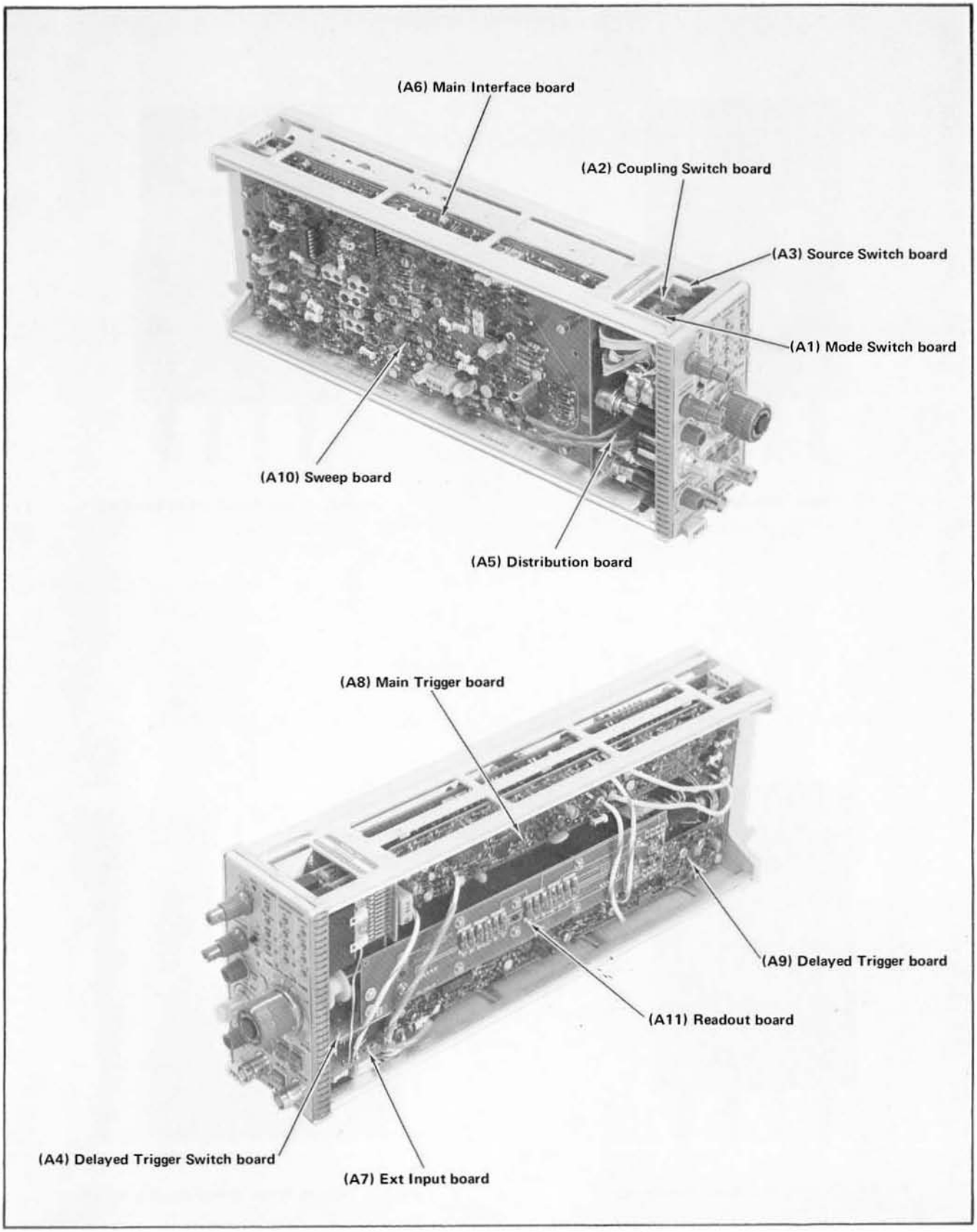


Fig. 6-2. Location of circuit boards in the 7B92.

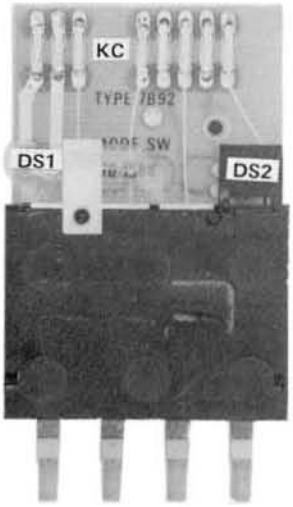


Fig. 6-3. Trigger Mode Switch circuit board A1.

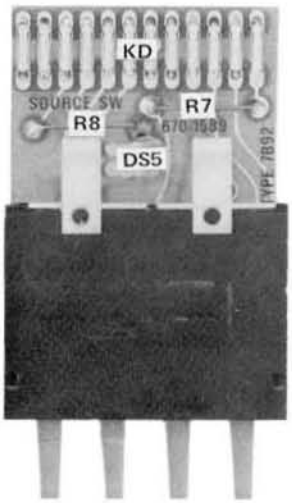


Fig. 6-5. Source Switch circuit board A3.

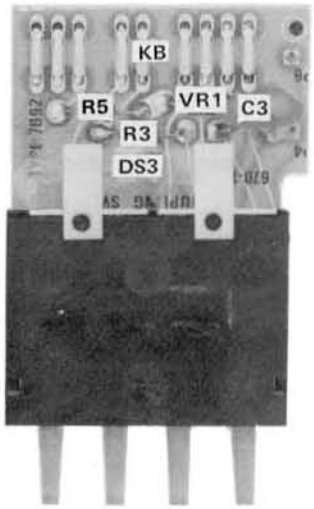


Fig. 6-4. Coupling Switch circuit board A2.

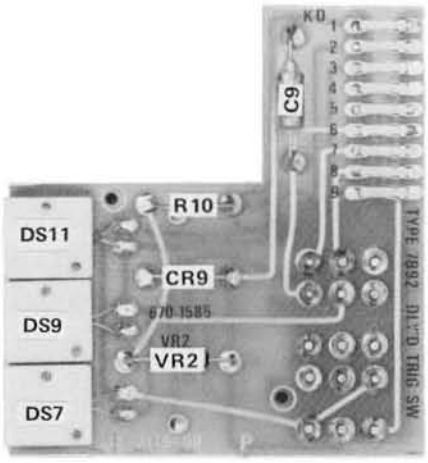


Fig. 6-6. Delayed Trigger Switch circuit board A4.

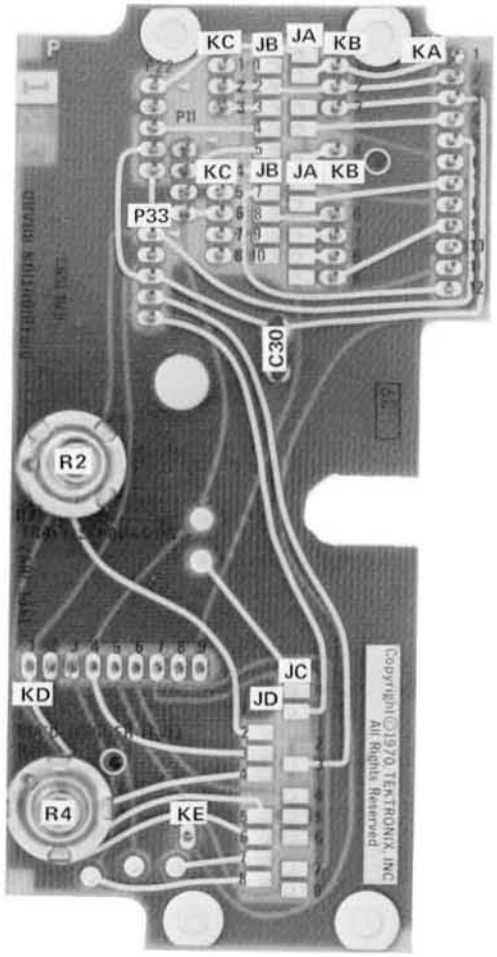


Fig. 6-7. Distribution circuit board A5.

NOTE: *CR10, *CR600, R16, and R14 are mounted on rear of circuit board.

*Added Serial Number B010200

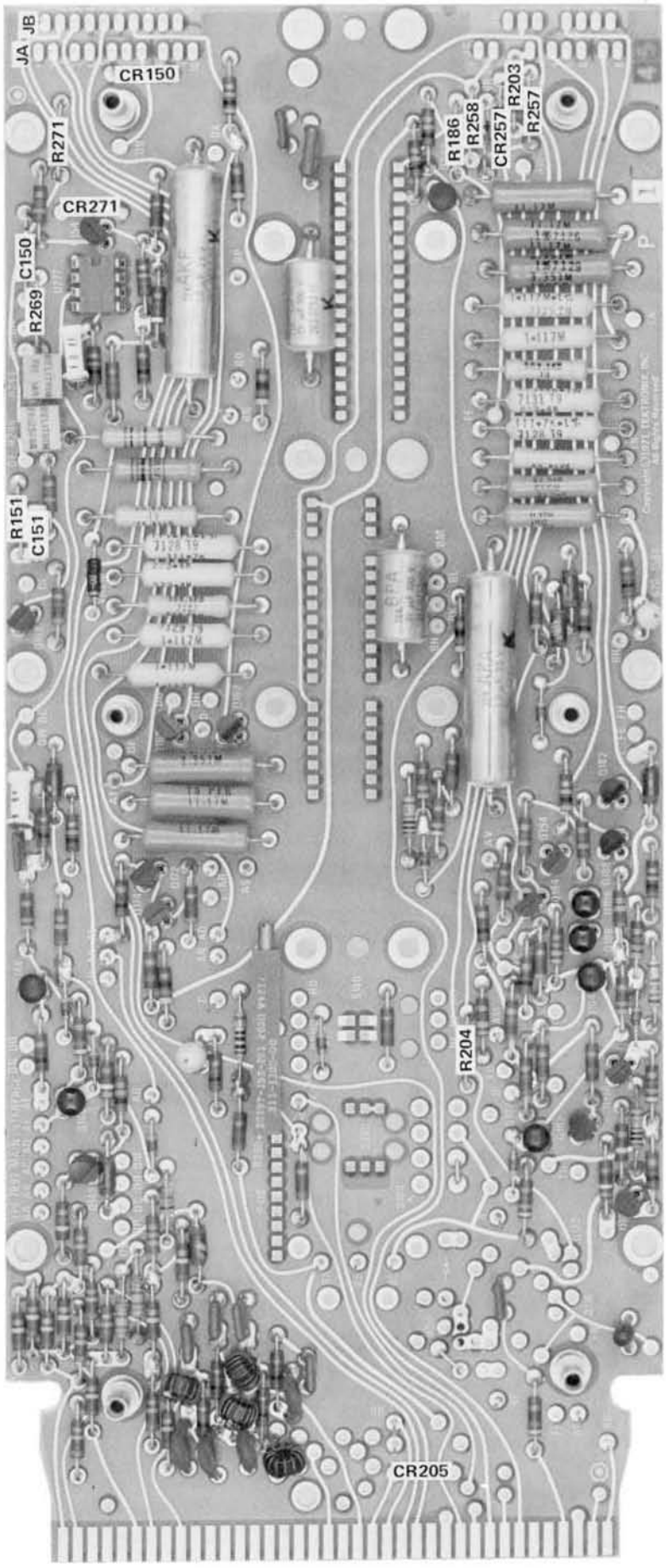
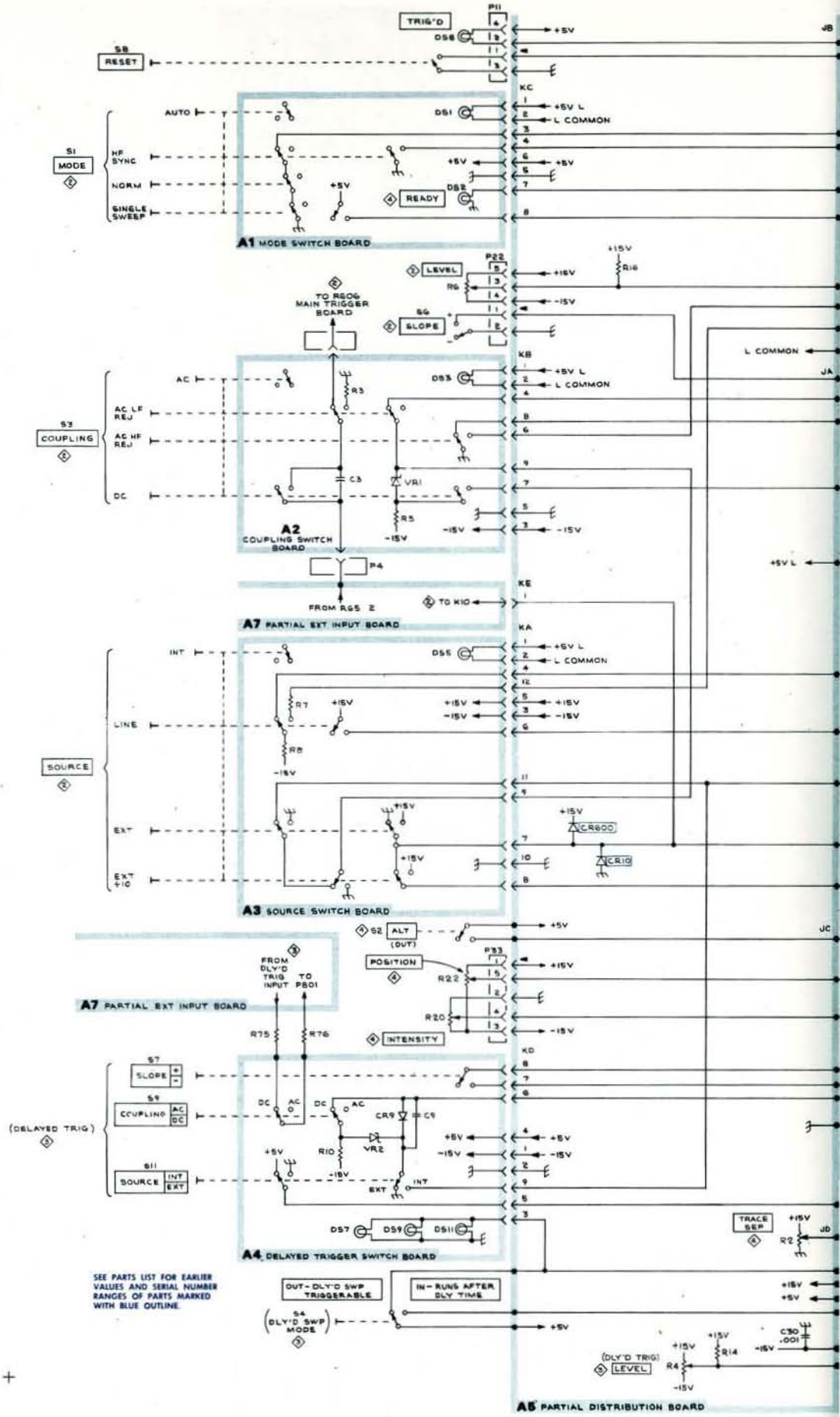
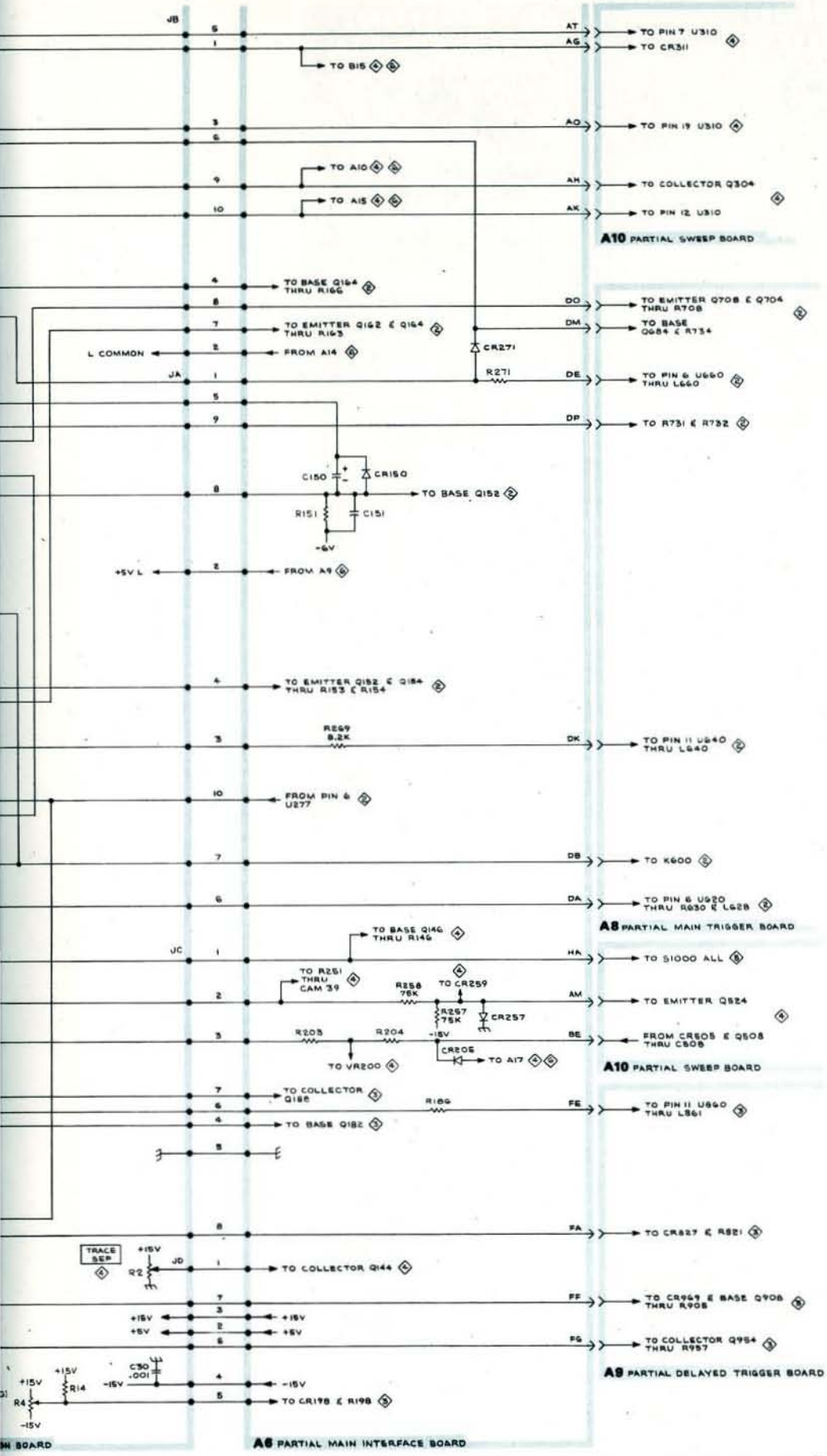


Fig. 6-8. Partial Main Interface circuit board A6.





