TEKTRONIX®

7B92A

DUAL TIME BASE

WITH OPTIONS

SERVICE

INSTRUCTION MANUAL

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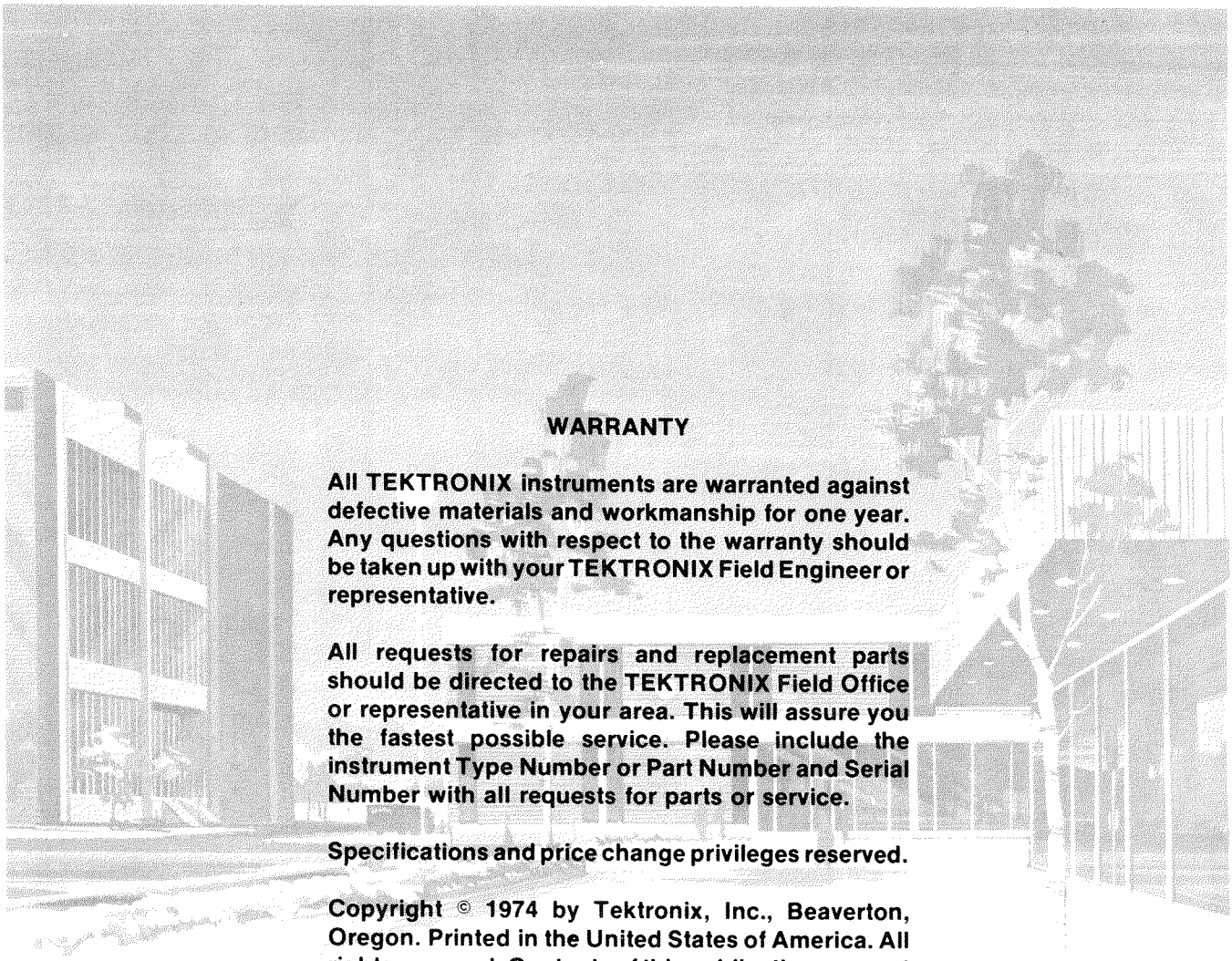

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All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

Specifications and price change privileges reserved.

TABLE OF CONTENTS

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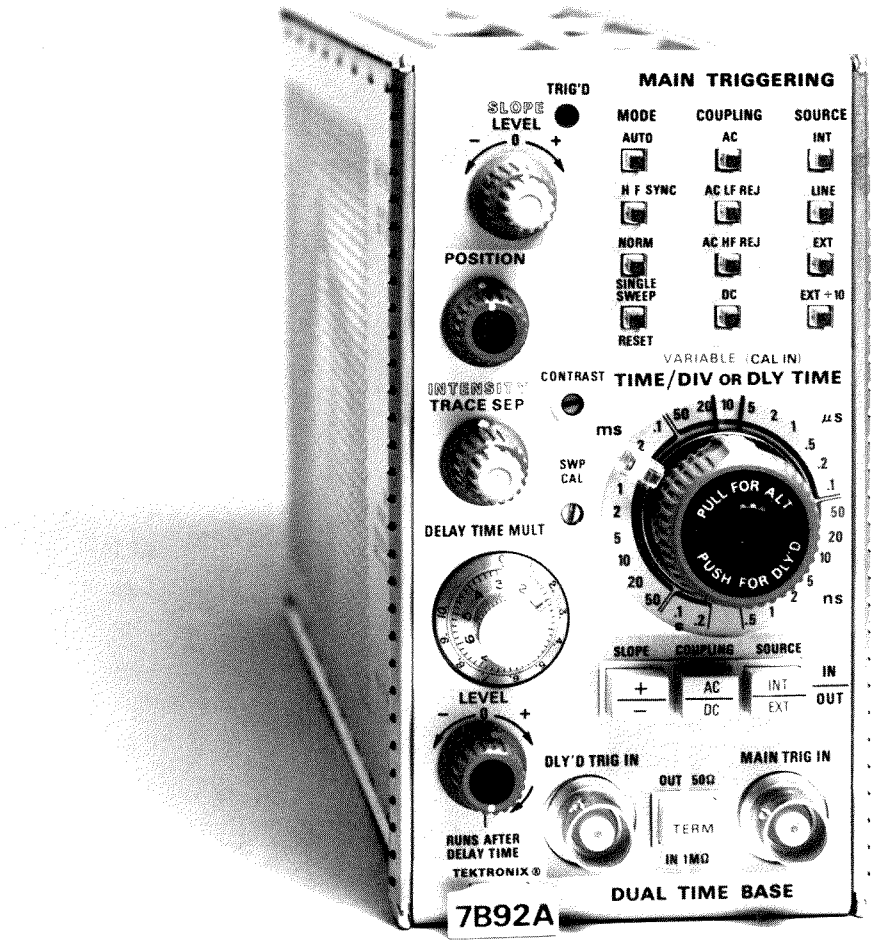
TABLE OF CONTENTS (CONT.)

LIST OF ILLUSTRATIONS

LIST OF TABLES



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7B92A Features

The 7B92A Dual Time Base unit provides normal, 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 7B92A is intended for use with high-frequency 7000-Series Oscilloscope systems; however, most 7B92A functions are compatible with all 7000-Series Oscilloscopes.

Other features include lighted pushbutton switches, compatibility with indicator oscilloscopes having an alphanumeric readout system, and 0 to 9.8 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.

7B92A Dual Time Base.

OPERATING INSTRUCTIONS

The 7B92A Dual Time-Base Plug-In Unit operates with a Tektronix 7000-Series Oscilloscope and a 7A-Series Amplifier plug-in unit to form a complete high-frequency oscilloscope system. This section describes the operation of the front-panel controls and connectors, provides general operating information, an Operating Check-Out procedure, and basic applications for this instrument.

INSTALLATION

The 7B92A is designed to operate in the horizontal plug-in compartment of the oscilloscope. This instrument can also be installed in a vertical plug-in compartment to provide a vertical sweep on the crt. However, when used in this manner, there are no internal triggering or retrace blanking provisions, and the unit may not meet the specifications given in Section 1 of the Operators manual.

Before proceeding with installation, check the settings of the Time/Div Variable Selector multi-pin connector and the Mainframe Selector multi-pin connector (see Fig. 1-2). The Time/Div Variable Selector determines whether the front-panel Time/Div VARIABLE control operates in conjunction with the delaying or delayed sweeps. The Mainframe Selector adapts the 7B92A to the oscilloscope mainframe being used. The two mainframe selections are:

(1) 7800 and 7900 Oscilloscopes.

(2) All other 7000-Series Oscilloscopes.

To install the 7B92A in a plug-in compartment, push it in until it fits firmly into the compartment. The front panel of the 7B92A should be flush with the front panel of the oscilloscope. Even though the gain of the oscilloscope is standardized, the sweep calibration of the 7B92A should be checked when installed. The procedure for checking the unit is given under Sweep Calibration in the Operating Checkout procedure in this section.

To remove the 7B92A, pull the release latch (see Fig. 1-3) to disengage the unit from the oscilloscope, and pull it out of the plug-in compartment.

FRONT-PANEL CONTROLS, CONNECTORS, AND INDICATORS

All controls, connectors, and indicators required for the operation of the 7B92A, except the Time/Div Variable and Mainframe Selectors, are located on the front panel. A brief description of the front-panel controls, connectors, and indicators is given here. More detailed information is given under General Operating Information. Fig 1-2 shows the Time/Div Variable and Mainframe Selectors. Fig. 1-4 shows the front-panel controls, connectors, and indicators.