FRONT PANEL DISTRIBUTION ◇1 373 EKP

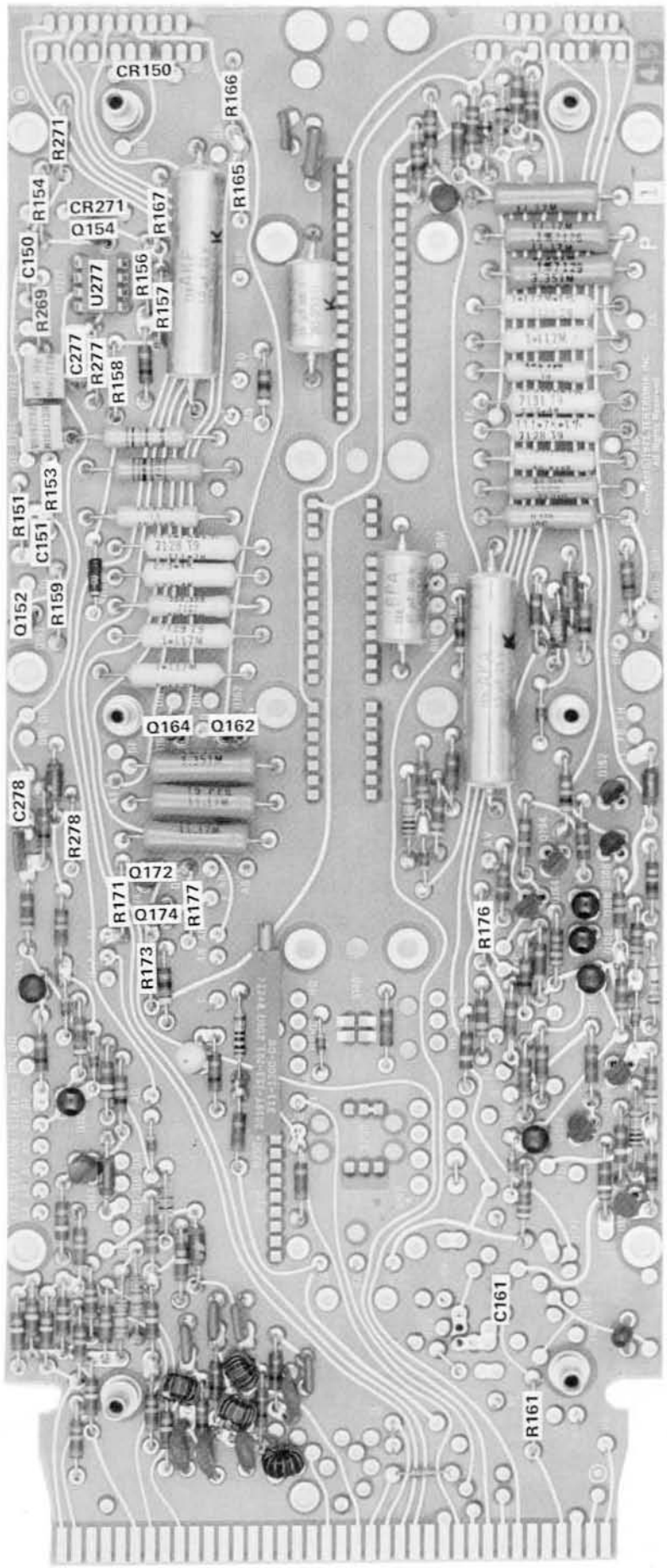


Fig. 6-9. Partial Main Interface circuit board A6.

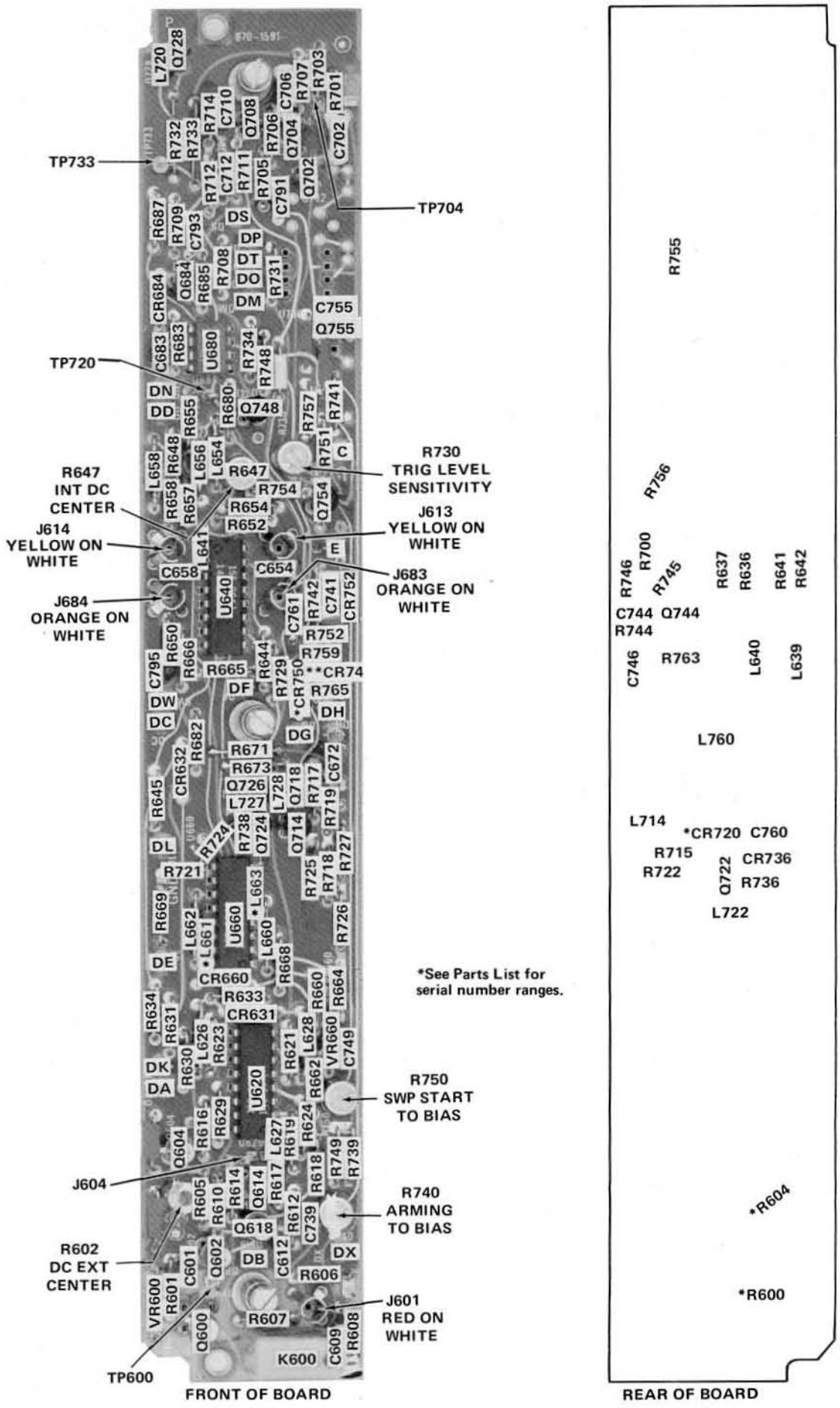
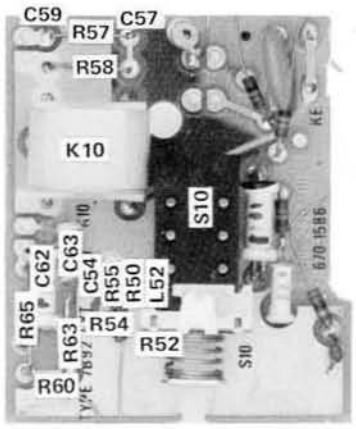


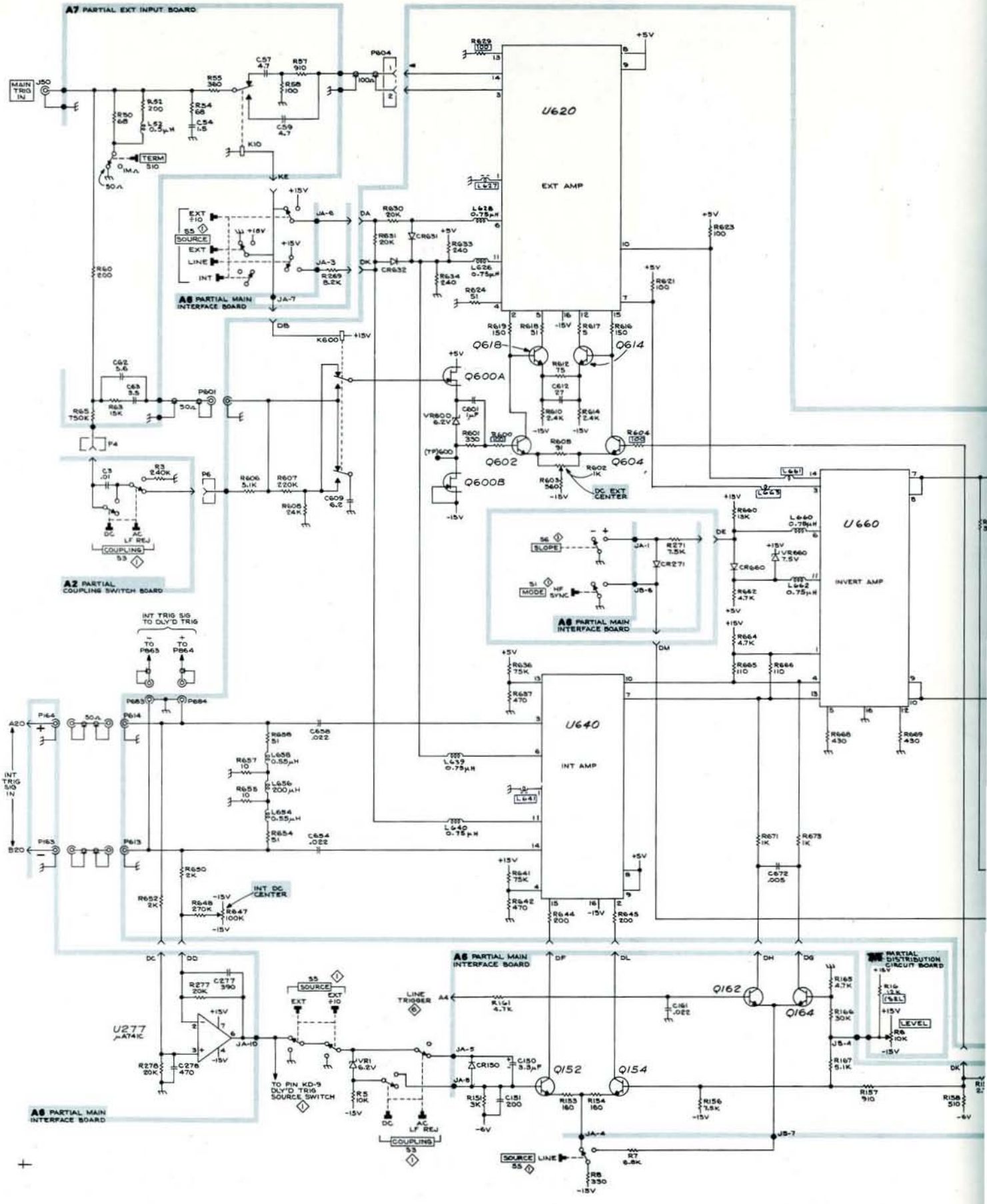
Fig. 6-10. Main Trigger circuit board A8.



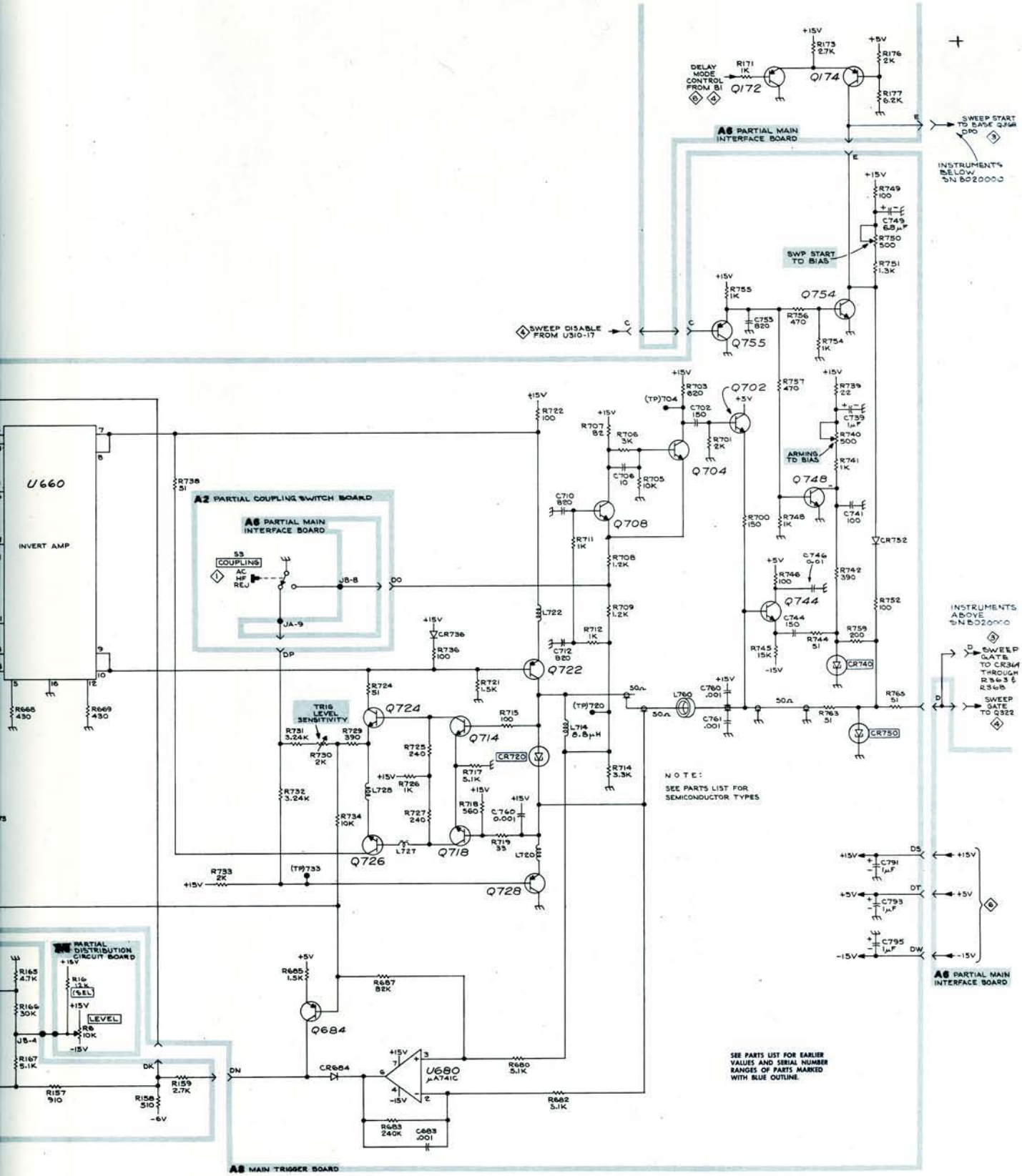
NOTE: See Figs. 6-3, 6-4, and 6-5 for parts not identified here.

Fig. 6-11. Partial Ext Input circuit board A7.

Ⓐ



7B92



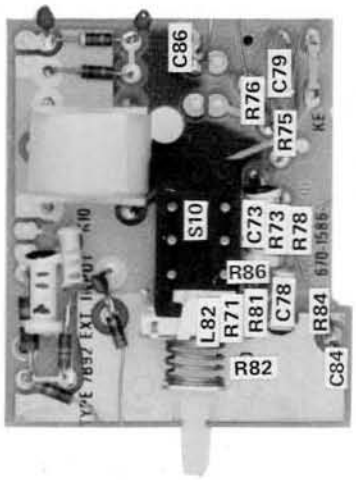


Fig. 6-12. Partial Ext Input circuit board A7.

Ⓐ

NOTE: CR365 and Q368 removed
Serial Number B030000.
R363 added to rear of board
Serial Number B030000.

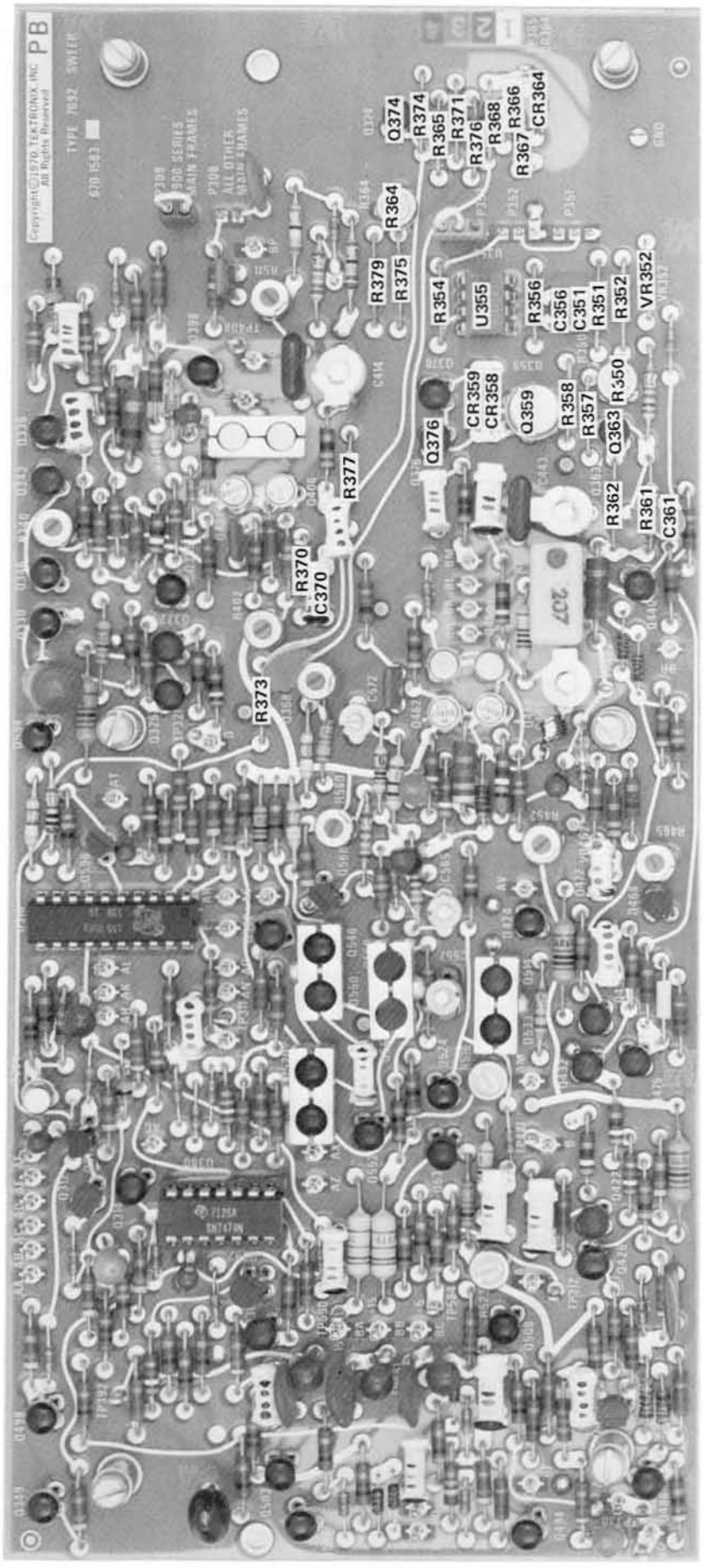


Fig. 6-13. Partial Sweep circuit board A10.

Ⓐ

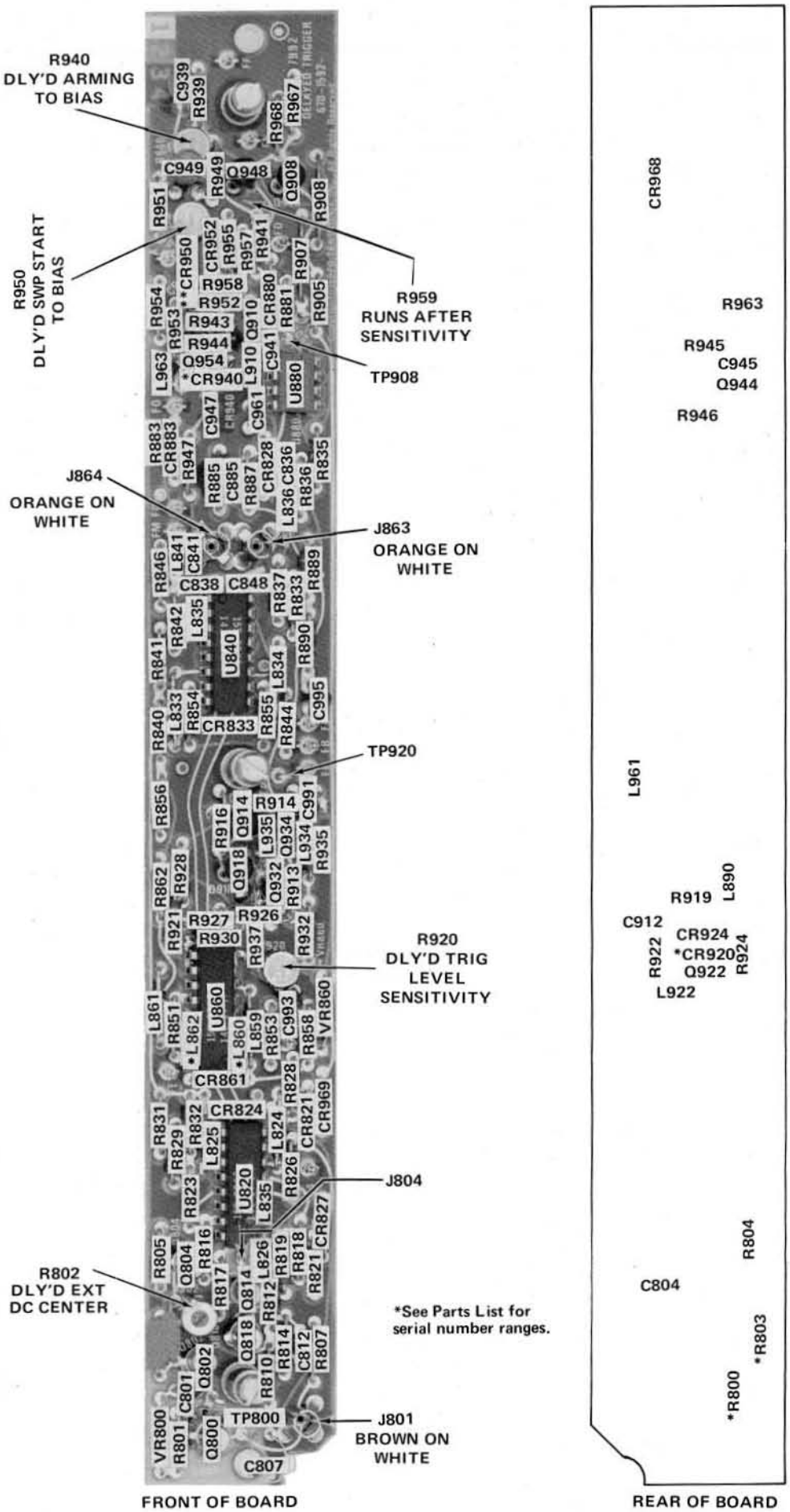
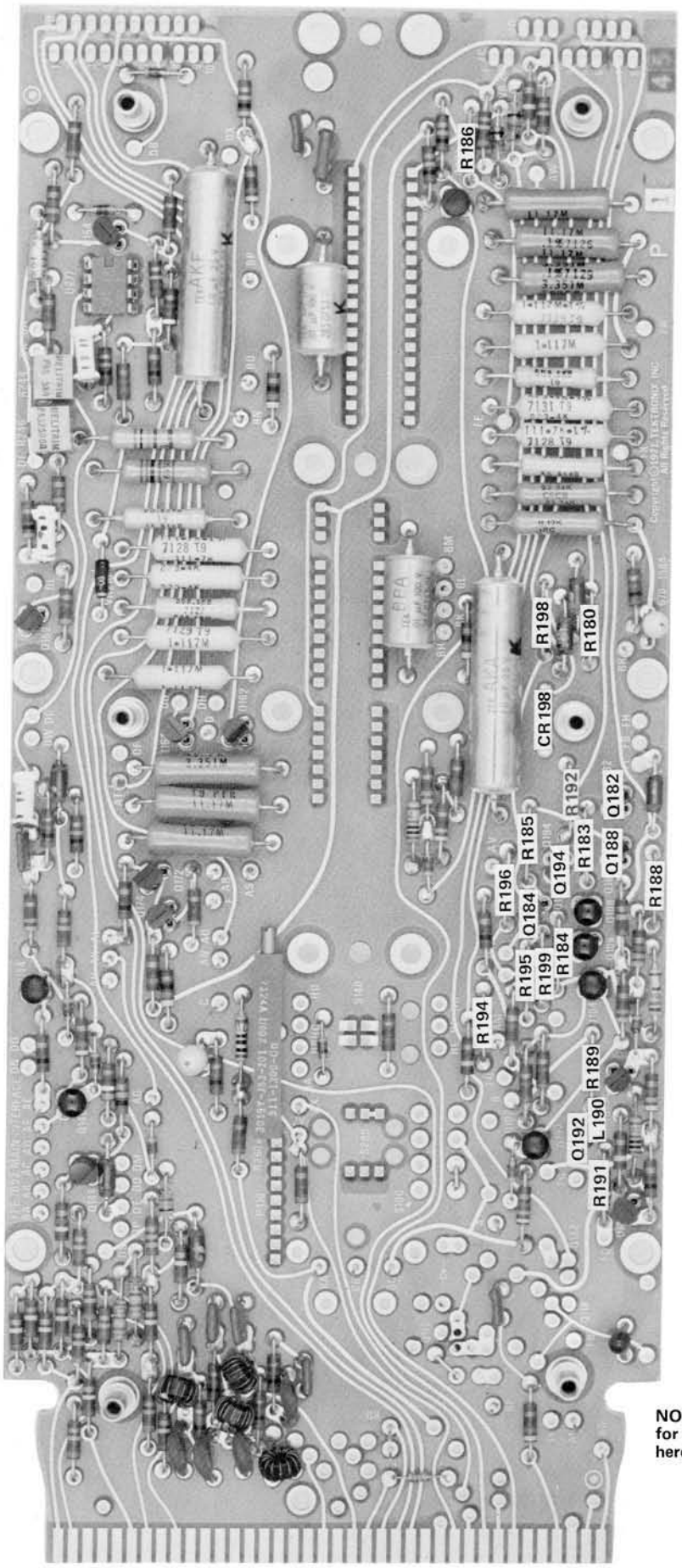


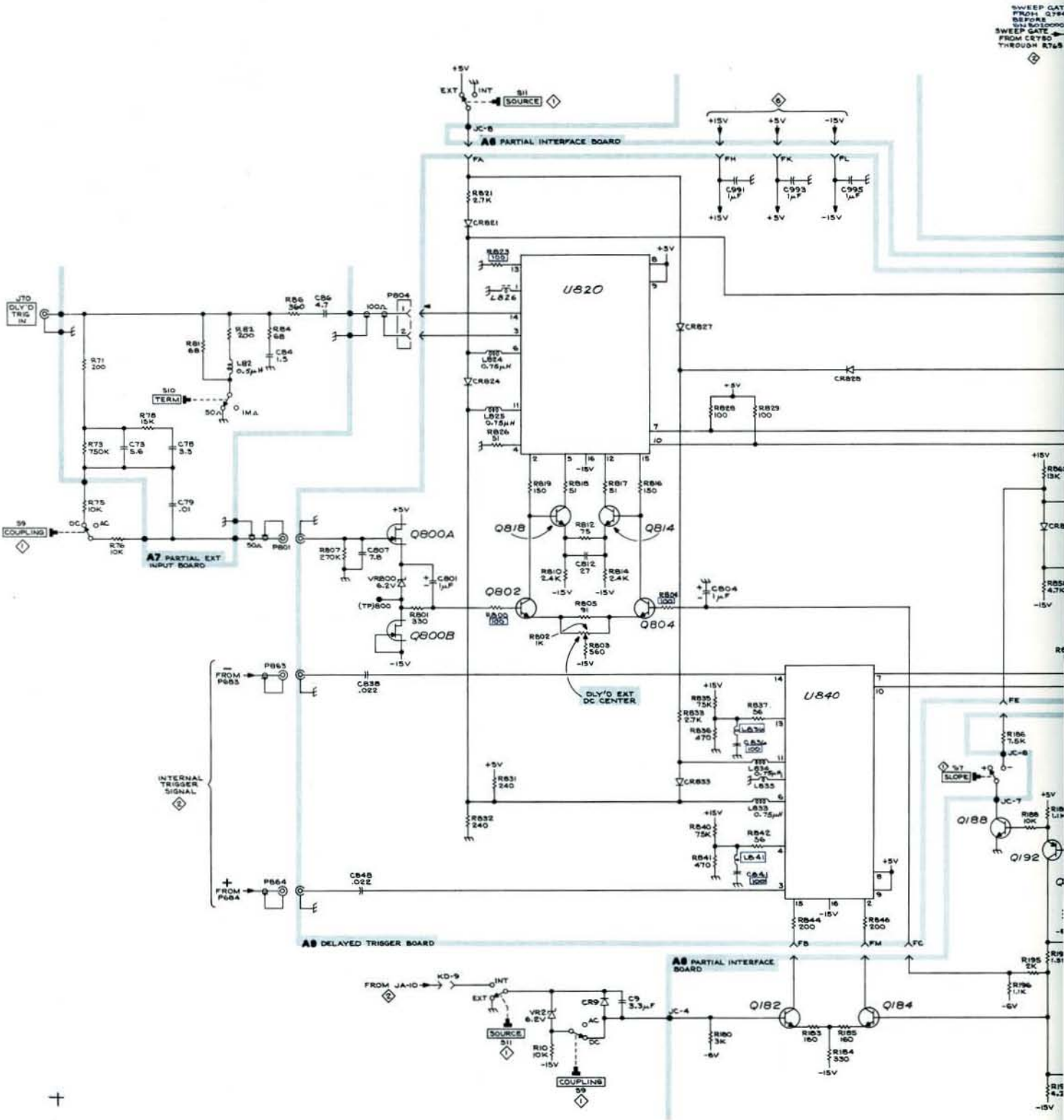
Fig. 6-14. Delayed Trigger circuit board A9.