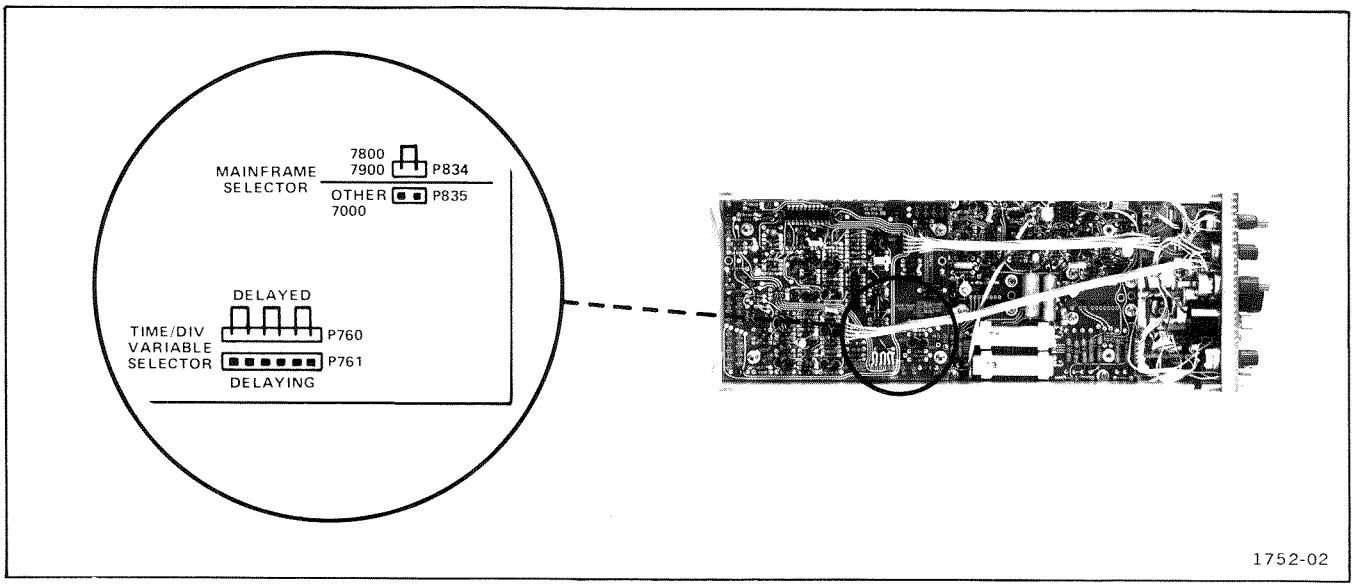

Fig. 1-2. Location of Variable and Mainframe Selector multi-pin connectors.

Main Triggering Controls

(1) LEVEL Control

Selects amplitude point on trigger signal where sweep triggering occurs when the Main Triggering Mode AUTO, NORM, or SINGLE SWEEP switches are pressed. When the Main Triggering Mode HF SYNC switch is pressed, the LEVEL control adjusts the frequency of the trigger generator to synchronize with the frequency (or sub-harmonic) of the triggering signal to provide a stable display.

(2) SLOPE Switch

Permits triggering on the positive or negative slope of the trigger signal (except in HF SYNC).

(3) TRIG'D Indicator

When lit, indicates that the sweep is triggered and will produce a display with correct setting of the POSITION control and the controls on the associated Amplifier plug-in unit(s) and oscilloscope.

(4) MODE Switches

Select the desired main triggering mode. Selected mode is indicated by lighted pushbutton.

AUTO: Selects a triggered sweep initiated by the applied trigger signal at a point determined 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 switches. When the LEVEL control is outside the amplitude range, the trigger repetition rate is outside the frequency range selected by the COUPLING switches, or the trigger signal is inadequate, the sweep free-runs to provide a reference trace.

HF SYNC: Sweep 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. 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 switches. Triggered sweep can be obtained only over the amplitude range of the applied trigger signal. When the LEVEL control is either outside the amplitude range, the trigger repetition rate is outside the frequency range selected by the COUPLING switches, or the trigger signal is inadequate, there is no trace.

SINGLE SWEEP-RESET: When the SINGLE SWEEP-RESET pushbutton switch is pressed, a single trace will be presented when the next trigger pulse is received. The SINGLE SWEEP-RESET pushbutton remains lit until a trigger is received and the sweep is completed. The SINGLE SWEEP-RESET pushbutton switch must be pressed again before another sweep can be displayed.

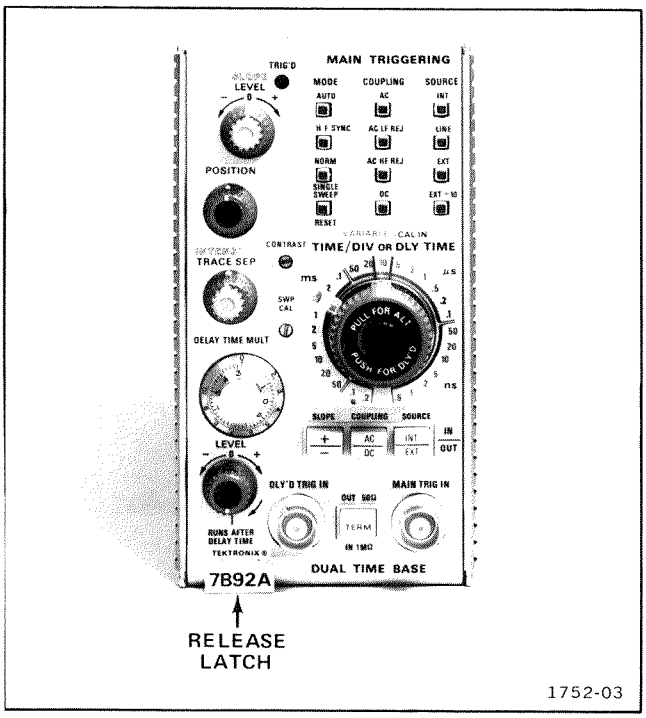

Fig. 1-3. Location of release latch.

(5) COUPLING Switches

Select trigger signal 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 above 50 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.

(6) SOURCE Switches

Select the triggering source. Selected source is indicated by lighted pushbutton.

INT: Trigger signal obtained internally from Amplifier plug-in unit of oscilloscope.

LINE: Trigger signal obtained internally from the line voltage applied to the oscilloscope.

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

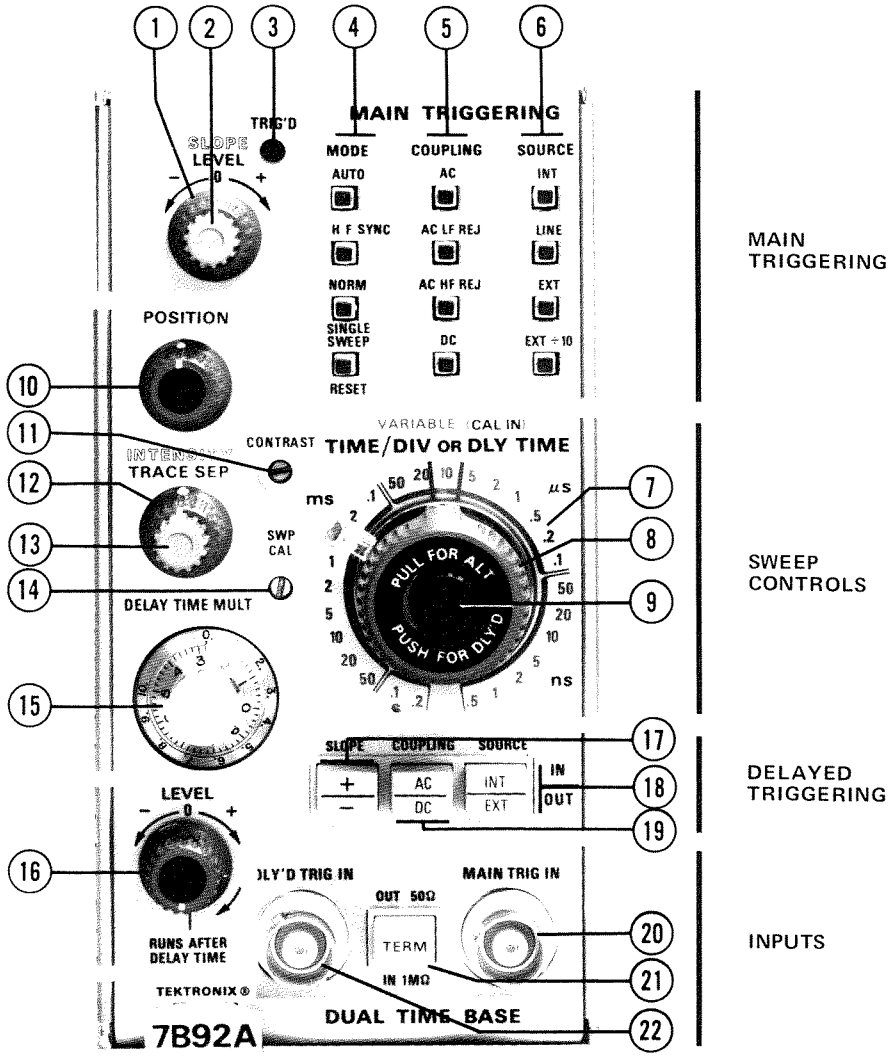

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Fig. 1-4. Front-panel controls and connectors.

(6) SOURCE Switches (cont.)

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

Sweep Controls

(7) TIME/DIV OR DLY TIME

Selects the basic sweep rate for normal sweep operation and selects the delay time (multiplied by the DELAY TIME MULT dial setting) when operating in the Alternate or Delayed sweep modes. The VARIABLE control must be in the CAL (knob in) position for calibrated sweep rate.

(8) DLY'D Time/Division

Selects the delayed sweep rate for operation in Delayed and Alternate sweep modes. The VARIABLE control must be in the CAL (knob in) position for calibrated sweep rate.

Three display modes can be selected by the following switch settings:

Normal Sweep: A normal sweep is selected when the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switches are locked together at the same sweep rate. The DLY'D Time/Division knob must be pressed in for normal sweep mode. Calibrated sweep rates from 0.2 second/division to 0.5 nanosecond/division can be selected.

ALT Sweep: The Alternate mode is selected when the DLY'D Time/Division switch is pulled out and rotated clockwise. In this mode, the delaying sweep is displayed (with an itensified zone during the time that the delayed sweep runs) alternately with the delayed sweep.

DLY'D Sweep: The delayed sweep mode is selected when the DLY'D Time/Division switch is pulled out, rotated for the desired delayed sweep rate, and then pushed in. In this 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 setting.

(9) VARIABLE

Two-position switch actuated by the VARIABLE control to select calibrated or uncalibrated sweep rates. In the CAL position (knob 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 will operate with either the delaying or delayed sweep by means of the internal Time/Div Variable Selector.

(10) POSITION Control

Positions the display horizontally on the graticule.

(11) CONTRAST Control

Varies the relative brightness of the intensified portion of the delaying trace when in the Alternate mode.