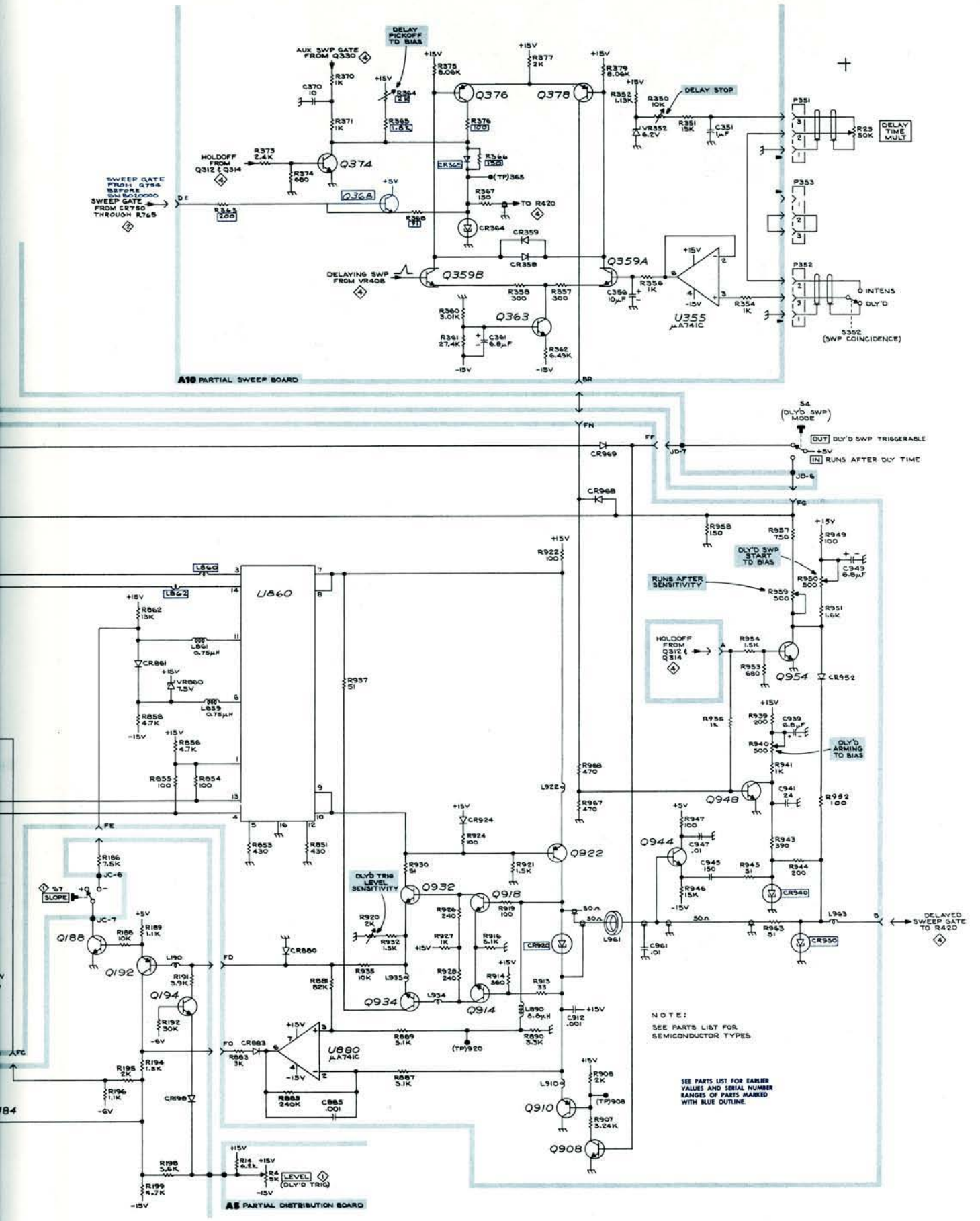
NOTE: See Figs. 6-4, 6-5, and 6-7 for location of parts not identified here.

Fig. 6-15. Partial Main Interface circuit board A6.

Ⓐ



7B92



DELAY PICKOFF & DELAYED TRIGGER ③ GR3 1073

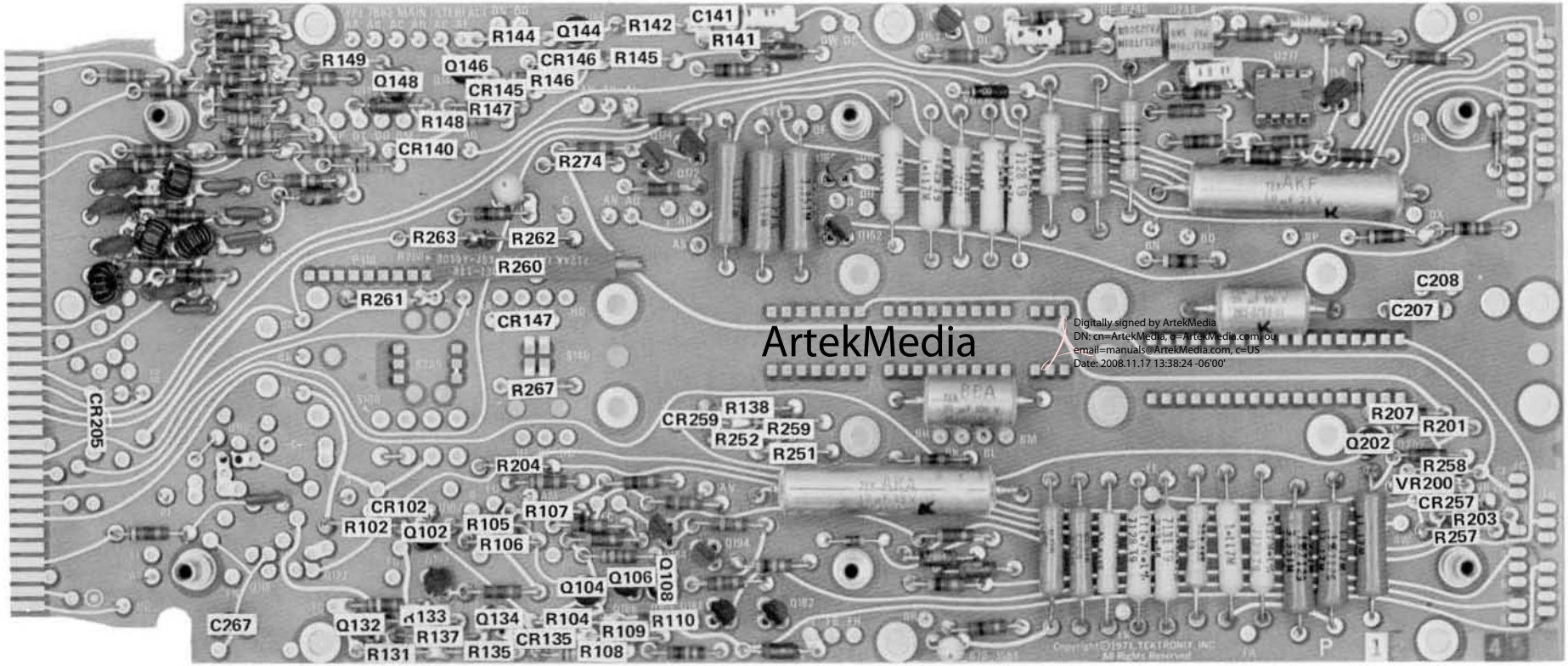


Fig. 6-16. Partial Main Interface circuit board A6.

• R208 added to rear of board

*See Parts List for serial number ranges.

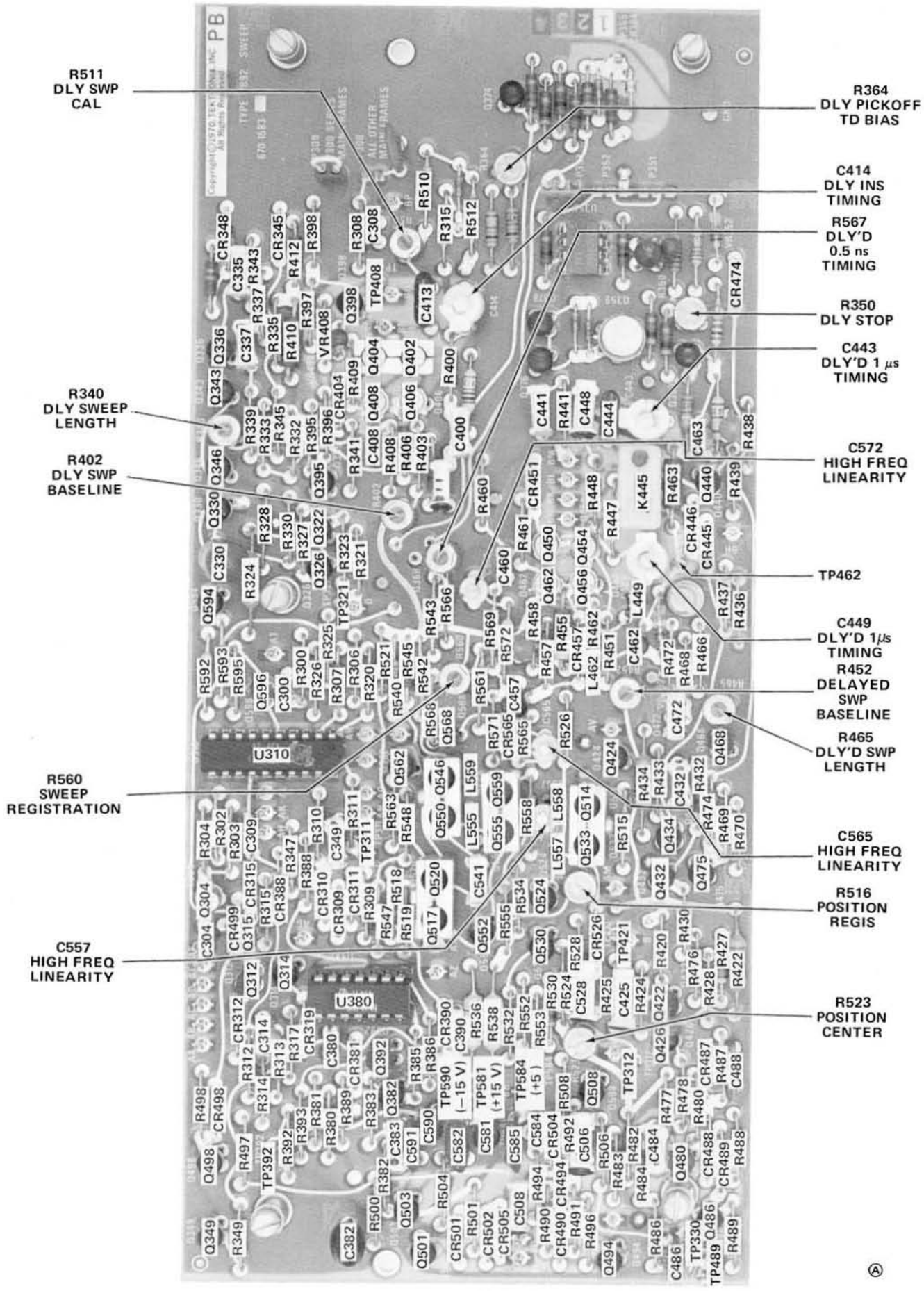
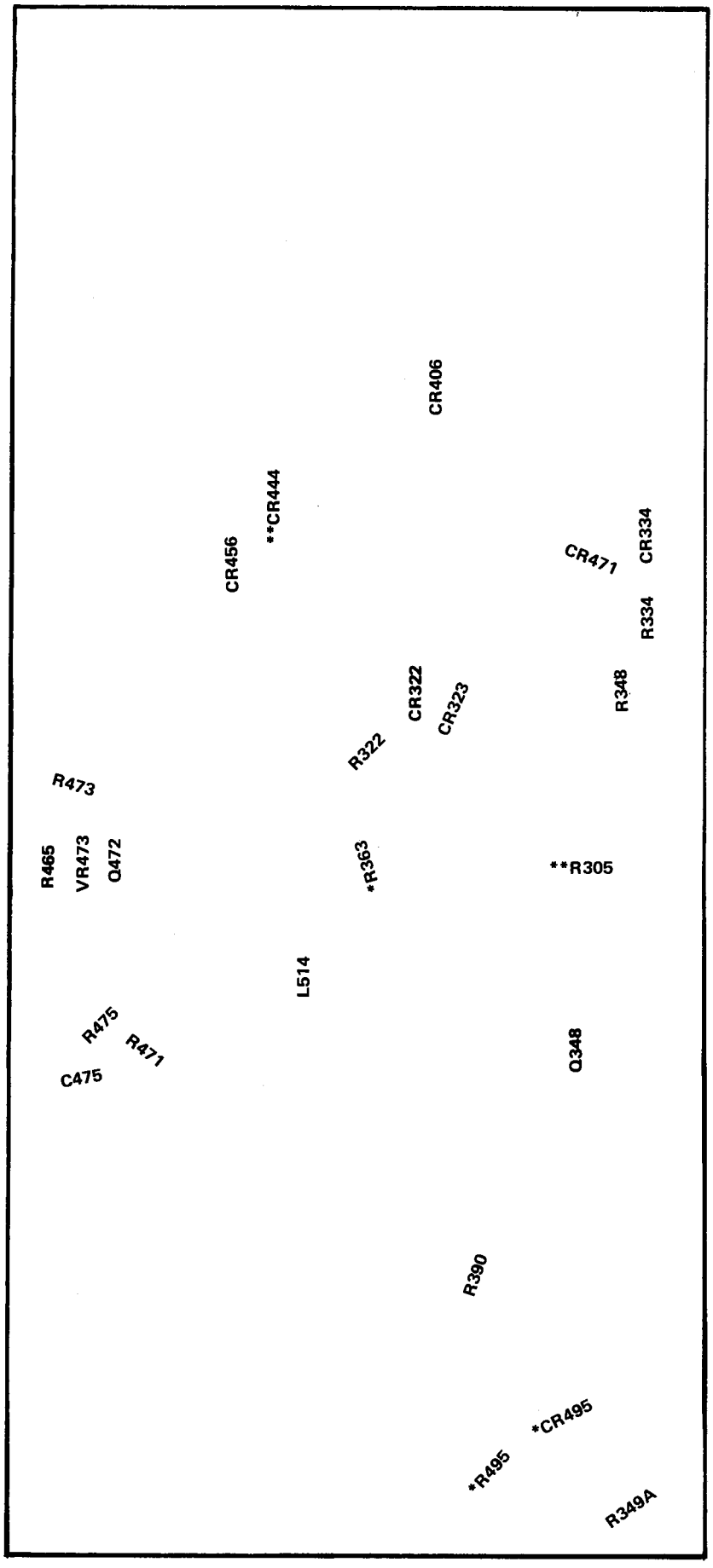


Fig. 6-17. Partial Sweep circuit boa

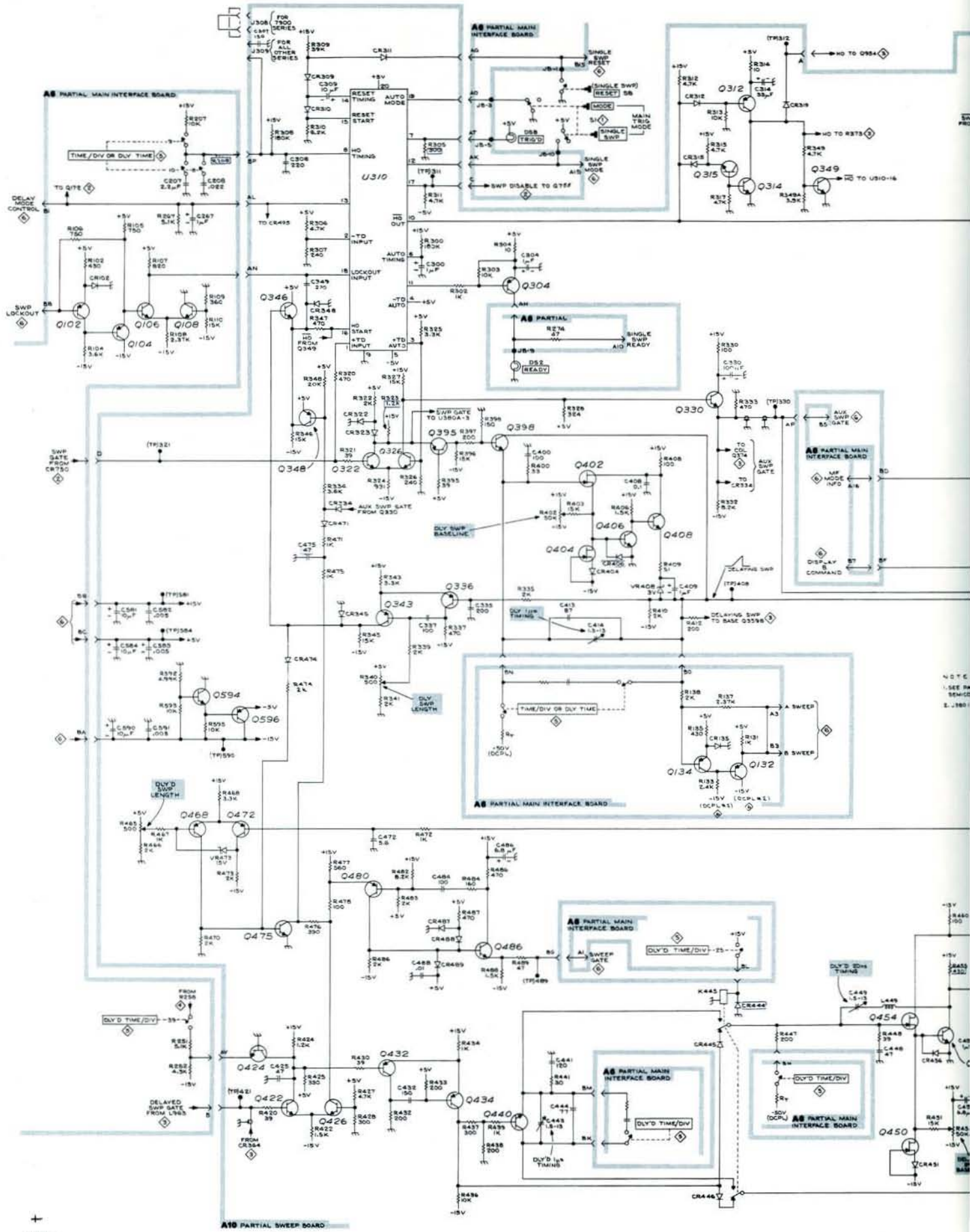


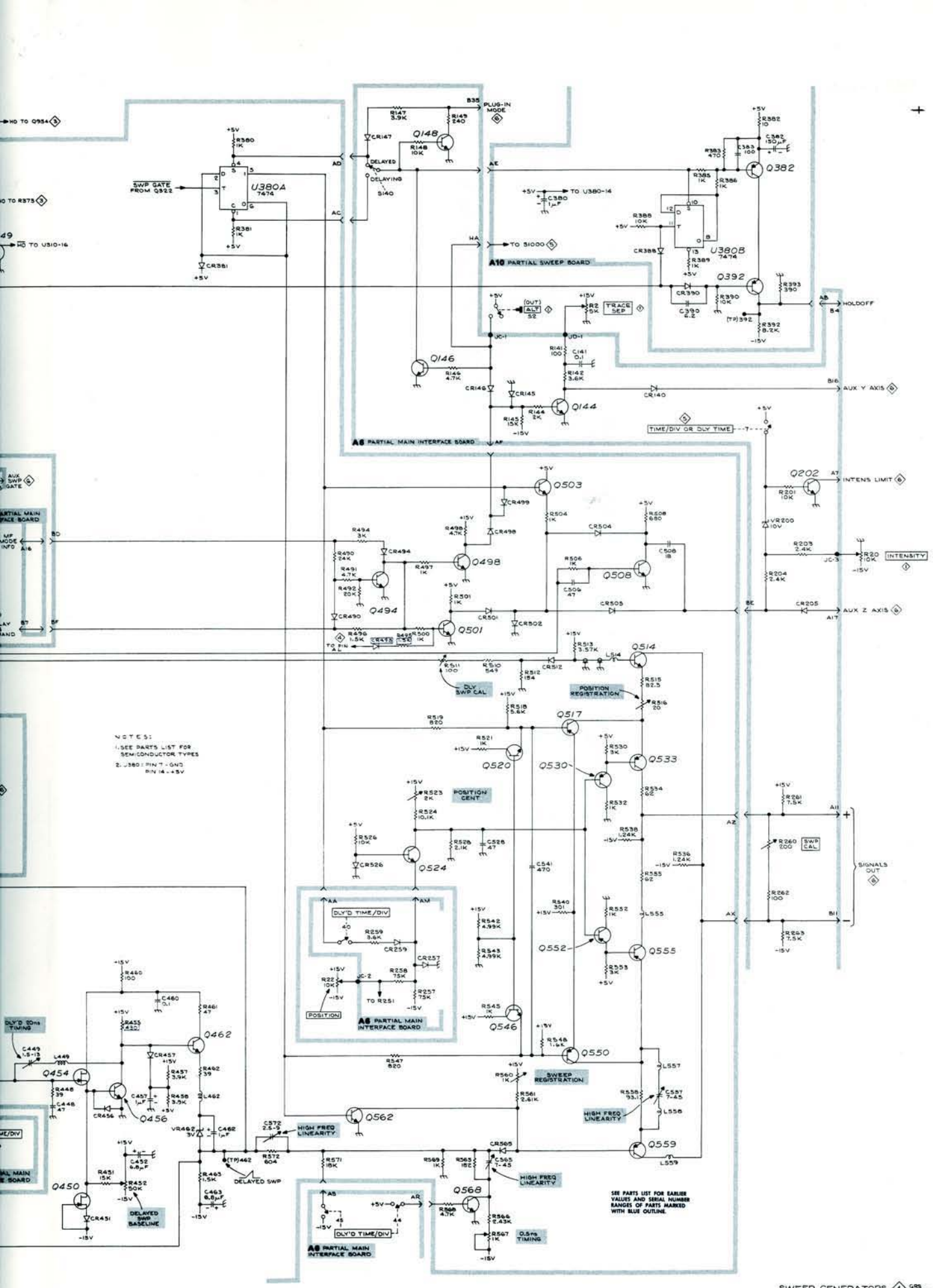
REAR OF BOARD

*Added Serial Number B030000

**Added Serial Number B010200

eep circuit board.





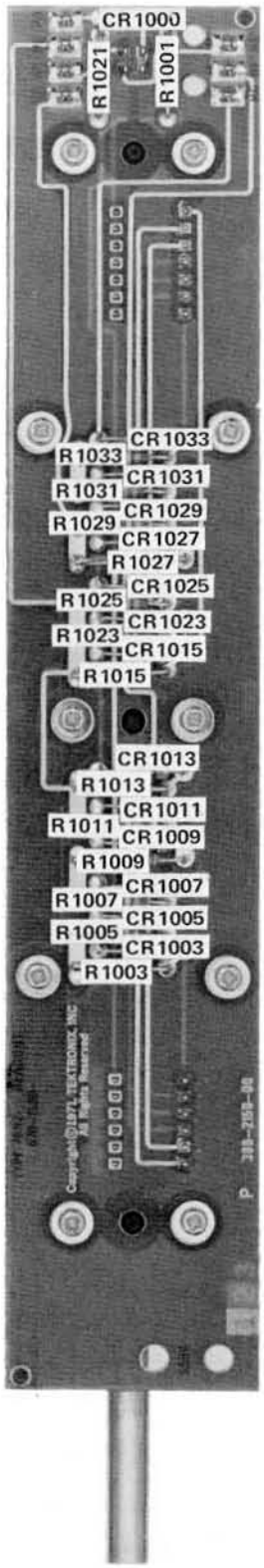
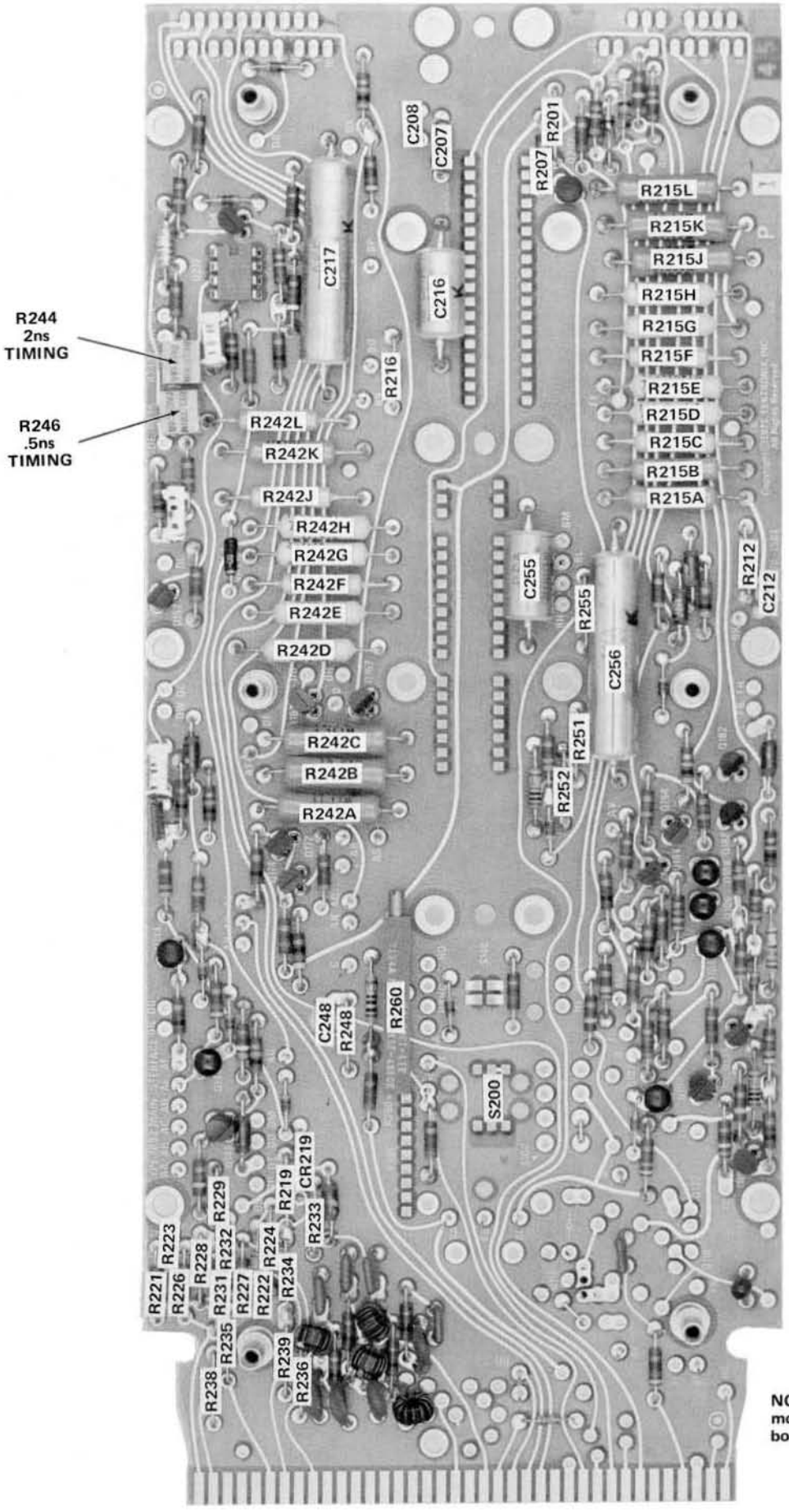
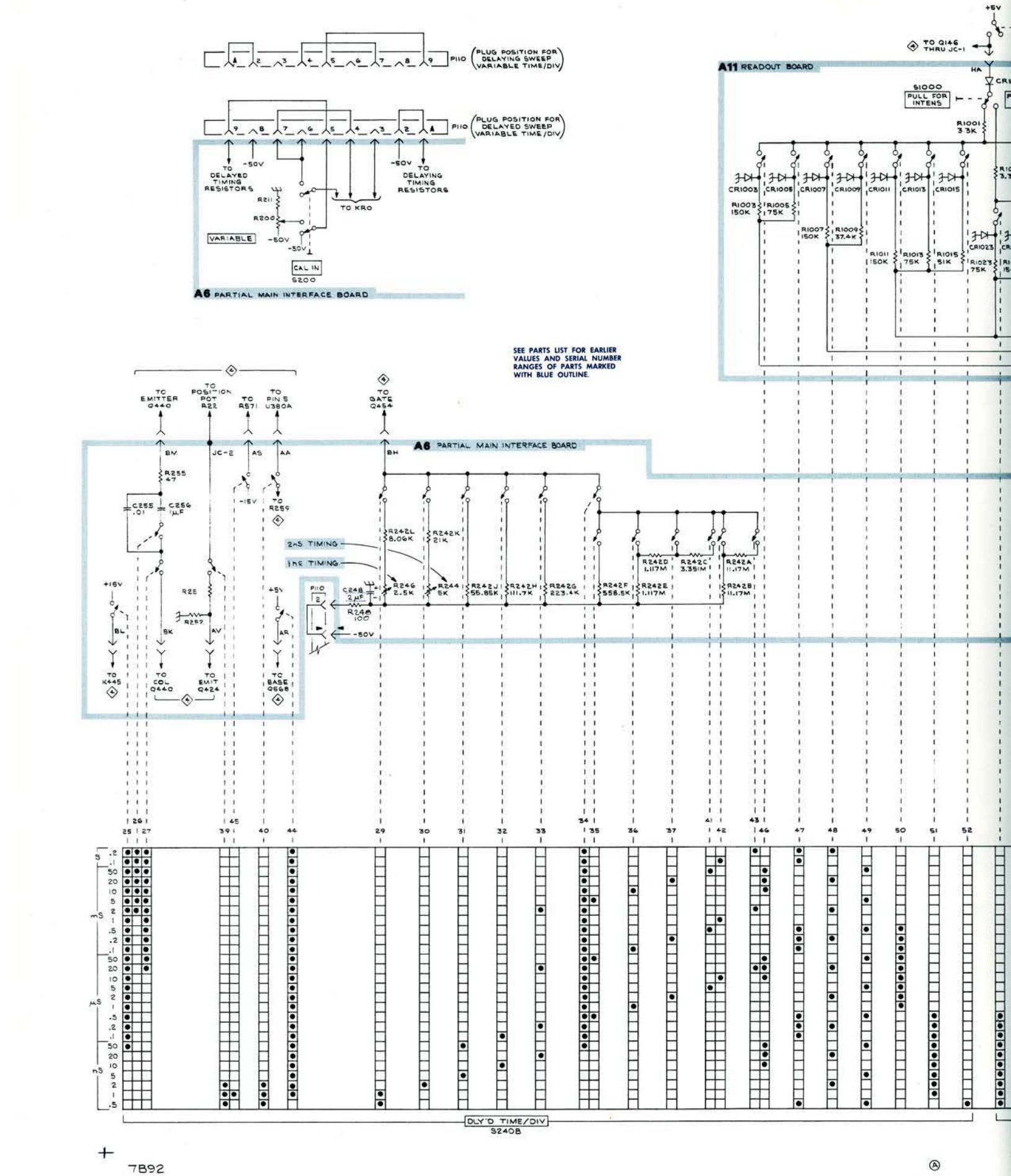


Fig. 6-18. Readout circuit board A11.