(12) TRACE SEP Control

This control vertically positions the delaying sweep display up to 3.5 divisions above the delayed sweep display when in the Alternate mode.

(13) INTENSITY Control

Varies the intensity of the delaying sweep display when operating in the Alternate mode.

(14) SWP CAL Adjustment

Screwdriver adjustment sets the basic timing of the 7B92A to compensate for slight differences in input sensitivity when changing indicator oscilloscopes.

(15) DELAY TIME MULT Dial

Provides variable delay of 0 to 9.8 times the basic delay time selected by the TIME/DIV OR DLY TIME switch.

Delayed Triggering Controls

(16) LEVEL Control

Determines the delayed trigger mode and the delayed trigger level.

RUNS AFTER DELAY TIME (LEVEL control turned fully clockwise into detent): Delayed sweep runs immediately following the delay time selected by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial. Delayed SLOPE, COUPLING, and SOURCE functions are inoperative.

Delayed Sweep Triggerable: When the Delayed Triggering LEVEL control is turned counter-clockwise out of detent, the delayed sweep is triggerable. The Delayed Triggering LEVEL control can now be rota-

(16) LEVEL Control (cont.)

ted to select the amplitude point on the trigger signal at which the delayed sweep is triggered. In the Delayed Sweep Triggerable mode, the delayed SLOPE, COUPLING, and SOURCE functions are activated.

(17) SLOPE Switch

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

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

– : The delayed sweep can be triggered on the negative slope of the trigger signal.

(18) SOURCE Switch

Two-position pushbutton switch to select the source of the delayed trigger signal.

INT: The delayed trigger signal is obtained from the vertical amplifier of the oscilloscope.

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

(19) COUPLING Switch

Two-position pushbutton switch to determine the method of coupling the trigger signal to the delayed trigger circuit.

AC: Rejects dc and attenuates signals below 30 hertz. Accepts trigger signals from 30 hertz to 500 megahertz.

DC: Accepts trigger signals from dc to 500 megahertz.

Front-Panel Inputs

(20) MAIN TRIG IN Connector

Serves as an external trigger input for the main triggering circuit when the Main Triggering Source EXT or EXT ÷ 10 pushbutton switches are pressed.

(21) TERM Switch

Two-position pushbutton switch to select 50 ohms (out position) or 1 megohm (in position) input impedance for the MAIN TRIG IN and DLY'D TRIG IN connectors.

(22) DLY'D TRIG IN Connector

Serves as an external trigger input for the delayed triggering circuit when the Delayed Triggering SOURCE switch is set to EXT.

CAUTION

Do not exceed 7 volts (rms) of external signal when 50 Ω termination is selected.

FAMILIARIZATION PROCEDURE

The following procedures may be used for familiarization or as a check of basic instrument operation. The procedure is divided into two parts, Sweep Functions and Triggering Functions. A complete operating check of the 7B92A functions can be made by performing both parts, or each part may be performed separately. If performing the Familiarization Procedure reveals a malfunction or improper calibration, first check the operation of the associated plug-in units; then refer to the Maintenance Section.

NOTE

For optimum high-frequency performance, the 7B92A should be installed in an oscilloscope system with similar frequency and sweep-rate capabilities.

Setup Procedure

1. Install the 7B92A in a horizontal compartment of the oscilloscope.

2. Install the Amplifier plug-in unit in a vertical compartment.

3. Turn on the oscilloscope and allow at least 20 minutes warmup.

4. Set the 7B92A controls as follows:

Main Triggering

SLOPE	(+)
MODE	AUTO
COUPLING	AC
SOURCE	INT

Delayed Triggering

LEVEL	RUNS AFTER DELAY TIME

Delayed Triggering (cont.)

SLOPE	(+)
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
INTENSITY	As desired
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms (knob in)
VARIBLE	CAL
Time/Div Variable Selector (Internal)	Delayed Sweep
DELAY TIME MULT	1.00

5. Set the oscilloscope to display the plug-in units and adjust for a well defined display. See oscilloscope and Amplifier plug-in unit instruction manuals for detailed operating instructions.

Sweep Functions

NORMAL SWEEP. Perform the following procedure to obtain a normal sweep and demonstrate the function of the related sweep controls:

1. Perform the Setup Procedure.

2. Connect a 4 volt, 1 kilohertz signal from the oscilloscope Calibrator to the Amplifier plug-in unit Input.

3. Adjust the Amplifier plug-in unit Volts/Division switch for two divisions of display.

4. Rotate the Main Triggering LEVEL control for a stable display.

5. Rotate the POSITION control and note that the trace moves horizontally.

6. Check the crt display for one complete cycle per division. If necessary, adjust the SWP CAL screwdriver adjustment for one complete cycle per division over the center 8 graticule divisions. Be sure that the timing of the Calibrator signal is accurate within 0.5%.

ALTERNATE AND DELAYED SWEEP. Perform the following procedure to obtain alternate-delayed sweeps and demonstrate the function of the related sweep controls:

7. Pull out the DLY'D Time/Division knob and rotate clockwise to 0.1 ms for the Alternate sweep mode. Note both an intensified trace and a normal-intensity delayed sweep trace on the crt. Increased oscilloscope intensity may be required for viewing the delayed sweep.

8. Rotate the INTENSITY control and note that it varies the intensity of the delaying sweep.

9. Rotate the CONTRAST adjustment for adequate identification of the intensified portion of the delaying sweep.

10. Rotate the TRACE SEP control to vertically position the delaying sweep trace with respect to the delayed sweep trace.

11. Rotate the DELAY TIME MULT dial and note that the amount of delay time before the intensified portion of the display is controlled by the DELAY TIME MULT dial.

12. Press the DLY'D Time/Division switch in for the Delayed sweep mode. Note the delayed display with sweep rate determined by the DLY'D Time/Division switch.

13. Press and release the VARIABLE control. Rotate the VARIABLE control and note that the sweep rate indicated by the DLY'D Time/Division switch can be varied to at least the sweep rate of the next adjacent position (0.2 ms). The internal Time/Div Variable Selector must be set to Delayed Sweep position. Return the VARIABLE control to the CAL position (knob in).

Triggering Functions

MAIN AND DELAYED TRIGGERING. Perform the following procedure to obtain a triggered alternate, normal, or delayed sweep and demonstrate the function of the related controls:

14. Perform the Set Up Procedure. Connect the 1 kilohertz Calibrator signal from the oscilloscope to the Amplifier plug-in unit Input and adjust for about 4 divisions of vertical display.

15. Set the DLY'D Time/Division switch and the TIME/DIV OR DLY TIME switch to 1 ms, and press in the DLY'D Time/Division knob (Normal sweep mode). Rotate the Main Triggering LEVEL control for a stable display.

16. Check that a stable display can be obtained with the Main Triggering COUPLING switch set to AC, AC HF REJ, and DC, for both the positive and negative positions of the SLOPE switch (Main Triggering LEVEL control may be adjusted as necessary to obtain a stable display). Remove all connections from the oscilloscope system.

17. Connect a 0.4 volt, 1 kilohertz signal from the oscilloscope Calibrator to the Amplifier plug-in unit and to the MAIN TRIG IN connector. Set the Main Triggering SOURCE switch to EXT. Set the Amplifier plug-in unit Volts/Div switch for about 4 divisions of display. Check that a stable

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display can be obtained with the Main Triggering COUPLING switch set to AC, AC HF REJ, and DC, for both the positive and negative positions of the SLOPE switch (Main Triggering LEVEL control may be adjusted as necessary for a stable display).

18. Change the Main Triggering SOURCE switch to EXT ÷ 10. Set the oscilloscope Calibrator for 4 volts at 1 kilohertz and adjust the Amplifier plug-in unit Volts/Div switch for about 4 divisions of display. Check that a stable display can be obtained with the Main Triggering COUPLING switch set to AC, AC HF REJ, and DC, for both the positive and negative positions of the SLOPE switch (Main Triggering LEVEL control may be adjusted as necessary to obtain a stable display). Remove all connections from the oscilloscope system.

19. Set the Main Triggering COUPLING switch to AC and SOURCE switch to INT. Connect a 1 kilohertz Calibrator signal from the oscilloscope to the Amplifier plug-in unit Input and adjust for about 4 divisions of display amplitude. Adjust the Main Triggering LEVEL control for a stable display. Set the MODE switch to NORM and check for a stable display. Change the MODE switch to AUTO and adjust the LEVEL control for a free-running display. Change the MODE switch to NORM and check for no display.

20. Adjust the Main Triggering LEVEL control for a stable display. Change the Main Triggering MODE switch to SINGLE SWEEP. Press the RESET button and check for one sweep as the RESET button is pressed. Remove the 1 kilohertz signal from the Amplifier plug-in unit and press the RESET button. Check for no display and READY light on. Connect the 1 kilohertz signal to the Amplifier plug-in unit Input and check for one sweep as the signal is applied. Remove all connections from the oscilloscope system.

21. Set the Main Triggering MODE switch to AUTO and SOURCE switch to AC. Turn the Delayed Triggering LEVEL control fully clockwise to the RUNS AFTER DLY TIME position. Pull out the DLY'D Time/Division switch and rotate to 0.2 ms (Alternate mode). Connect a 0.4 volt, 1 kilohertz signal from the oscilloscope Calibrator to the Amplifier plug-in unit Input and adjust for about 2 divisions of display amplitude. Rotate the Main Triggering LEVEL control for a stable intensified display. The INTENSITY control may need to be adjusted to view the intensified display. Rotate the DELAY TIME MULT dial and note that the delay time before the intensified portion of display is continuously variable.

22. Set the Delayed Triggering SLOPE, COUPLING, and SOURCE switches to (+), AC, and INT. Rotate the Delayed Triggering LEVEL control counterclockwise out of the detent and adjust for a stable display. Rotate the DELAY TIME MULT dial and note that the intensified sweep does not start at the completion of the delay time but waits for the next trigger pulse.

23. Check that a stable display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC for both the (+) and (−) positions of the SLOPE switch (Delayed Triggering LEVEL control may be adjusted as necessary for a stable display).

24. Change the Delayed Triggering SOURCE switch to EXT. Connect a 0.4 volt, 1 kilohertz signal from the oscilloscope Calibrator to the DLY'D TRIG IN connector. Check that a stable display can be obtained with the Delayed Triggering COUPLING switch set to AC and DC, for both the (+) and (−) positions of the SLOPE switch (Delayed Triggering LEVEL control may be adjusted as necessary for a stable delayed sweep display).

HIGH-FREQUENCY SYNCHRONIZATION. Perform the following procedure to obtain a triggered alternate, normal, or delayed sweep with a 100 megahertz to 500 megahertz input signal:

NOTE

To check HF SYNC operation, a signal source frequency between 100 megahertz and 500 megahertz is required. If a 100 to 500 megahertz signal source is not available, or if it is not desired to check the HF SYNC operation, the last two steps of this procedure may be deleted.

25. Change the Main Triggering MODE switch to HF SYNC. Connect a high-frequency signal source (100 to 500 megahertz) to the Amplifier plug-in unit Input and adjust for 4 divisions of vertical deflection. Adjust the TIME/DIV OR DLY TIME switch and DLY'D Time/Division switch for about 6 cycles of display. Rotate the Main Triggering LEVEL control throughout its range and note that the sweep is alternately stable, then free-running, several times during the rotation (stable display indicates that the trigger-generator frequency is adjusted to a subharmonic of the trigger signal frequency). Check that stable displays can also be obtained with the Main Triggering COUPLING switch set to AC, AC LF REJ, and DC (Main Triggering LEVEL control may be adjusted, as necessary for a stable display).

26. Pull out the DLY'D Time/Division switch, rotate it to the next fastest sweep rate from the setting of the TIME/DIV OR DLY TIME switch (Alternate mode). When the LEVEL control is in the detent (RUNS AFTER DELAY TIME) the display should be stable. Rotate the LEVEL control counterclockwise out of the detent and adjust for a stable display. Check that stable crt displays can be obtained with the Delayed Triggering COUPLING switch set to AC and DC. Disconnect the high-frequency signal from the oscilloscope system.

GENERAL OPERATING INFORMATION

Main Triggering

The Main Triggering MODE, COUPLING, and SOURCE pushbutton switches are arranged in a sequence which places the most-often used position at the top of each series of pushbuttons. With this arrangement, a stable display can usually be obtained by pressing the top pushbuttons: AUTO, AC, and INT. When an adequate trigger signal is applied and the LEVEL control is set correctly, the TRIG'D indicator will light. If the TRIG'D indicator is not lit: (1) the LEVEL control is at a setting outside the range of the trigger signal from the Amplifier plug-in unit, (2) the trigger signal is inadequate, or (3) the trigger-signal frequency is below the lower frequency limit of the COUPLING switch position. If the desired display is not obtained with these pushbuttons, other selections must be made. Refer to the following discussions or the instruction manuals for the oscilloscope and Amplifier plug-in unit for more information.

Main Trigger Modes

The MODE pushbutton switches select the mode in which the main sweep is triggered.

AUTO. The AUTO pushbutton provides a triggered display with the correct setting of the LEVEL control (see Trigger Level discussion) whenever an adequate trigger signal is applied. The TRIG'D indicator lights when the display is triggered.

When the trigger repetition rate is outside the frequency range selected by the COUPLING switch or the trigger signal is inadequate, the sweep free-runs at the sweep rate indicated by the TIME/DIV OR DLY TIME switch (TRIG'D indicator off). An adequate trigger signal ends the free-running condition and a triggered display is presented. When the LEVEL control is at a setting outside the amplitude range of the trigger signal, the sweep also free runs at the sweep rate indicated by the TIME/DIV OR DLY TIME switch. This type of free-running display can be useful when it is desired to measure only the maximum peak-to-peak amplitude of a signal without observing the waveshape (such as in bandwidth measurements).

HF SYNC. The HF SYNC pushbutton permits stable displays of repetitive signals with only 0.5 division of internal trigger signal (100 millivolts external signal) required for frequencies between 100 megahertz and 500 megahertz.

A triggered display is obtained when the LEVEL control adjusts the frequency of the trigger generator to the frequency or subharmonic of the trigger signal. Stable displays may be obtained several times between the limits of the LEVEL control, depending on the amplitude and frequency of the trigger signal. The LEVEL control should be set for optimum display. (In the High-Frequency Synchronization mode, the display is not necessarily stable when the TRIG'D indicator is lit.)

When the LEVEL control is adjusted between subharmonics of the trigger signal frequency, the trigger repetition rate is below 100 megahertz or outside the frequency range selected by the COUPLING switch, or the trigger signal amplitude is inadequate, the sweep free-runs at the sweep rate determined by the TIME/DIV OR DLY TIME switch.

NORM. The NORM pushbutton provides a triggered display with the correct setting of the LEVEL control whenever an adequate trigger signal is applied. The TRIG'D indicator lights when the display is triggered.

The NORM trigger mode must be used to produce triggered displays with trigger repetition rates below about 30 hertz. When the TRIG'D indicator is off, no trace will be displayed.

SINGLE SWEEP. When the signal to be displayed is not repetitive or varies in amplitude, waveshape, or repetition rate, a conventional repetitive type display may produce an unstable presentation. A stable display can often be obtained under these circumstances by using the single-sweep feature of this unit. The single-sweep mode is also useful to photograph non-repetitive or unstable displays.

To obtain a single-sweep display of a repetitive signal, first obtain the best possible display in the NORM mode. Then, without changing the other MAIN TRIGGERING controls, press the SINGLE SWEEP RESET pushbutton. A single trace is presented each time the pushbutton is pressed. Further sweeps cannot be presented until the SINGLE SWEEP-RESET pushbutton is pressed again. If the displayed signal is a complex waveform composed of pulses of varying amplitude, successive single-sweep displays may not start at the same point on the waveform. To avoid confusion due to the crt persistence, allow the display to disappear before pressing the SINGLE SWEEP-RESET pushbutton again. At fast sweep rates, it may be difficult to view the single-sweep display. The apparent trace intensity can be increased by reducing the ambient light level or using a viewing hood as recommended in the oscilloscope instruction manual.

When using the single-sweep mode to photograph waveforms, the graticule must be photographed separately in the normal manner to prevent over-exposing the film. Be sure the camera system is well protected against stray light, or operate the system in a darkened room. For repetitive waveforms, press the SINGLE SWEEP-RESET pushbutton only once for each waveform unless the signal is completely symmetrical. Otherwise, multiple waveforms may appear on the film. For random signals, the lens can be left open until the signal triggers the unit. Further information on photographic techniques is given in the appropriate camera instruction manual.

Main Trigger Coupling

The Main Triggering COUPLING switches select the method in which the trigger signal is connected to the trigger circuits. Each position permits selection or rejection of some frequency components of the trigger signal which trigger the sweep.

AC. The AC pushbutton blocks the dc component of the trigger signal. Signals with low-frequency components below about 30 hertz are attenuated. In general, ac coupling can be used for most applications. However, if the signal contains unwanted frequency components or if the sweep is to be triggered at a low repetition rate or dc level, one of the other COUPLING switch positions will provide a better display.

AC LF REJ. The AC LF REJ pushbutton rejects dc, and attenuates low-frequency trigger signals below about 30 kilohertz. Therefore, the sweep is triggered only by the higher-frequency components of the trigger signal. This position is particularly useful for providing stable triggering if the trigger signal contains line-frequency components. Also, the AC LF REJ position provides the best alternate-mode vertical displays at fast sweep rates when comparing two or more unrelated signals.

AC HF REJ. The AC HF REJ pushbutton passes all low-frequency signals between about 30 hertz and 50 kilohertz. Dc is rejected and signals outside the above range are attenuated. When triggering from complex waveforms, this position is useful to provide a stable display of the low-frequency components. AC HF REJ Coupling should not be used when operating in the HF SYNC triggering mode.

DC. The DC pushbutton can be used to provide stable triggering from low-frequency signals which would be attenuated in the other modes. It can also be used to trigger the sweep when the trigger signal reaches a dc level set by the LEVEL control. When using internal triggering, the setting of the Amplifier plug-in unit Position control affects the triggering point.

Main Trigger Source

The Main Triggering SOURCE pushbutton switches select the source of the trigger signal which is connected to the main trigger circuits.

INT. The INT pushbutton connects the trigger signal from the Amplifier plug-in unit. Further selection of the internal trigger signal may be provided by the Amplifier plug-in unit or oscilloscope; see the instruction manuals for these instruments for more information. For most applications, the internal source can be used. However, some applications require special triggering which cannot be obtained in the INT position. In such cases, the LINE or EXT positions of the SOURCE switches must be used.

LINE. The LINE pushbutton connects a sample of the power-line voltage from the oscilloscope to the trigger circuit. Line triggering is useful when the input signal is time-related (multiple or submultiple) to the line frequency. It is also useful for providing a stable display of a line-frequency component in a complex waveform. Line triggering cannot be used when operating in the HF SYNC triggering mode.

EXT. The EXT pushbutton connects the signal from the MAIN TRIG IN connector to the trigger circuit. The external signal must be time-related to the displayed waveform for a stable display. An external trigger signal can be used to provide a triggered display when the internal signal is too low in amplitude for correct triggering, or contains signal components on which triggering is not desired. It is also useful when signal tracing in amplifiers, phase-shift networks, wave-shaping circuits, etc. The signal from a single point in the circuit can be connected to the MAIN TRIG IN connector through a probe or cable. The sweep is then triggered by the same signal at all times and allows amplitude, time relationship, or waveshape changes of signals at various points in the circuit to be examined without resetting the MAIN TRIGGERING controls.

EXT ÷ 10. The EXT ÷ 10 pushbutton operates the same as described for EXT except that the external signal is attenuated. Attenuation of high-amplitude external trigger signals is desirable to increase the effective range of the LEVEL control.

Input Impedance

The input impedance of the MAIN TRIG IN and DLY'D TRIG IN connectors may be selected by the front-panel TERM switch.

IN — 1 MΩ. The 1 MΩ position is suitable for most low- and medium-frequency applications or when using a 10X probe. The 1 MΩ position provide a high input impedance for minimum loading on the trigger signal source.

OUT — 50 Ω. The 50Ω position is recommended for high-frequency applications requiring maximum overall bandwidth. The 50 ohm termination should be used when externally triggering from a 50 ohm system.