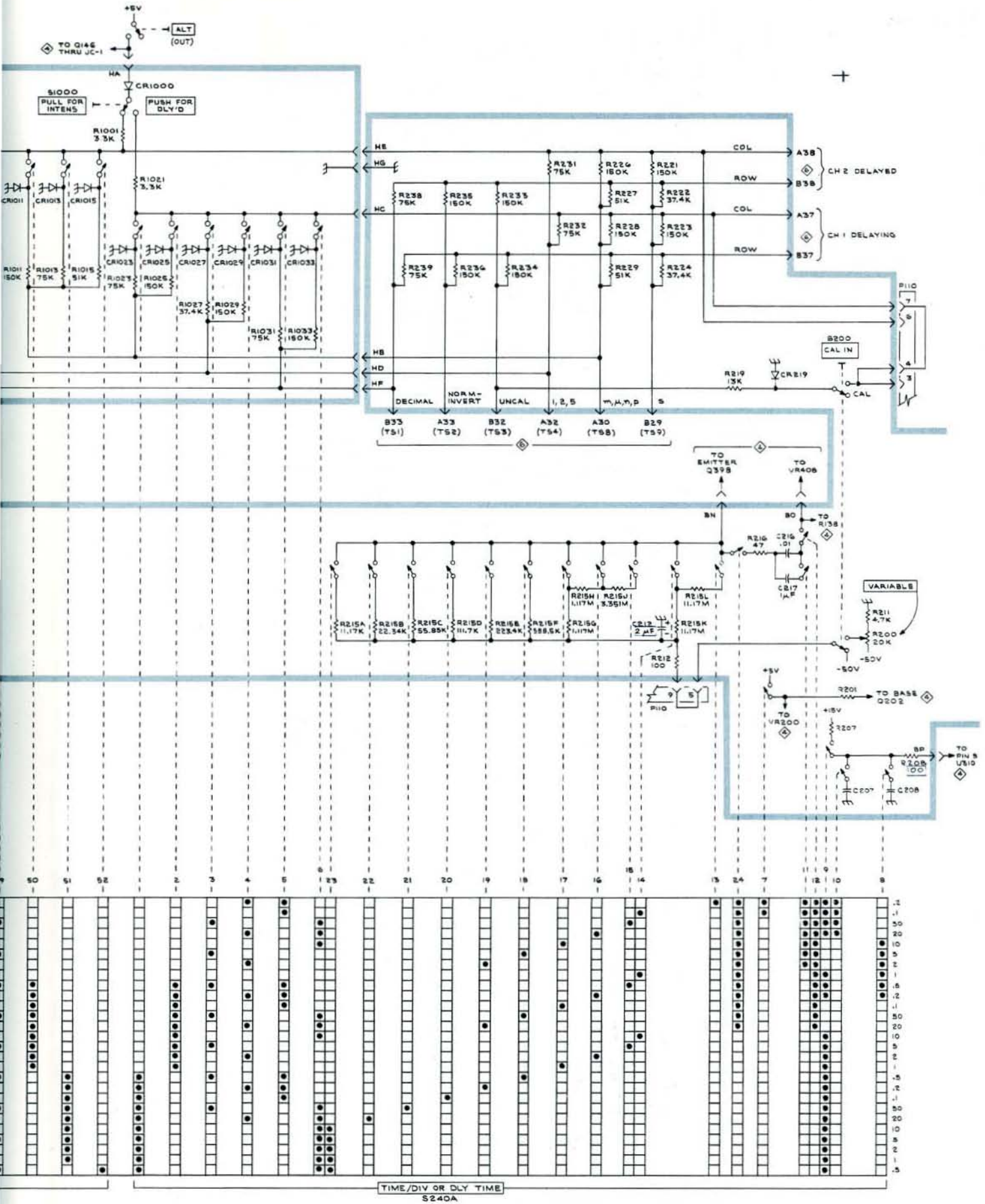


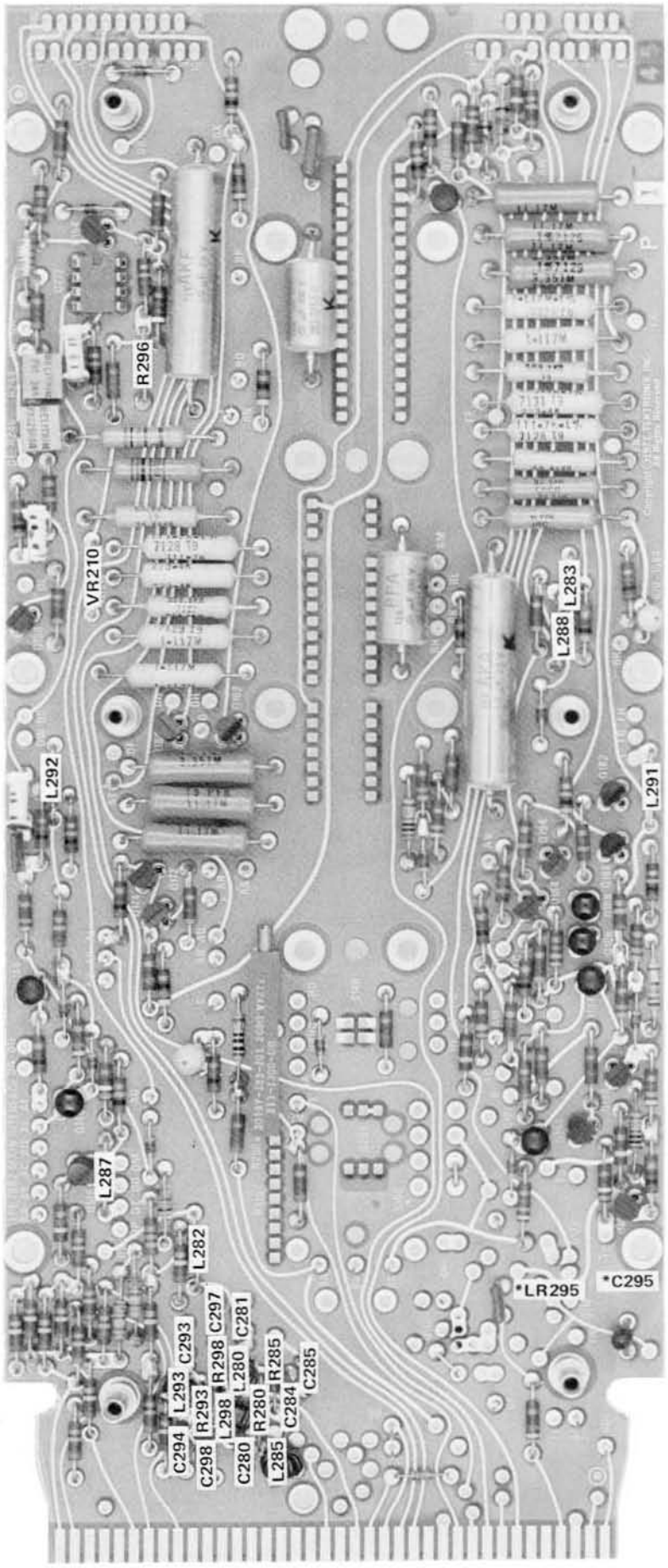
NOTE: R200 and R211 are mounted on the rear of circuit board.

Fig. 6-19. Partial Main Interface circuit board A6.



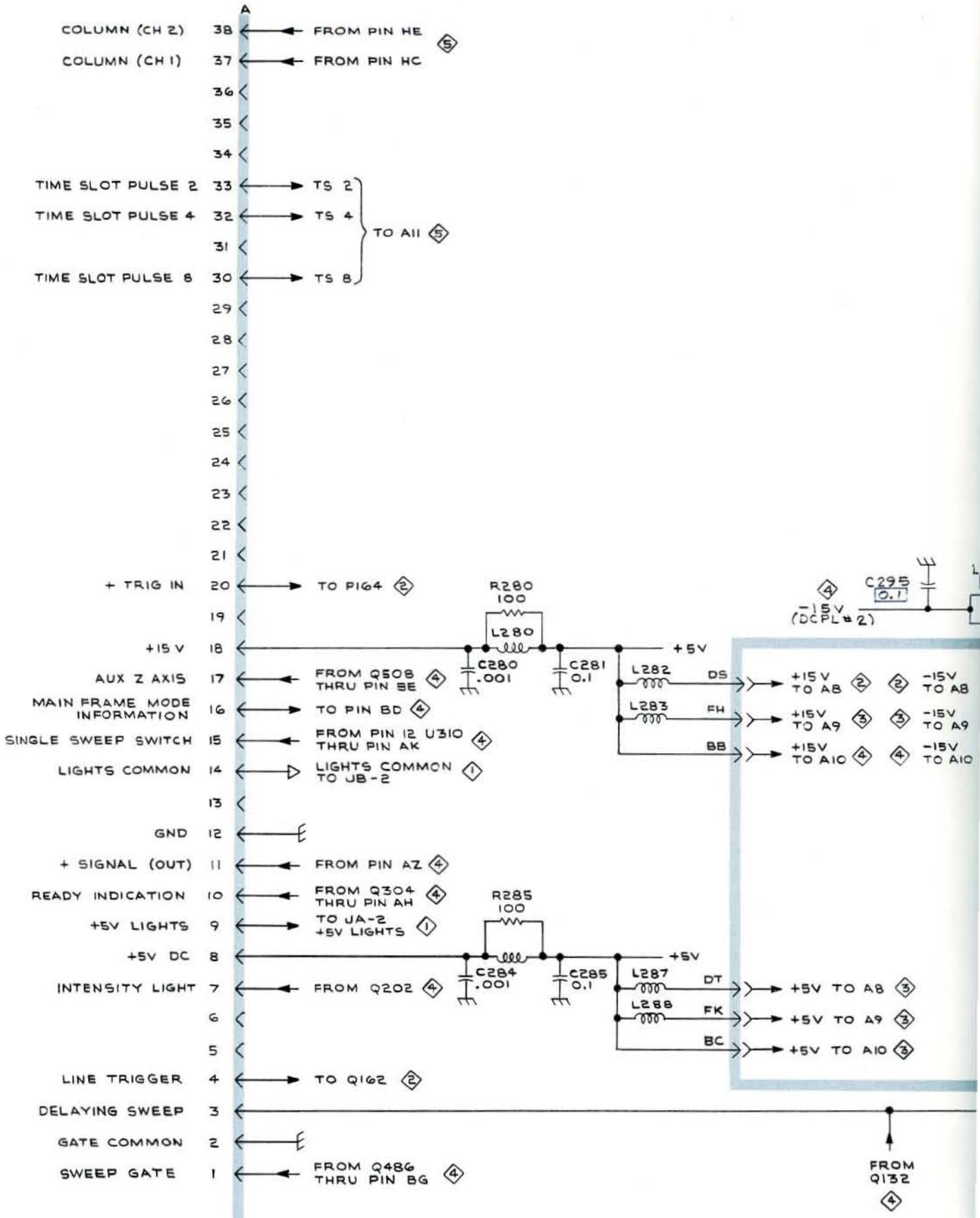
7B92





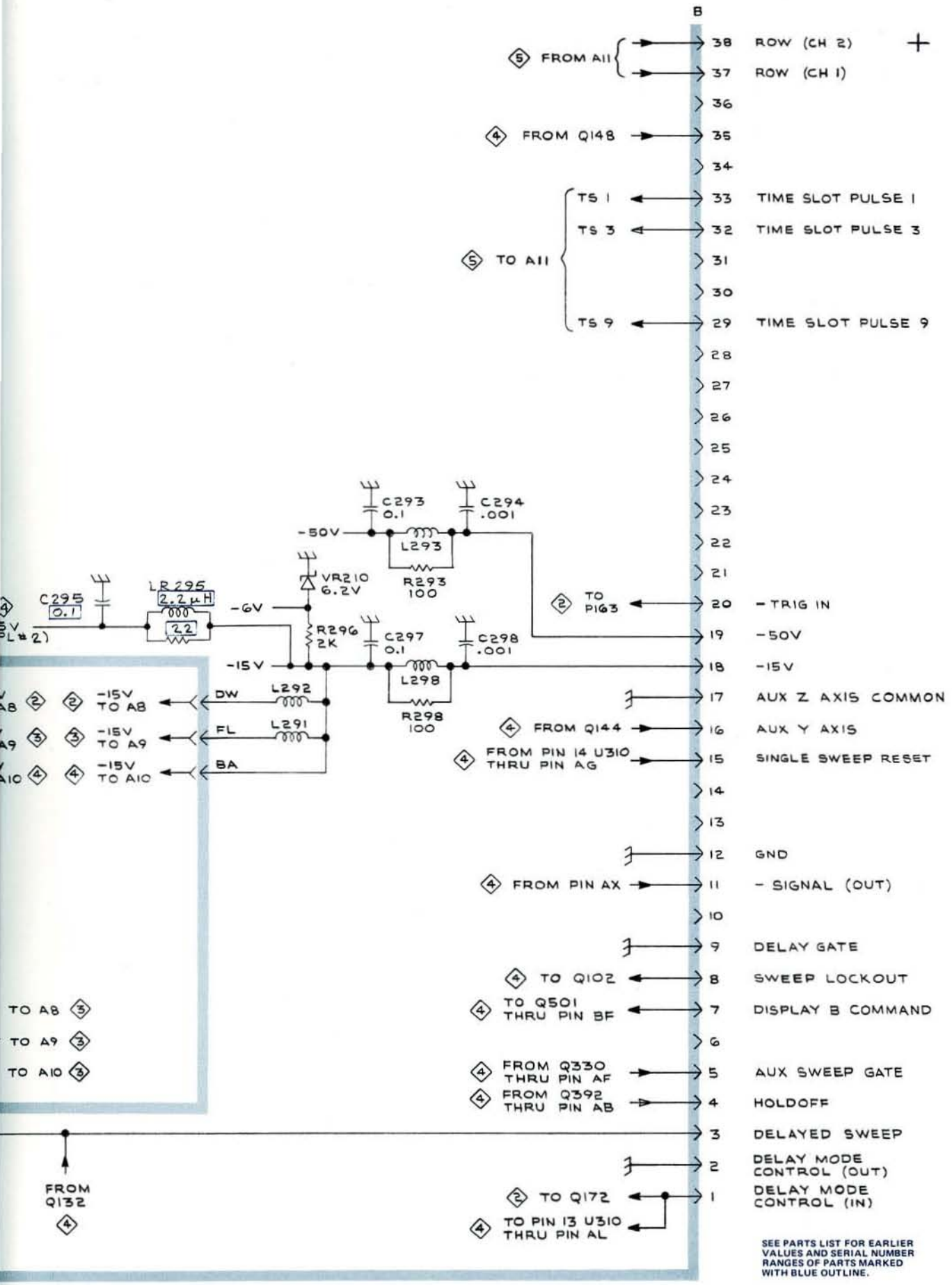
*Added Serial Number B030000

Fig. 6-20. Partial Main Interface circuit board A6.



7B92

A



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.

OUTPUT CONNECTORS ◇6◇ 373 EKP

OUTPUT CONNECTORS ◇6◇

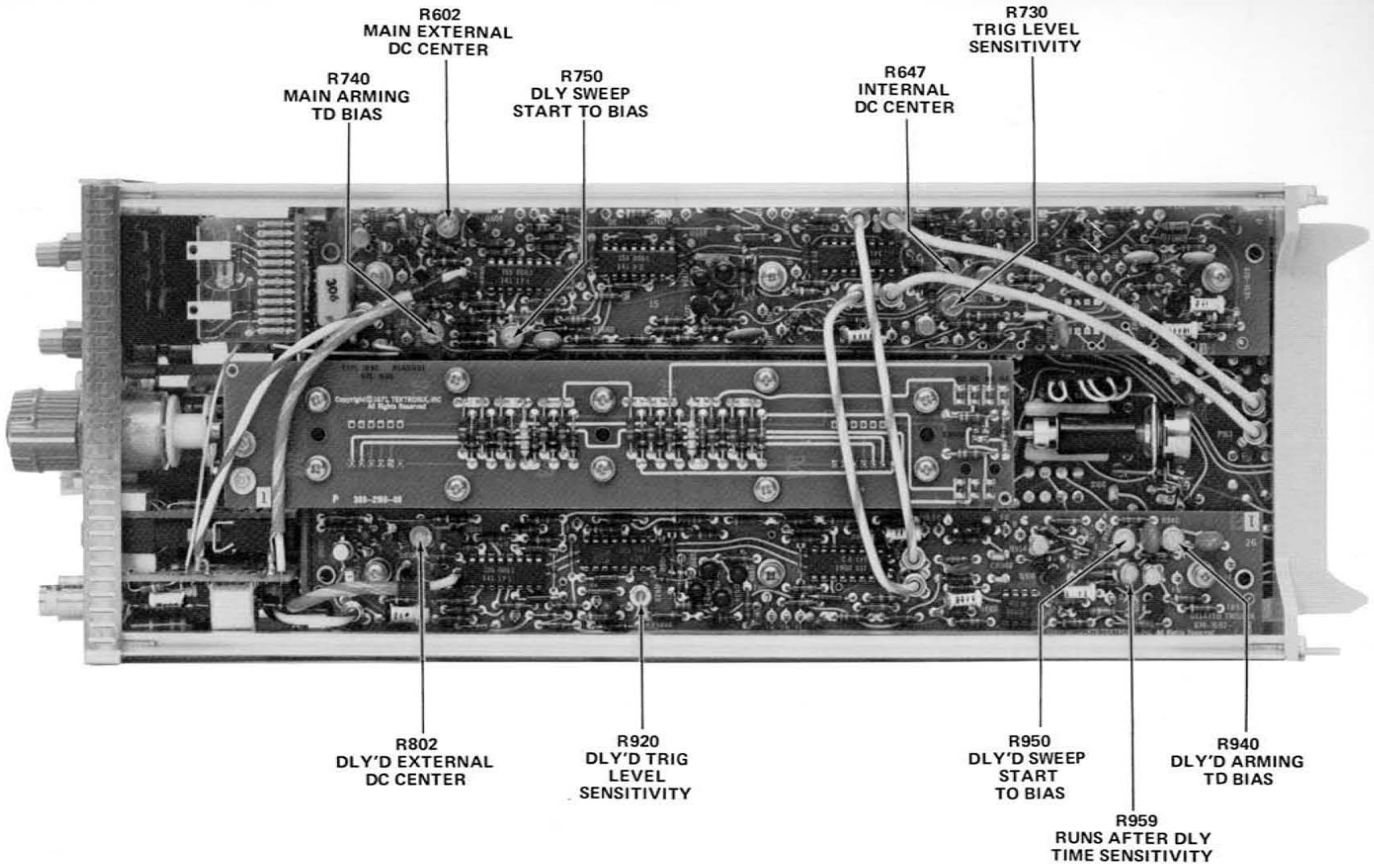


Fig. 6-21. Location of Trigger System adjustments.