Trigger Slope

The Main Triggering SLOPE switch (concentric with the Main Triggering LEVEL control) determines whether the trigger circuit responds on the positive-going or negative-going portion of the trigger signal. The trigger slope cannot be selected when operating in the high-frequency synchronization mode. When the SLOPE switch is in the (+) (positive-going) position, the display start on the positive-going portion of the waveform; in the (—) (negative-going) position, the display starts on the negative-going portion of the waveform (see Fig. 1-5). When several cycles of a signal appear in the display, the setting of the SLOPE switch is often unimportant. However, if only a certain portion of a cycle is

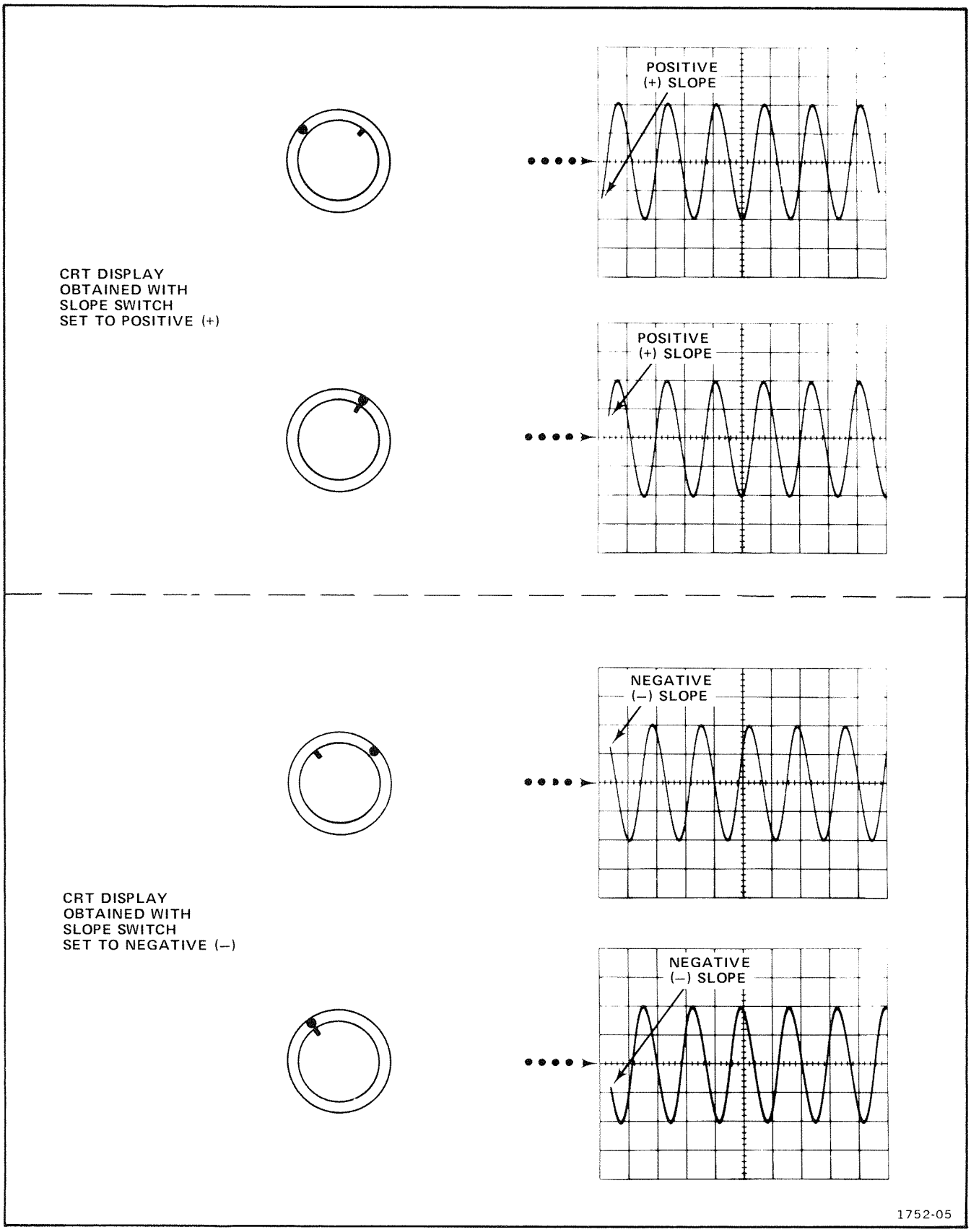


Fig. 1-5. Effect of LEVEL control and SLOPE switch on crt display.

to be displayed, correct setting of the SLOPE switch is important to provide a display which starts on the desired slope of the input signal.

Trigger Level

The Main Triggering LEVEL control determines the voltage level on the trigger signal at which the sweep is triggered when operating in the AUTO, NORM, or SINGLE SWEEP modes. When the LEVEL control is set in the + region, the trigger circuit responds at a more positive point on the trigger signal. When the LEVEL control is set in the – region, the trigger circuit responds at a more negative point on the trigger signal. Fig. 1-5 illustrates this effect with different settings of the SLOPE switch.

To set the LEVEL control, first select the Main Triggering MODE, COUPLING, SOURCE, and SLOPE. Then set the LEVEL control fully counterclockwise and rotate it clockwise until the display starts at the desired point. Less selection of the triggering level is available as the trigger signal frequency exceeds 150 megahertz.

When operating in the Main Triggering HF SYNC Mode, the LEVEL control synchornizes the trigger generator frequency to a subharmonic of the trigger signal frequency. Trigger slope and level cannot be selected.

Selecting Sweep Rates

The TIME/DIV OR DLY TIME switch selects calibrated sweep rates for the delaying sweep. The DLY'D Time/Division switch selects calibrated sweep rates for the delayed sweep. The sweep rate for the delaying sweep is bracketed by the black lines on the clear plastic flange of the TIME/DIV OR DLY TIME switch. Sweep rate of the delayed sweep is indicated by the white line on the DLY'D Time/Division knob. When the white line on the outer knob is set to the same position as the lines on the inner knob, the two knobs lock together and the sweep rate of both generators is changed at the same time. However, when the DLY'D Time/Division knob is pulled outward, the clear plastic flange is disengaged and only the delayed sweep rate is changed. This allows changing the delayed sweep rate without changing the delaying sweep rate. The TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch also select display modes. See Display Mode discussion in this section for further information.

A VARIABLE control is provided concentric with the TIME/DIV OR DLY TIME and DLY'D Time/Division switches (see Fig. 1-4). This control can be used with either the delaying or delayed sweeps as determined by the Time/Div Variable Selector multi-pin connector (internal, See Fig. 1-2 for location). The VARIABLE control also incorporates a two-position switch to determine if the applicable sweep is calibrated or uncalibrated. When the VARIABLE control is pressed in, it is inoperative. However, when pressed and released, the VARIABLE control is activated for uncalibrated sweep rates. The sweep rate can be returned to the calibrated position by pressing the VARIABLE knob in. This feature is useful when a specific uncalibrated sweep rate has been obtained and it is desired to switch between calibrated and uncalibrated sweep rates. Switching from uncalibrated to calibrated and vice-versa does not affect the setting of the VARIABLE control. The VARIABLE control allows the sweep rate in each Time/Division switch position to be increased to at least the next adjacent switch position.

Time Measurement

When making time measurements from the graticule, the area between the second and tenth vertical lines of the graticule provides the most linear time measurements (see Fig. 1-6). Position the start of the timing area to the second vertical line and adjust the TIME/DIV OR DLY TIME switch so the end of the timing area falls between the fourth and tenth vertical lines.

Display Modes

Four display modes can be selected by appropriate settings of the TIME/DIV OR DLY TIME and DLY'D Time/Division switches.

NORMAL SWEEP OPERATION. To select the Normal sweep display mode, press in the DLY'D Time/Division switch and set it to the same sweep rate as the TIME/DIV OR DLY TIME switch. Rotate the Delayed Triggering LEVEL control clockwise into the detent to the RUNS AFTER DELAY TIME position.

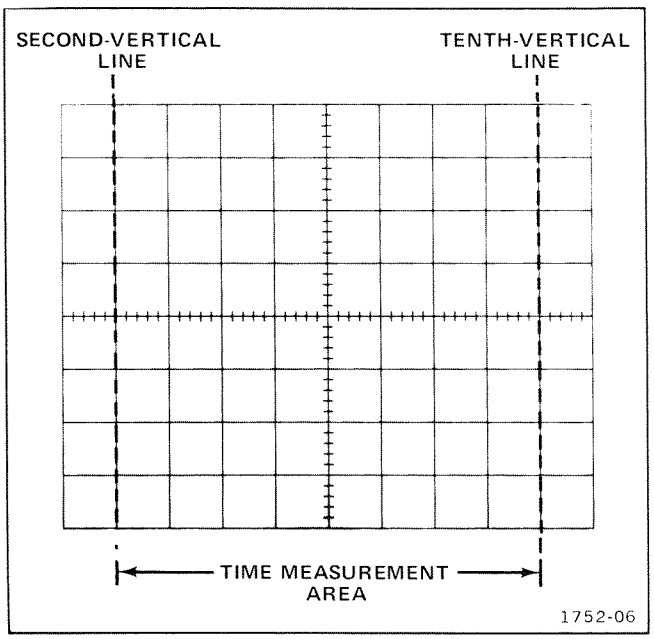


Fig. 1-6. Area of graticule used for most accurate time measurements.

Calibrated sweep rates in the Normal sweep display mode are 0.2 s/Div to 0.5 ns/Div. By using the VARIABLE control (Time/Div Variable Selector connector set for variable Delayed Sweep rates) uncalibrated sweep rates to 0.5 s/Div are available. Triggering in the Normal sweep display mode is controlled by the MAIN TRIGGERING controls.

ALTERNATE SWEEP DISPLAY. To select the Alternate display mode, pull out the DLY'D Time/Division knob and rotate it to a desired sweep rate faster than the TIME/DIV OR DLY TIME switch setting. In this mode, both an intensified sweep and a delayed sweep are displayed (see Fig. 1-7).

The intensified trace of the Alternate sweep display provides an intensified portion on the delaying sweep during the time the delayed sweep is running. The amount of delay time between the start of the delaying sweep and the intensified portion is determined by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial. Triggering for the delaying sweep portion of the intensified trace is controlled by the MAIN TRIGGERING controls; triggering for the intensified portion and the delayed sweep trace is controlled by the Delayed Triggering controls.

The TRACE SEP control vertically positions the intensified trace up to 3.5 divisions above the delayed sweep trace. The brightness of the intensified zone may be varied by the CONTRAST control. The brightness of the intensified sweep may be varied by the 7B92A INTENSITY control.

DELAYED SWEEP DISPLAY. The Delayed sweep display mode is selected when the DLY'D Time/Division switch is pulled out, rotated to the desired sweep rate, and then pushed in. In this mode, only the delayed sweep is displayed.

Calibrated sweep rates in the Delayed sweep mode are available from 0.2 s/Div to 0.5 ns/Div. By using the VARIABLE control (Time/Div Variable Selector connector set for variable delayed sweep rates), uncalibrated delayed sweep rates to 0.5 s/Div are available. Triggering for the delayed sweep is controlled by the Delayed Triggering controls.

Delay Time Multiplier

The DELAY TIME MULT dial (functional in the Delayed, Alternate, or Mainframe Delaying modes) provides 0 to 9.8 times continuous sweep delay. The amount of time that the delaying sweep runs before the start of the delayed sweep is determined by the settings of the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial.

For example, a DELAY TIME MULT dial setting of 3.55 corresponds to 3.55 crt divisions of delaying sweep. Thus, 3.55 multiplied by the delaying sweep rate, indicated by the TIME/DIV OR DLY TIME switch, gives the calibrated delay time before the start of the delayed sweep.

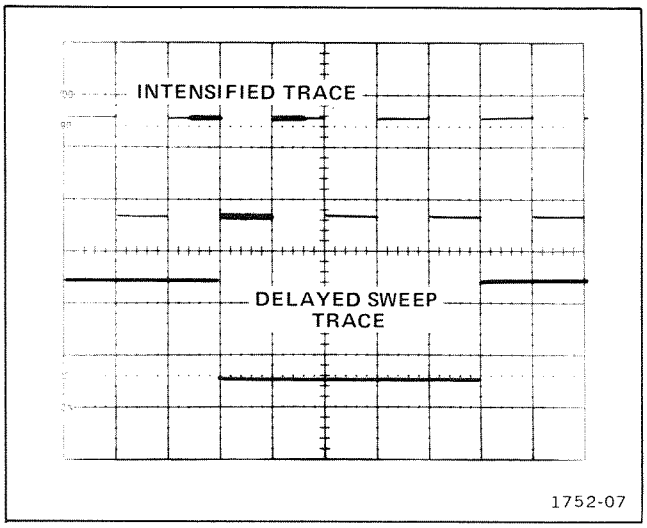


Fig. 1-7. Typical alternate sweep display.

Delayed Sweep Triggering

The Delayed Triggering LEVEL control determines the delayed triggering mode, and delayed triggering level. When the LEVEL control is in the RUNS AFTER DLY TIME detent position (fully clockwise), the delayed sweep starts immediately after the delay time (determined by the TIME/DIV OR DLY TIME switch and DELAY TIME MULT dial). This mode permits selection of continuously variable delay times by rotating the DELAY TIME MULT dial. The Delayed Triggering LEVEL control and SLOPE, COUPLING, and SOURCE switches are inoperative.

When the delayed sweep is triggerable (Delayed Triggering LEVEL out of the RUNS AFTER DELAY detent), the delayed sweep does not start at the completion of the delay time. Instead, it waits until a trigger pulse is received by the Delayed Triggering circuits. The delay time in this mode is dependent not only on the settings of the delay time controls, but on the Delayed Triggering controls and the occurence of the delayed-sweep triggering signal as well. The primary purpose of this mode is to eliminate jitter from the delayed sweep waveform. Since the delayed sweep is triggered by the input waveform, jitter is eliminated from the delayed sweep display even though it may be inherent in the input waveform. When jitter in the delayed sweep display is not a problem, the RUNS AFTER DLY TIME mode should be used.

In the Delayed Sweep Triggerable mode, the Delayed Triggering LEVEL control is rotated to select the amplitude point on the trigger signal at which the delayed sweep is triggered. The SLOPE, COUPLING, and SOURCE functions are the same for delayed triggering as for MAIN TRIGGERING (see Main Triggering SLOPE, COUPLING, SOURCE, and TERM switch discussions in this section).

THEORY OF OPERATION

This section of the manual contains a description of the circuitry used in the 7B92A. The description begins with a discussion of the instrument using the block diagram in the Diagrams section. Each circuit is then described in detail with a block diagram provided to show the major interconnections between circuits, and the relationship of the front-panel controls to each circuit.

BLOCK DIAGRAM DESCRIPTION

The Main Trigger Generator ensures a stable crt display by starting each sweep at the same point on the waveform. The output of the Main Trigger Generator is a fast-rise pulse which starts the Delaying Sweep Generator.

The Delaying Sweep Generator produces a linear voltage ramp. This ramp is displayed when the time base is in the Alternate mode. The Delaying Sweep ramp is also used as a delay-time reference when the time base is in the Alternate or Delayed mode. The delay time is set by the slope of the Delaying Sweep ramp and the Delay Pickoff comparator voltage. When the time base is in the Normal Sweep mode, the comparator voltage is set to 0 (zero) and the Delay Pickoff outputs a pulse when the Delaying Sweep ramp starts.

The Delayed Trigger Generator produces a fast-rise pulse to start the Delayed Sweep Generator. When the Delayed Trigger Generator is in the Runs After Delay Time mode, the pulse from the Delay Pickoff produces the Delayed Trigger output pulse. When the Delayed Trigger Generator is in the Triggerable After Delay Time mode, the pulse from the Delay Pickoff enables the Delayed Trigger Generator, which then processes the input signal in the same way as the Main Trigger Generator.

The Delayed Sweep Generator produces a linear voltage ramp which is displayed as either the Normal or Delayed sweep.

The Horizontal Logic controls the Main Trigger Generator, the Delayed Trigger Generator, and the Output Amplifier. The Horizontal Logic produces a Trigger Disable pulse which resets the trigger generators and allows the sweep generators to reset and stabilize before starting another ramp. The Horizontal Logic also controls which sweep ramp is passed through the Output Amplifier to be displayed.

The Output Amplifier horizontally positions the crt display and couples the proper sweep ramp(s) to the oscilloscope.

Main Trigger Generator ◇2◇

The Main Trigger Generator provides a stable display by starting the Delaying Sweep Generator at a selected point on the input waveform. The triggering point can be varied by the LEVEL control and may be on either the positive or negative slope of the waveform. The input signal may be the waveform being displayed (INT), a waveform from an external source (EXT or EXT ÷ 10), or a sample of the power-line voltage (LINE).

The bandwidth of the Main Trigger Generator is set by the COUPLING switches. Dc coupling provides a bandwidth of dc to 500 megahertz. Ac coupling blocks dc and frequencies below about 30 hertz. AC LF REJ (ac coupling, low-frequency rejection) passes frequencies above 30 kilohertz. AC HF REJ (ac coupling, high-frequency rejection) passes frequencies between 30 hertz and 30 kilohertz.

EXTERNAL SOURCE. The external trigger signal is connected to the Main Trigger Generator through the MAIN TRIG IN connector, J100. The input impedance at J100 can be set to either 1 megohm or 50 ohms by TERM switch S205.

If the SOURCE switch is set to EXT, relay K6 energizes and applies the trigger signal to C11 and R11. Signals below 30 kilohertz are connected to the gate of Q22A through R14, C12, R12, and R11. Signals between 30 kilohertz and 100 megahertz are connected to the gate of Q22A through R17 and C11. These signals pass through Q22A and Q24 to pin 3 of U64. Signals above 100 megahertz are connected to pin 4 of U64 through C20. (Pins 3 and 4 of U64 are internally connected.)

If the SOURCE switch is set to EXT ÷ 10, relay K6 de-energizes and applies the input signal to C10 and R9. The signal is then divided by 10 before being applied to the gate of Q22A.

INTERNAL SOURCE. The internal trigger signal from the vertical channel of the oscilloscope is connected to the Main Trigger Generator through J150. Signals below 30 kilohertz

are amplified by U128B and connected, along with the offset from the LEVEL control, to pin 1 of U64 and to the base of Q72. Signals above 30 kilohertz are coupled through C46 to pin 14 of U64. (Pins 13 and 14 of U64 are internally connected.)

INTERNAL-EXTERNAL AMPLIFIER. Amplifier U64 is a dual-channel, differential amplifier with a common reference voltage for both channels. The input channel to be amplified is selected by the bias on pins 2 and 15. When R66 is connected to −15 volts, the internal trigger signal (pins 13 and 14) is amplified. When R67 is connected to −15 volts, the external trigger signal (pins 3 and 4) is amplified. The push-pull outputs (pins 8 and 9) are connected to the inputs (pins 3 and 14) of U84.

When AC HF REJ (ac coupling, high-frequency rejection) coupling is selected, R66 and R67 are both disconnected from −15 volts, disabling U64. The low-frequency signals (below 30 kilohertz) are then connected to U84 through Q72 (internal signals) or Q74 (external or line signals).

SLOPE SELECTOR AMPLIFIER. Amplifier U84 selects the slope of the input waveform on which triggering occurs. If pin 6 is high, the time base will trigger on the positive slope of an internal signal or the negative slope of an external signal. If pin 6 is low, the time base will trigger on the negative slope of an internal signal or the positive slope of an external signal. (The internal signal is inverted by U64 or Q72 before being applied to U84.)

The push-pull outputs (pins 7, 8 and 9, 10) of U84 are connected to the inputs (pins 3 and 13) of U104.

OUTPUT AMPLIFIER. Amplifier U104 provides a final gain stage before driving the trigger-output tunnel diodes. The push-pull output of U104 (pins 8 and 9) drives the emitter and base of Q112. Transistor Q112 converts the push-pull output of U104 to a single-ended output to drive tunnel diode CR114. As the emitter-base voltage of Q112 increases, the current through CR114 increases. When the current through CR114 reaches 10 milliamperes, it switches to its high level. The fast risetime of CR114 is coupled through C141 to the Arming Tunnel Diode, CR172, which also switches high. The high level at the anode of CR172 increases the current through the Gate Tunnel Diode, CR176. The risetime of CR114 is also coupled through C124 (and a 1 nanosecond delay line) to CR176. The combination of the added current from CR172 and the pulse from CR114 (1 nanosecond later) switches CR176 high. The fast-rise pulse from CR176 is connected to the Sweep Start Comparator of the Delaying Sweep Generator.