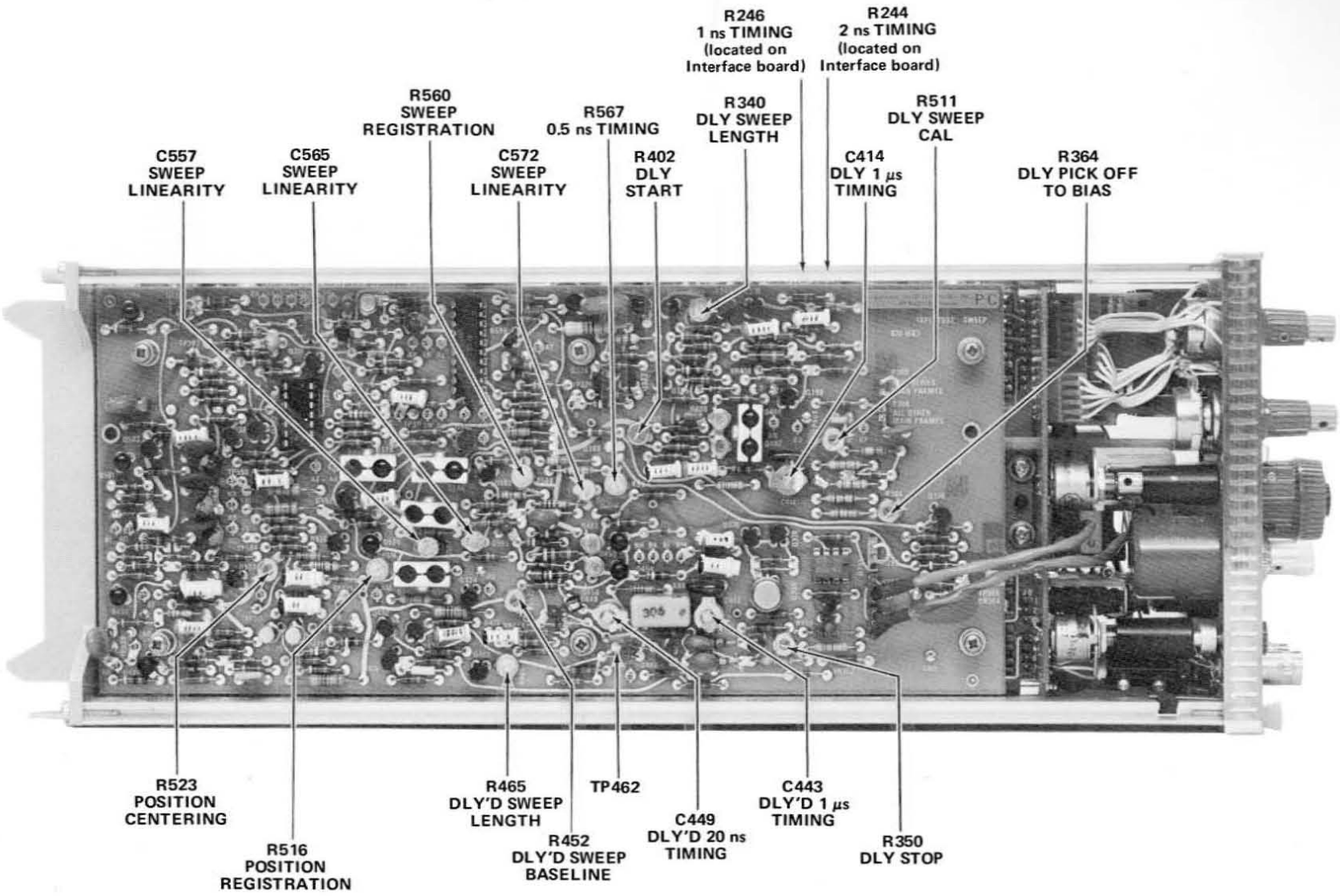


Fig. 6-22. Location of Horizontal System adjustments.

SECTION 8
MECHANICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

ABBREVIATIONS

BHB	binding head brass	h	height or high	OHB	oval head brass
BHS	binding head steel	hex.	hexagonal	OHS	oval head steel
CRT	cathode-ray tube	HHB	hex head brass	PHB	pan head brass
csk	countersunk	HHS	hex head steel	PHS	pan head steel
DE	double end	HSB	hex socket brass	RHS	round head steel
FHB	flat head brass	HSS	hex socket steel	SE	single end
FHS	flat head steel	ID	inside diameter	THB	truss head brass
Fil HB	fillister head brass	lg	length or long	THS	truss head steel
Fil HS	fillister head steel	OD	outside diameter	w	wide or width

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-1	366-1168-00			1		KNOB, red w/black cap--VARIABLE (CAL IN)
	- - - - - -			-		knob includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HHS
-2	366-1321-00			1		KNOB, charcoal--TIME/DIV or DLY TIME
	- - - - - -			-		knob includes:
	213-0243-00			2		SETSCREW, 5-40 x 0.25 inch, HHS
-3	354-0410-00			1		RING, knob skirt
	- - - - - -			-		ring includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HSS
-4	384-1087-00			1		SHAFT, push, actuator
-5	401-0126-00			1		BEARING, knob skirt
-6	366-1319-01			1		KNOB, charcoal--INTENSITY
	- - - - - -			-		knob includes:
	213-0140-00			1		SETSCREW, 2-56 x 0.094 inch, HSS
-7	366-1077-00			1		KNOB, charcoal--POSITION
	- - - - - -			-		knob includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HSS
-8	366-1319-01			1		KNOB, charcoal--SLOPE
	- - - - - -			-		knob includes:
	213-0140-00			1		SETSCREW, 2-56 x 0.094 inch, HSS
-9	366-1077-00			1		KNOB, carcoal--LEVEL
	- - - - - -			-		knob includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HSS
-10	366-1023-01			1		KNOB, charcoal--ALT (OUT)
	- - - - - -			-		knob includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HSS
-11	331-0247-00			1		DIAL, control
-12	366-1023-01			1		KNOB, charcoal--LEVEL
	- - - - - -			-		knob includes:
	213-0153-00			1		SETSCREW, 5-40 x 0.125 inch, HSS

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-13	214-1597-00			1		ACTUATOR, switch
-14	131-0106-02			2		CONNECTOR, receptacle, female, BNC
-15	366-1214-01			1		PUSHBUTTON, light gray--INT-EXT
-16	366-1214-02			1		PUSHBUTTON, light gray--AC-DC
-17	366-1214-03			1		PUSHBUTTON, light gray-- + -
-18	366-1328-01			1		PUSHBUTTON, charcoal--TERM
-19	426-0681-00			1		FRAME, pushbutton
-20	366-1058-26			1		KNOB, latch
	- - - - - -			-		mounting hardware: (not included w/knob)
-21	214-1095-00			1		PIN, spring
-22	105-0076-00			1		RELEASE BAR, latch
-23	214-1280-00			1		SPRING, helical, extension
-24	358-0378-00			1		BUSHING, sleeve
-25	333-1447-00			1		PANEL, front
-26	337-1064-00			1		SHIELD, electrical, left
-27	337-1435-01			1		SHIELD, electrical, right
-28	358-0408-00			2		BUSHING, sleeve
-29	200-0935-00			1		CAP, lamp holder
-30	378-0602-00			1		LENS, indicator light
-31	352-0157-00			1		HOLDER, lamp
-32	- - - - - -			1		RESISTOR, variable
	- - - - - -			-		mounting hardware: (not included w/resistor)
-33	210-0583-00			1		NUT, hex., 0.25-32 x 0.312 inch
-34	- - - - - -			1		RESISTOR, variable
	- - - - - -			-		mounting hardware: (not included w/resistor)
-35	210-0583-00			1		NUT, hex., 0.25 x 0.312 inch
-36	260-0735-01			1		SWITCH, push, w/hardware
	- - - - - -			-		mounting hardware: (not included w/switch)
-37	210-0008-00			1		WASHER, lock, internal, 0.172 ID x 0.331 inch OD
-38	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--TRIGGER MODE A1
	- - - - - -			-		circuit board assembly includes:
	136-0328-02			8		SOCKET, pin terminal
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
-39	211-0156-00			2		SCREW, 1-76 x 0.25 inch, 82° csk, FHS
-40	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--TRIGGER COUPLING A2
	- - - - - -			-		circuit board assembly includes:
	131-0608-00			2		TERMINAL, pin, 0.24 inch long
	136-0328-02			9		SOCKET, pin terminal
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
	211-0156-00			2		SCREW, 1-76 x 0.25 inch, 82° csk, FHS

[1]Refer to Electrical Parts List for part number.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-41	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--TRIGGER SOURCE A3
	- - - - - -			-		circuit board assembly includes:
-42	136-0328-02			12		SOCKET, pin terminal
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
	211-0156-00			2		SCREW, 1-76 x 0.25 inch, 82° csk, FHS
-43	380-0200-00			3		HOUSING, pushbutton
-44	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--DELAYED TRIGGER A3
	- - - - - -			-		circuit board assembly includes:
	388-2145-00			1		CIRCUIT BOARD
-45	136-0328-02			9		SOCKET, pin terminal
-46	352-0239-00			3		LAMPHOLDER
	- - - - - -			-		mounting hardware for each: (not included w/lampholder)
-47	213-0098-00			2		SCREW, 0-80 x 0.125 inch, 82° csk, FHS
-48	260-1133-00			1		SWITCH, push, set of 3--SLOPE, COUPLING, SOURCE
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
-49	211-0541-00			3		SCREW, 6-32 x 0.25 inch, 100° csk, FHS
-50	- - - - - -			1		CIRCUIT BOARD ASSEMBLY--EXTERNAL INPUT A7
	- - - - - -			-		circuit board assembly includes:
	388-2146-00			1		CIRCUIT BOARD
-51	136-0328-00			1		SOCKET, pin terminal
-52	260-1132-00			1		SWITCH, push--TERM
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
-53	211-0001-00			2		SCREW, 2-56 x 0.25 inch, PHS
-54	220-0616-00			1		NUT BLOCK
	- - - - - -			-		mounting hardware: (not included w/nut block)
-55	211-0105-00			2		SCREW, 4-40 x 0.187 inch, 100° csk, FHS
-56	348-0235-00			2		SHIELDING GASKET
-57	386-1447-56			1		SUBPANEL, front
	- - - - - -			-		mounting hardware: (not included w/subpanel)
-58	213-0192-00			4		SCREW, thread forming, 6-32 x 0.50 inch, Fil HS
-59	384-1009-09			2		SHAFT, extension, 0.56 inch long
-60	214-1190-00			2		EXTENDER-RETRACTER, knob
	- - - - - -			-		each extender-retracter includes:
	213-0075-00			1		SETSCREW, 4-40 x 0.094 inch, HSS
	213-0140-00			1		SETSCREW, 2-56 x 0.094 inch, HSS
-61	260-0516-00			1		SWITCH, sensitive--ALT (OUT)
	- - - - - -			-		mounting hardware: (not included w/switch)
-62	211-0159-00			2		SCREW, 2-56 x 0.375 inch, PHS
-63	210-0001-00			2		WASHER, lock, internal, 0.092 ID x 0.18 inch OD
-64	210-0405-00			2		NUT, hex., 2-56 x 0.188 inch

[1]Refer to Electrical Parts List for part number.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-65	260-0516-00			1		SWITCH, sensitive--IN-RUNS AFTER DLY TIME
	- - - - - -			-		mounting hardware: (not included w/switch)
-66	211-0159-00			2		SCREW, 2-56 x 0.375 inch, PHS
-67	210-0001-00			2		WASHER, lock, internal, 0.092 ID x 0.18 inch OD
-68	210-0405-00			2		NUT, hex., 2-56 x 0.188 inch
-69	407-0749-00			2		BRACKET, component mounting
	- - - - - -			-		mounting hardware for each: (not included w/bracket)
-70	210-0583-00			1		NUT, hex., 0.25-32 x 0.312 inch
-71	210-0046-00			1		WASHER, lock, internal, 0.26 ID x 0.40 inch OD
-72	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--DISTRIBUTION A5
	- - - - - -			-		circuit board assembly includes:
	388-2153-00			1		CIRCUIT BOARD
-73	131-0589-00			49		TERMINAL, pin, 0.50 inch long
	131-0590-00			4		TERMINAL, pin, 0.665 inch long
-74	- - - - - -			2		RESISTOR, variable
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
-75	211-0116-00			4		SCREW, sems, 4-40 x 0.312 inch, PHB
-76	386-1402-00			1		PANEL, rear
	- - - - - -			-		mounting hardware: (not included w/panel)
-77	213-0192-00			4		SCREW, thread forming, 6-32 x 0.50 inch, Fil HS
-78	361-0326-00			1		SPACER, sleeve, 0.10 inch long
-79	220-0547-01			10		NUT BLOCK
	- - - - - -			-		mounting hardware for each: (not included w/nut block)
-80	211-0105-00			1		SCREW, 4-40 x 0.188 inch, 100° csk, FHS
-81	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--SWEEP A10
	- - - - - -			-		circuit board assembly includes:
	388-2143-00			1		CIRCUIT BOARD
-82	131-0608-00			11		TERMINAL, pin, 0.365 inch long
-83	136-0220-00			1		SOCKET, transistor, 3 pin, square
-84	136-0269-00			1		SOCKET, integrated circuit, 14 pin
-85	136-0252-04			212		SOCKET, pin connector, 0.181 inch long
-86	136-0263-03			39		SOCKET, pin terminal
-87	200-0945-00			5		COVER, half, transistor temperature stabilizer
-88	200-0945-01			5		COVER, half, transistor temperature stabilizer
-89	211-0001-00			5		SCREW, 2-56 x 0.25 inch, PHB
-90	214-0579-00			13		PIN, test point
-91	352-0228-00			4		HOLDER, cable, single, plastic
-92	211-0155-00			6		SCREW, relieved shank, 4-40 x 0.375 inch
-93	361-0238-00			6		SPACER, sleeve, 0.34 inch long

[1]Refer to Electrical Parts List for part number.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-94	- - - - - -[1]			1		CIRCUIT BOARD ASSEMBLY--DELAYED TRIGGER A9
	- - - - - -			-		circuit board assembly includes:
	388-2152-00			1		CIRCUIT BOARD
-95	131-0608-00			2		TERMINAL, pin, 0.365 inch long
-96	131-1003-00			3		RECEPTACLE, coaxial cable
-97	136-0252-04			104		SOCKET, pin connector, 0.365 inch long
-98	136-0263-03			15		SOCKET, pin terminal
-99	214-0579-00			3		PIN, test point
-100	352-0213-00			1		HOLDER, cable, double, plastic
-101	352-0228-00			2		HOLDER, cable, single, plastic
-102	352-0238-00			1		HOLDER, coaxial, single, grounding
-103	211-0155-00			3		SCREW, relieved shank, 4-40 x 0.375 inch
-104	361-0238-00			3		SPACER, sleeve, 0.34 inch long
-105	- - - - - -[1]			-		CIRCUIT BOARD ASSEMBLY--MAIN TRIGGER A8
	- - - - - -			-		circuit board assembly includes:
	388-2151-00			1		CIRCUIT BOARD
-106	131-0566-00			1		LINK, terminal connecting
-107	131-0608-00			3		TERMINAL, pin, 0.365 inch long
-108	131-1003-00			5		RECEPTACLE, coaxial cable
-109	136-0252-04			112		SOCKET, pin connector, 0.365 inch long
-110	136-0337-00			1		SOCKET, relay, 8 pin
-111	136-0263-03			21		SOCKET, pin terminal
-112	214-0579-00			4		PIN, test point
-113	352-0213-00			2		HOLDER, cable, double, plastic
-114	352-0228-00			1		HOLDER, cable, single, plastic
-115	352-0238-00			2		HOLDER, coaxial, single, grounding
-116	211-0155-00			3		SCREW, relieved shank, 4-40 x 0.375 inch
-117	361-0238-00			3		SPACER, sleeve, 0.34 inch long
-118	384-1082-00			1		SHAFT, extension, 8.53 inch long
-119	376-0101-00			1		COUPLING, shaft
	- - - - - -			-		coupling includes:
	213-0075-00			2		SETSCREW, 4-40 x 0.094 inch, HSS
	672-0025-00			1		CIRCUIT BOARD ASSEMBLY--INTERFACE READOUT
	- - - - - -			-		circuit board assembly includes:
-120	131-0963-00			1		CONTACT, electrical, grounding
-121	214-1136-00			1		ACTUATOR, slide switch
-122	214-1190-00			1		EXTENDER-RETRACTER, knob
	- - --- - -			-		extender-retractor includes.
	213-0075-00			1		SETSCREW, 4-40 x 0.094 inch, HSS
	213-0140-00			1		SETSCREW, 2-56 x 0.094 inch, HSS
-123	214-1630-00			1		DETENT ASSEMBLY, switch
-124	260-0960-01			1		SWITCH, slide
-125	384-1102-00			1		SHAFT, extension, 10.85 inches long
-126	- - - - - -			1		RESISTOR, variable
	- - - - - -			-		mounting hardware: (not included w/resistor)
-127	210-0583-00			1		NUT, hex., 0.25-32 x 0.312 inch
-128	210-0046-00			1		WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-129	210-1027-00			1		WASHER, flat, 0.252 ID x 0.406 inch OD

[1]Refer to Electrical Parts List for part number.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	Description 1 2 3 4 5
1-130	407-0803-00[1]			1	BRACKET, component mounting
-131	- - - - - - -[1]			1	CIRCUIT BOARD ASSEMBLY--INTERFACE A6
	- - - - - -			-	circuit board assembly includes:
	388-2144-00			1	CIRCUIT BOARD
-132	131-0589-00			17	TERMINAL, pin, 0.50 inch long
	131-0590-00			31	TERMINAL, pin, 0.655 inch long
	131-0591-00			18	TERMINAL, pin, 0.835 inch long
	131-0592-00			33	TERMINAL, pin, 0.885 inch long
-133	131-0593-00			7	TERMINAL, pin, 1.15 inches long
	131-0595-00			5	TERMINAL, pin, 1.37 inches long
-134	131-0604-00			40	CONTACT, electrical, spring
	131-0608-00			9	TERMINAL, pin, 0.365 inch long
-135	131-1003-00			2	RECEPTACLE, coaxial cable
-136	136-0252-04			70	SOCKET, pin connector, 0.181 inch long
-137	260-0984-00			1	SWITCH, slide
-138	- - - - - -			1	RESISTOR, variable
-139	131-0707-00			6	TERMINAL, connector
-140	352-0167-00			1	HOLDER, terminal connector, 9 pin
-141	352-0274-00			1	HOLDER, terminal, strip of 8
-142	352-0180-00			1	GUIDE, actuator, slide switch
-143	351-0185-00			6	GUIDE-POST, lock, 0.65 inch long
-144	351-0186-00[1]			6	GUIDE-POST, lock, 0.84 inch long
-145	- - - - - -[1]			1	CIRCUIT BOARD ASSEMBLY--READOUT A11
	- - - - - -			-	circuit board assembly includes:
	388-2150-00			1	CIRCUIT BOARD
	- - - - - -			-	mounting hardware: (not included w/circuit board)
-146	211-0182-00			10	SCREW, sems, 2-56 x 0.312 inch, PHB
-147	210-0405-00			10	NUT, hex., 2-56 x 0.187 inch
-148	376-0129-01			1	COUPLER, cam switch
-149	384-0806-00			1	SHAFT, cam switch
-150	200-1255-00			2	COVER, cam switch
	- - - - - -			-	mounting hardware for each: (not included w/cover)
-151	211-0116-00			1	SCREW, sems, 4-40 x 0.312 inch, PHB
-152	210-0591-00			1	NUT, hex., 4-40 x 0.188 inch
-153	200-1256-00			2	COVER, cam switch
	- - - - - -			-	mounting hardware for each: (not included w/cover)
	211-0116-00			1	SCREW, sems, 4-40 x 0.312 inch, PHB
-154	210-0591-00			1	NUT, hex., 4-40 x 0.188 inch
-155	354-0391-00[2]			2	RING, retaining
-156	214-1139-00[2]			-	SPRING, flat, gold
	214-1139-02[2]			-	SPRING, flat, green
	214-1139-03[2]			-	SPRING, flat, red
-157	214-1127-00			4	ROLLER, detent
-158	401-0081-02			2	BEARING, front
	- - - - - -			-	mounting hardware for each: (not included w/bearing)
-159	211-0116-00			2	SCREW, sems, 4-40 x 0.312 inch, PHB
-160	210-0591-00			2	NUT, hex., 4-40 x 0.188 inch

[1]Refer to Electrical Parts List for part number.
[2]Replace only with part bearing the same color as the original part in your instrument.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
1-161	401-0083-00			1		BEARING, center
	- - - - - -			-		mounting hardware: (not included w/bearing)
	211-0116-00			2		SCREW, sems, 4-40 x 0.312 inch, PHB
	210-0591-00			2		NUT, hex., 4-40 x 0.188 inch
-162	105-0267-00			1		DRUM, cam switch, rear
-163	105-0266-00			1		DRUM, cam switch, front
-164	131-0604-00			13		CONTACT, electrical, spring
-165	260-0960-01			1		SWITCH, slide
-166	136-0327-01			7		SOCKET, pin, terminal
	- - - - - -			-		mounting hardware: (not included w/circuit board assembly)
-167	211-0116-00			6		SCREW, sems, 4-40 x 0.312 inch, PHB
-168	260-1309-00			1		SWITCH, push
	- - - - - -			-		mounting hardware: (not included w/switch)
-169	211-0185-00			2		SCREW, 4-40 x 1.75 inches, PHS
-170	210-0850-00			2		WASHER, flat, 0.093 ID x 0.281 inch OD
-171	220-0619-00			1		NUT PLATE
-172	214-1061-00			1		SPRING, flat, sliding ground
-173	426-0505-11			1		FRAME SECTION, top
-174	214-1054-00			1		SPRING, flat, latch detent
-175	105-0075-00			1		BOLT, latch
-176	426-0499-11			1		FRAME SECTION, bottom
-177	352-0161-01			1		HOLDER, terminal connector, 3 wire (brown)
	352-0161-02			1		HOLDER, terminal connector, 3 wire (red)
-178	352-0162-01			1		HOLDER, terminal connector, 4 wire (brown)
-179	352-0163-02			1		HOLDER, terminal connector, 5 wire (red)
	352-0163-03			1		HOLDER, terminal connector, 5 wire (orange)
-180	352-0169-00			1		HOLDER, terminal connector, 2 wire (black)
-181	131-0622-00			2		TERMINAL, connector
	131-0707-00			24		TERMINAL, connector
	131-0792-00			2		TERMINAL, connector
-182	210-0774-00			6		EYELET, outer
-183	210-0775-00			6		EYELET, inner
-184	175-0827-00			ft		WIRE, electrical, 4 wire ribbon, 3.00 inches long
-185	175-0828-00			ft		WIRE, electrical, 5 wire ribbon, 5.75 inches long
-186	- - - - - -			1		RESISTOR, variable, w/hardware

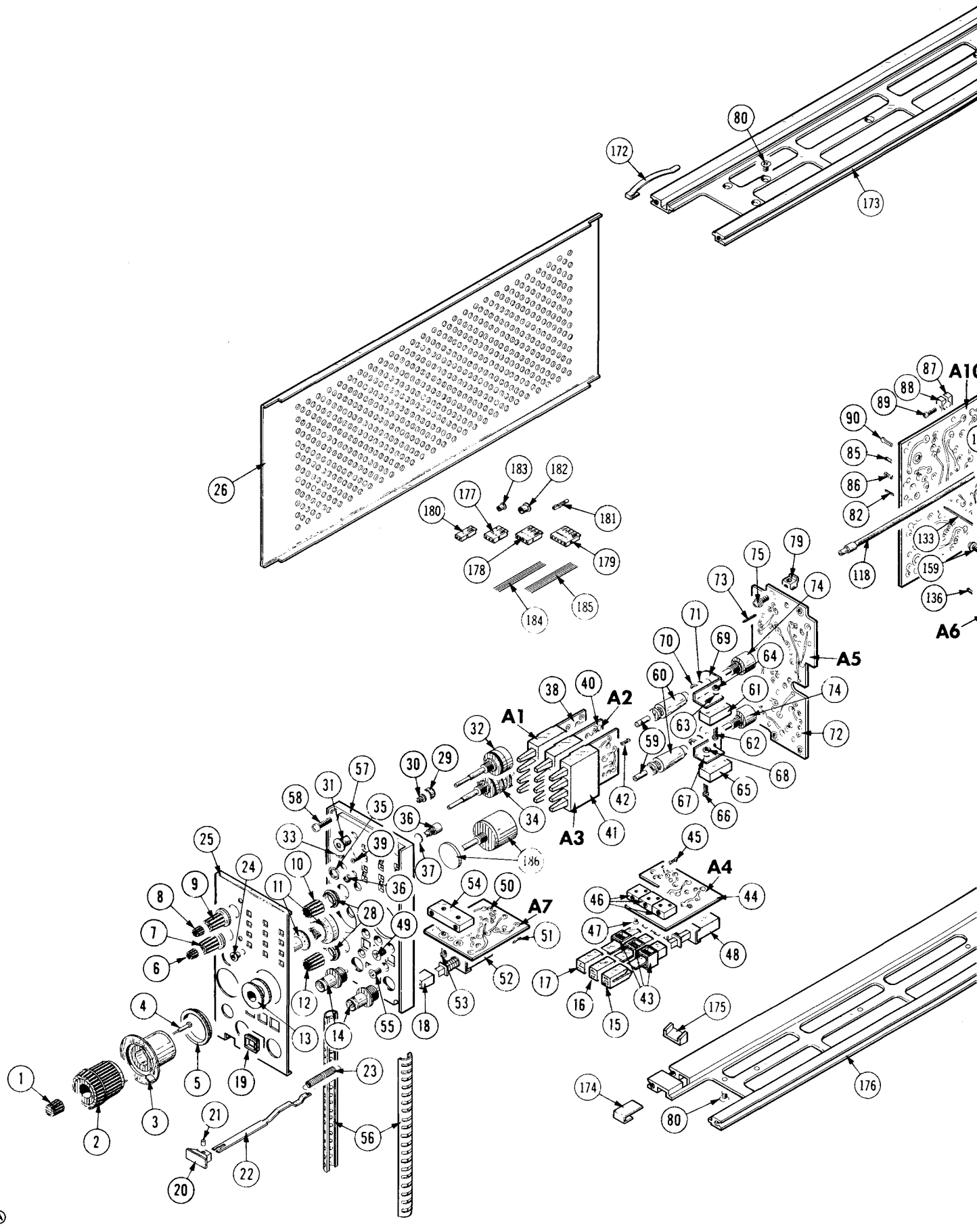
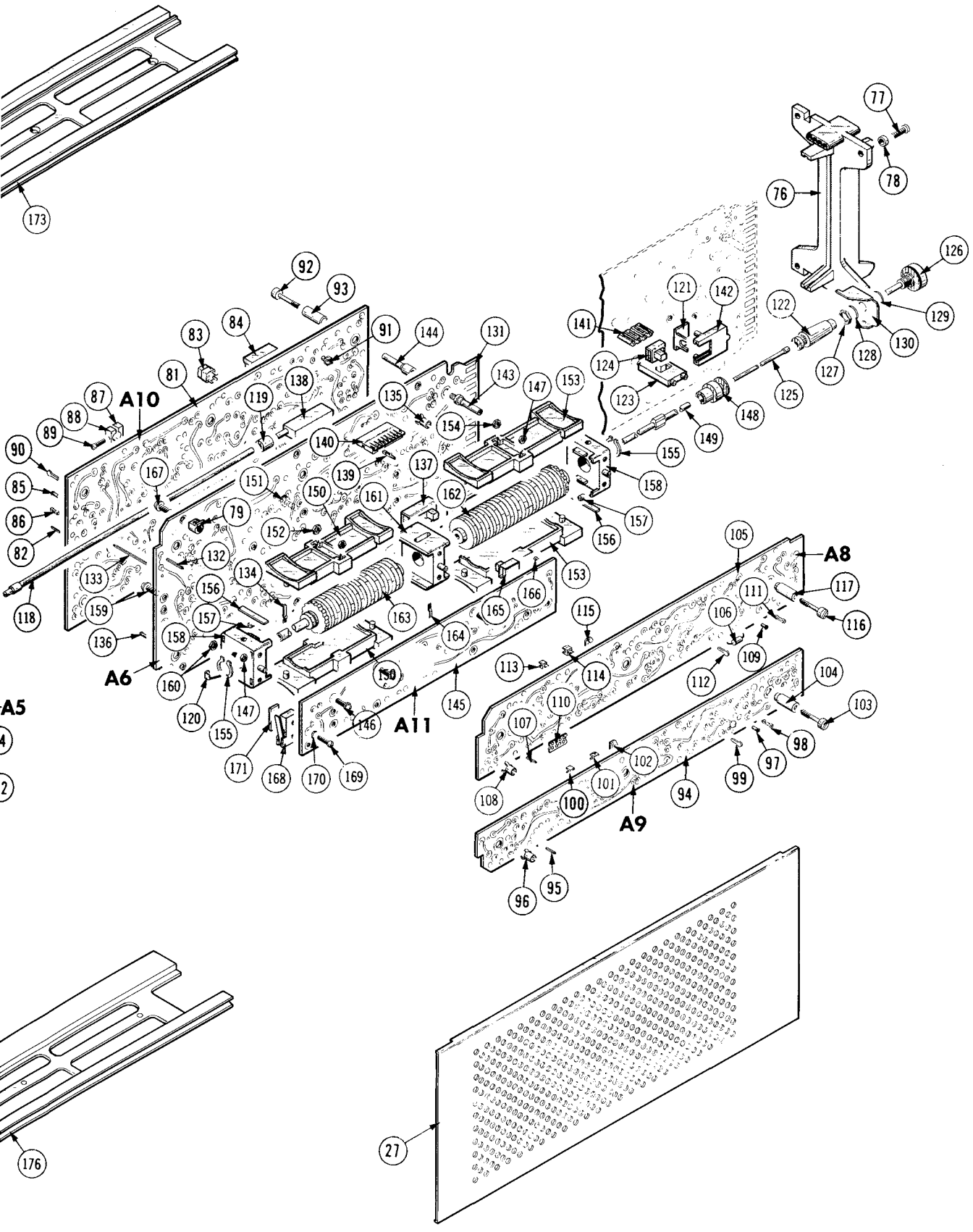


FIG. 1 EXPLODED



7B92 DUAL TIME BASE

FIG. 2 STANDARD ACCESSORIES
REPACKAGING

STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	1 2 3 4 5	Description
	070-1192-00			1		MANUAL, service
	070-1401-00			1		MANUAL, operators
	070-1630-00			1		CIRCUIT DESCRIPTION SUPPLEMENT

CARTON ASSEMBLY
(Part No. 065-0125-00)

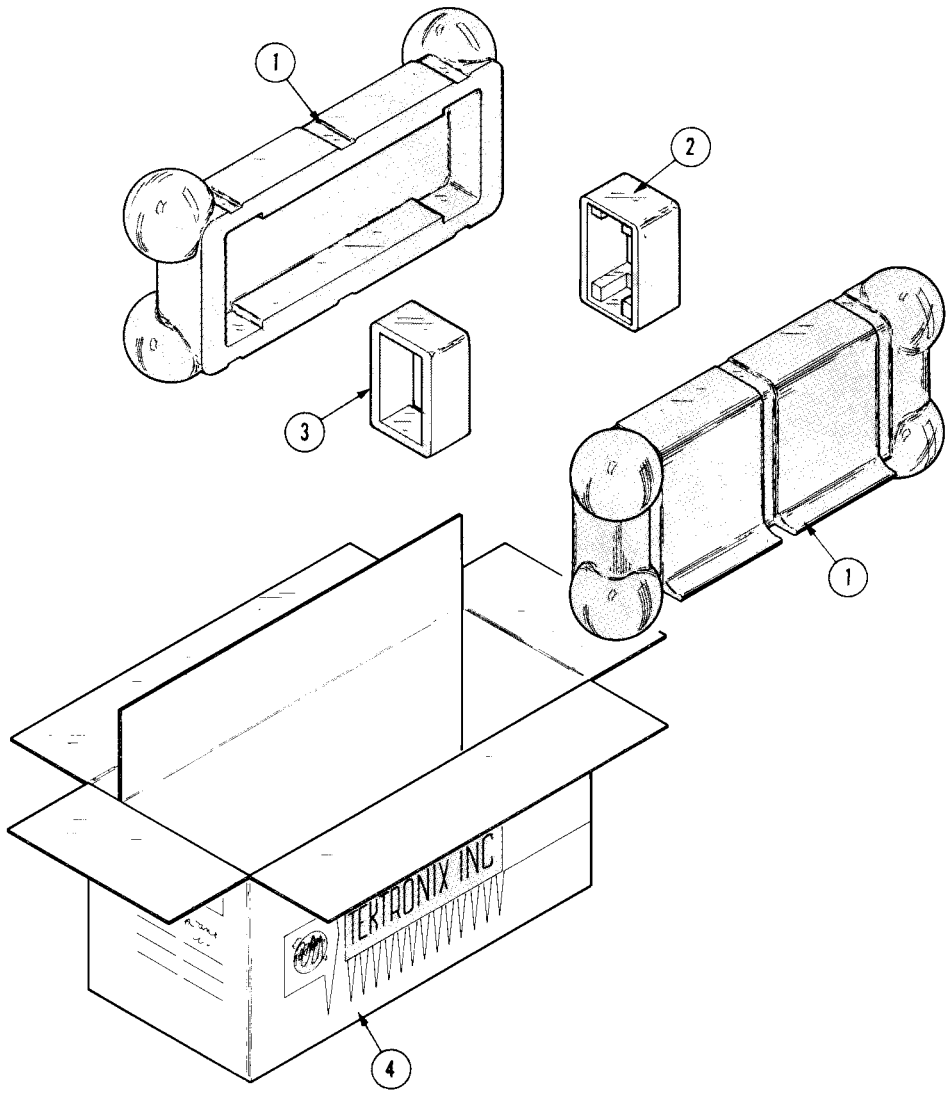


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5	Description
2-	065-0125-00			1		CARTON ASSEMBLY
	- - - - - - - - - -			-		carton assembly includes:
-1	004-0241-00			2		CASE HALF
-2	004-0242-00			1		END CAP, rear
-3	004-0243-00			1		END CAP, front
-4	004-0748-00			1		CARTON

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