TRIGGER DISABLE. At the end of each sweep, the Horizontal Logic produces a Trigger Disable pulse to reset the Arming and Gate Tunnel Diodes to a low level and allow enough time for the sweep generator to reset and stabilize before another trigger pulse starts the next sweep. The Trigger Disable signal is connected to the base of Q151 through interconnecting pin CA. When the Trigger Disable pulse is high, Q148 and Q158 turn on, removing the bias current from CR172 and CR176, respectively. The rest of the trigger generator operates normally, but CR172 and CR176 will not switch to a high level.

HIGH-FREQUENCY SYNCHRONIZATION. The HF SYNC mode increases the sensitivity of the trigger generator at frequencies above 100 megahertz. In the HF SYNC mode, the trigger generator free runs at a frequency determined by the LEVEL control, R50. The LEVEL control adjusts the free-running frequency of the trigger generator to be close enough to the signal frequency, or subharmonic, to synchronize with it.

The positive feedback loop required to maintain oscillation is through Q104 to input pin 4 of U104, through Q112 to CR114, and back to Q104. A negative feedback loop is also present to maintain synchronization of the oscillator with the trigger signal. The negative feedback loop is through U128A to input pin 1 of U64, through U84, U104, and Q112 to CR114, and back to U128A.

Delaying Sweep Generator ◇4

The Delaying Sweep Generator produces a linear ramp waveform when gated by the Main Trigger Generator. The Delaying Sweep ramp is displayed as the intensified sweep of the Alternate display. The Delaying Sweep ramp is also the time reference for the Delay Pick-off comparator.

The linear ramp waveform is produced by charging a capacitor from a constant current source. The slope of the ramp determines the time/division of the displayed trace and the delay time set by the DELAY TIME MULT dial.

RAMP GENERATOR. When a trigger pulse is received from the Main Trigger Generator, Q402 cuts off and Q404 conducts, driving the base of Q410 high. When Q410 turns on, Q412 turns off and the timing current from Q436 starts to charge the timing capacitors in a positive ramp. The timing current is determined by the timing resistors in the emitter circuit of Q436 and the reference voltage at the base of Q436. The reference is set by the SWP CAL adjustment, R750. Integrated circuit U752 is a unity-gain, voltage follower. Diode CR753 compensates for the base-emitter

voltage drop of Q436, Q494, and Q536. Transistors Q446A and B and Q450 form a unity-gain, voltage-follower for the delaying sweep signal. The output of Q450 is attenuated by divider R468, R469, and R458 before it is connected to the Output Amplifier. The output of Q450 also drives the Sweep Stop Comparator, the Baseline Stabilizer, and the Delay Pickoff.

SWEEP STOP COMPARATOR. Transistors Q462 and Q464 control the sweep length. When the Delaying Sweep ramp exceeds the voltage on the base of Q464, Q462 turns off and Q464 provides a positive pulse to end the Auxiliary Gate and produce the Holdoff Start pulse.

AUXILIARY GATE GENERATOR. When the trigger pulse cuts off Q402, the negative pulse at the base of Q472 causes the Auxiliary Gate at the emitter of Q474 to go high. The Auxiliary Gate signal remains high until a positive pulse from the Sweep Stop Comparator turns Q468 on, ending the Auxiliary Gate. The positive pulse from the Sweep Stop Comparator is also coupled through CR811 to the base of Q812 and results in a positive Holdoff Start pulse at the collector of Q816. The Holdoff Start pulse is connected to the Horizontal Logic which starts the Trigger Disable pulse.

BASELINE STABILIZER. When the Trigger Disable pulse resets the output of the Main Trigger Generator to a low level, Q402 turns on and Q404 turns off. The low level on the base of Q410 turns on Q412, which discharges the timing capacitors. With the timing capacitors discharged, the Baseline Stabilizer maintains a constant level from which the ramp begins. The output of Q450 is compared with the reference on the base of Q420A. If the output is less than the reference, Q430 charges the timing capacitors through CR434 until the output and reference voltages are equal. If the output is greater than the reference, Q430 conducts less and the timing capacitors discharge through Q412. When the two voltages are equal, the currents through Q430 and Q436 equal the current through Q412, holding the voltage on the timing capacitors constant.

DELAY PICKOFF. The Delay Pickoff allows a continuously variable delay of 0 to 9.8 times the TIME/DIV OR DLY TIME control setting between the start of the Delaying Sweep Generator and the start of the Delayed Sweep Generator. The Delay Pickoff uses the Delaying Sweep ramp as a time reference by comparing the ramp voltage to a voltage set by the DELAY TIME MULT. When the ramp voltage exceeds the DELAY TIME MULT voltage, a pulse is coupled to the Delayed Trigger Generator.

When a trigger pulse is received from the Main Trigger Generator, Q493 cuts off and Q492 conducts through CR493. As the Delaying Sweep ramp exceeds the voltage on the base of Q482B, Q482A cuts off and Q482B conducts. With both Q492 and Q482B conducting, CR493 switches to a high level. The positive pulse from CR493 is coupled through Q382 to enable the Delayed Trigger Generator.

Transistor Q494 is a constant current source which maintains a constant voltage across DELAY TIME MULT, R490. When the time base is set for a Normal sweep mode, S490 grounds R499 and cuts off Q494. With Q494 cut off, the voltage at the input (pin 3) of voltage follower U492 is zero. Therefore, in the Normal sweep mode, the Delay Pickoff outputs a pulse as soon as the Main Trigger pulse cuts off Q493.

Delayed Trigger Generator ◇3

When the Delayed Triggering LEVEL control is in the RUNS AFTER DELAY TIME position, or the time base is in the Normal sweep mode, the Delayed Trigger Generator outputs a trigger pulse to the Delayed Sweep Generator as soon as the Delay Pickoff pulse is received. If the Delayed Triggering LEVEL control is out of the RUNS AFTER DELAY TIME detent, and the time base is in the Delayed or Alternate sweep modes, the Delayed Trigger Generator is enabled by the Delay Pickoff pulse. The Delayed Trigger Generator then operates much the same as the Main Trigger Generator.

EXTERNAL SOURCE. The external trigger signal is connected to the Delayed Trigger Generator through the DLY'D TRIG IN connector, J200. The input impedance at J200 can be set to either 1 megohm or 50 ohms by TERM switch S205.

Input signals below 100 megahertz are coupled through Q222A and Q224 to pin 3 of U264. Input signals above 100 megahertz are coupled through C226 to pin 4 of U264. (Pins 3 and 4 of U264 are internally connected.)

INTERNAL SOURCE. When the Delayed Trigger Generator is using an internal trigger signal, the internal trigger signal from the vertical channel of the oscilloscope is connected to the Delayed Trigger Generator through J250. Signals above 30 kilohertz are coupled through C246 to pin 14 of U264. (Pins 13 and 14 of U264 are internally connected.) Signals below 30 kilohertz are connected to amplifier U240 through R253. The output of amplifier U240 is coupled, along with the offset from the LEVEL control, to pin 1 of U264.

SLOPE SELECTOR AMPLIFIER. Amplifier U284 selects the slope of the input waveform on which triggering occurs. If pin 6 is high, the time base will trigger on the negative

slope. If pin 6 is low, the time base will trigger on the positive slope. (The internal signal is inverted by U264 before being applied to U284.)

The push-pull outputs (pins 7, 8 and 9, 10) of U284 are connected to the inputs (pins 3 and 13) of U304.

OUTPUT AMPLIFIER. Amplifier U304 provides a final gain stage before driving the trigger-output tunnel diodes. The push-pull outputs of U304 (pins 8 and 9) drive the emitter and base of Q312. Transistor Q312 converts the push-pull output of U304 to a single-ended output to drive tunnel diode CR314. As the emitter-base voltage of Q312 increases, the current through CR314 increases. When the current through CR314 reaches 10 milliamperes, it switches to its high level. The fast rise of CR314 is coupled through C341 to the Arming Tunnel Diode, CR372, which also switches high. The high level at the anode of CR372 increases the current through the Gate Tunnel Diode, CR376. The rise of CR314 is also coupled through C324 (and a 1 nanosecond delay line) to CR376. The combination of the added current from CR372 and the pulse from CR314 (1 nanosecond later) switches CR376 high. The fast-rise pulse from CR376 is connected to the Delayed Sweep Generator.

TRIGGER DISABLE. At the end of each Delaying Sweep, the Horizontal Logic produces a Trigger Disable pulse to reset the Arming and Gate Tunnel Diodes to a low level and allow enough time for the sweep generator to reset and stabilize before another trigger pulse starts the next sweep. The Trigger Disable signal is connected to the base of Q332. When the Trigger Disable pulse is high, Q348 and Q358 turn on, removing the bias current from CR372 and CR376 respectively. With no bias current, CR372 and CR376 both reset to a low level.

DELAYED TRIGGERING MODES. The Delayed Trigger Generator operates in one of three modes; Normal, Delayed (Runs After Delay Time), and Delayed (Triggerable After Delay Time).

In the Normal mode (both Time/Division knobs locked together), Q334 is cut off and U284 and U304 are both disabled. Additional current for CR372 and CR376 is supplied by R335 and R337. When the Delay Pickoff pulse cuts off CR381, CR372 switches high. The fast rise of CR382 is coupled through R373 and C373 to CR376 which also switches high.

In the Delayed (Runs After Delay Time) mode, the Delayed Trigger Generator operates the same as in the Normal mode. However, Q334 is cut off by the RUNS AFTER DELAY TIME switch, S250, and there is a delay between the time the Delaying Sweep Generator starts and the Delay Pickoff pulse cuts off CR381.

In the Delayed (Triggerable After Delay Time) mode, the entire Delayed Trigger Generator is operating, but the Arming Tunnel Diode, CR372, is held low by the Delay Pickoff signal until after the delay time.

When the Delay Pickoff pulse cuts off CR381, the next positive pulse from CR314 sets CR372 high and 1 nanosecond later sets CR376 high.

Delayed Sweep Generator ◇5

The Delayed Sweep Generator produces a linear ramp waveform when gated by the Delayed Trigger Generator. The Delayed Sweep ramp is displayed as the Normal or Delayed Sweep trace.

The linear ramp waveform is produced by charging a capacitor from a constant current source. The slope of the ramp determines the time/division of the displayed trace.

RAMP GENERATOR. When a trigger pulse is received from the Delayed Trigger Generator, Q502 cuts off and Q504 conducts, driving the base of Q510 high. When Q510 turns on, Q512 turns off and the timing current from Q536 starts to charge the timing capacitors in a positive ramp. The timing current is determined by the timing resistors in the emitter circuit of Q536 and the reference voltage at the base of Q536. Transistors Q546A and B and Q550 form a unity-gain, voltage follower for the delaying sweep signal. The output of Q550 is attenuated by divider R557 and R558 before it is connected to the Output Amplifier. At 0.5 nanosecond/division, the Delayed Sweep ramp is not attenuated. The output of Q550 also drives the Sweep Stop Comparator and the Baseline Stabilizer.

SWEEP STOP COMPARATOR. Transistors Q562 and Q564 control the sweep length. When the Delayed Sweep ramp exceeds the voltage on the base of Q564, Q562 turns off and Q564 provides a positive pulse to end the Main Gate.

MAIN GATE GENERATOR. When the trigger pulse cuts off Q502, the negative pulse at the base of Q572 causes the Main Gate at the emitter of Q584 to go high. The Main Gate signal remains high until a positive pulse from the Sweep Stop Comparator turns Q568 on, ending the Main Gate.

BASELINE STABILIZER. When the Trigger Disable pulse resets the output of the Delayed Trigger Generator to a low level, Q502 turns on and Q504 turns off. The low level on the base of Q510 turns on Q512 which discharges the timing capacitors. With the timing capacitors discharged, the Baseline Stabilizer maintains a constant output level. The output of Q550 is compared with the reference on the base of Q522. If the output is less than the reference, Q530 charges the timing capacitors through CR534 until the output and reference voltages are equal. If the output is greater than the reference, Q530 conducts less and the timing capacitors discharge through Q512. When the two voltages are equal, the currents through Q530 and Q536 equal the current through Q512, which holds the voltage on the timing capacitors constant.

AUXILIARY Y AND Z AXIS. The Aux Y and Aux Z outputs allow the 7B92A to control the trace separation, intensity, and contrast of the Delaying Sweep trace when the time base is operating in the Alternate mode.

The Aux Y, Z Inhibit signal disables both outputs except when the time base is in the Alternate mode and the delaying sweep is being displayed. The CONTRAST control is active when the above conditions are met and the Delayed Sweep Generator is running. The CONTRAST control varies the brightness of the intensified zone.

Horizontal Logic ◇7◇

The Horizontal Logic controls the different sweep modes and functions of the time base (e.g., sweep display, holdoff, auto-trigger, single-sweep, etc.). The Horizontal Logic also generates control signals for the oscilloscope mainframe.

SWEEP CONTROL IC. The sweep control IC, U820 generates most of the control signals used in the 7B92A.

When the Main Triggering MODE is set to AUTO, the Sweep Control IC supplies a triggering gate to the Delaying Sweep Generator when the Main Trigger Generator is not triggered. The auto triggering circuit starts to operate if pin 19 of U820 is held low by S100 and an Auto Disable Pulse has not been received for about 40 milliseconds.

When the Main Triggering MODE is set to SINGLE SWEEP, the Sweep Control IC allows one ramp to be displayed. The Trigger Disable signal then prevents another ramp from running until U820 is manually reset by pressing the SINGLE SWEEP-RESET button.

LOCKOUT. When the 7B92A is used in a 4-channel oscilloscope mainframe in an alternate mode with another time base, a Lockout signal prevents the 7B92A from running while the other time base is being displayed. The Lockout signal is coupled through the Lockout Amplifier, Q802, Q804 and Q806 to pin 18 of U820. The Lockout signal drives the Trigger Disable output (pin 17) high to reset and hold the trigger generator outputs low.

The 7B92A also outputs a Holdoff Pulse (pin B4) to the oscilloscope mainframe which controls the Lockout Pulse to the other time base. The Holdoff pulse occurs at the end of each Delaying Sweep ramp when the time base is in the Normal or Delayed sweep mode. When the time base is in the Alternate mode, the Holdoff pulse occurs after the Delayed Sweep ramp is displayed.

SWEEP DISPLAY. The Sweep Display flip-flop, U856A determines which sweep ramp is displayed. When the time base is in the Normal or Delayed sweep mode, S800 connects R861 and R862 to ground. With the Set input of U856A low, pin 5 is held high and pin 6 is held low. The high level on pin 5 of U856A inhibits the Delaying Sweep signal at the Output Amplifier. The low on pin 6 allows the Delayed Sweep signal to be coupled through the Output Amplifier to the oscilloscope mainframe.

If the time base is in the Alternate mode, the Set, J and K inputs of U856A are all high. The end of each Aux. Gate pulse toggles U856A, which allows alternate display of the Delaying and Delayed Sweep ramps.

Output Amplifier ◇6◇

The Output Amplifier connects the sweep signal to the oscilloscope mainframe and provides an offset voltage to position the trace on the graticule.

The Delaying Sweep and Delayed Sweep ramps are connected to Q900 and Q910, respectively. The Delaying Sweep Inhibit and Delayed Sweep Inhibit signals saturate either Q902 or Q912 to prevent that sweep ramp from being amplified and coupled to the oscilloscope mainframe.

The POSITION control, R930 offsets the ramp waveform to horizontally position the displayed trace. Transistors Q926 and Q932 turn on when contact 52 is closed and the Delaying Sweep Inhibit signal is high. These transistors provide additional offset at fast sweep rates.

The positioning offset voltage and the selected sweep ramp are connected to Q942 and Q952. The push-pull output is connected to the oscilloscope mainframe through pins A11 and B11.

The Auxiliary Sweep Amplifier, Q456 and Q458, is a unity-gain amplifier which couples the Delaying Sweep ramp to the mainframe. This signal may be connected to the + Sawtooth output of the oscilloscope mainframe.

Readout ◈8◈

The oscilloscope readout system in 7000-series oscilloscopes provides alpha-numeric display of information encoded by the plug-in units. This display is presented on the crt on a time-shared basis with the waveform display.

The oscilloscope readout system produces a pulse train consisting of 10 negative-going pulses called time-slots. Each pulse represents a possible character in a readout word, and is assigned a time-slot number corresponding to its position in the word. Each time-slot pulse is directed to 1 of 10 lines, labelled TS-1 through TS-10 (time-slots 1 through 10), which are connected to the vertical and horizontal plug-in compartments. Two output lines, row and column, are connected from each channel (2 channels per plug-in compartment) back to the oscilloscope readout system.

Data is encoded on the output lines either by connecting resistors between the output lines and the time-slot input lines, or by generating equivalent currents. The resultant output is a sequence of analog current levels on the row and column output lines. The row and column current levels address a character matrix during each time-slot, thus selecting a character to be displayed or a special instruction to be followed.

The encoding resistors are selected by the TIME/DIV OR DLY TIME and DLY'D Time/Division switches. Table 2-1 lists the resistors that control the readout characters and functions.

TABLE 2-1
7B92A Readout Character Selection

Characters	Time-Slot	Description	Encoded By	
			Channel (Delaying Sweep)	Channel (Delayed Sweep)
Decimal	TS-1	Determines decimal magnitude (number of zeros displayed or prefix change information)	R761, R762 R781	R771, R772 R791
Uncalibrated (>)	TS-3	Indicates calibrated or uncalibrated sweep rates	R782	R792
1, 2, 5	TS-4	Scaling	R763, R764 R785	R773, R774 R794
m, μ, n, p	TS-8	Defines the prefix which modifies the units of measurement	R765, R766 R783, R786	R775, R776 R788, R795
s (seconds)	TS-9	Defines the unit of measurement	R784, R787	R789, R796

MAINTENANCE

This section of the manual contains information for use in preventive and corrective maintenance of the 7B92A.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, lubrication and calibration. Preventive maintenance performed at regular intervals will improve the reliability of the instrument. How often preventive maintenance is performed depends upon environmental conditions.

Cleaning

The 7B92A should be cleaned as often as operating conditions require. A heavy accumulation of dust on components acts as an insulating blanket that prevents efficient heat dissipation. Dust may also provide a current leakage path, particularly under conditions of high humidity, which could result in reduced operating efficiency or an overall failure.

CAUTION

Cleaning agents containing plastic damaging chemicals such as benzene, toluene, xylene, acetone or similar solvents must not be used. Methyl alcohol, ethyl alcohol, freon TE or a solution of mild detergent and water may be used.

EXTERIOR. Loose dust accumulated on the outside of the instrument 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 with a cleaning 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 cleaning solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Semiconductor Checks

Periodic checks of the transistors, FET's, and IC's used in the time base 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 calibration; substandard semiconductors will usually be detected at that time.

Recalibration

To ensure accurate measurements, check the calibration of this instrument after 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

The following information is provided to facilitate troubleshooting of the 7B92A. 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 Section 2, Theory of Operation.

Troubleshooting Aids

DIAGRAMS. Circuit diagrams are given on foldout pages in Section 7. The component number and electrical value of each component in this instrument is shown on the diagrams.

CIRCUIT BOARDS. Figure 7-2 (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. Illustrations of the circuit boards are shown in the Diagrams section. Each electrical component on the board 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 7B92A 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 or dot on the circuit board for normal circuit operation.

INTERFACE CONNECTOR CONTACT LOCATIONS. The interface circuit board connects the 7B92A to the associated oscilloscope. See diagram 9 at the back of this manual for the location of the contacts on the interface connector.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 7B92A.

1. Transistor Tester

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

2. Volt-ohmmeter

   20,000 ohms/volt. 0 to 500 volts dc. Accurate within 3%.

3. Test Oscilloscope

   Dc to 100 megahertz frequency response, 5 millivolts to 5 volts/division. Use a 10X probe.

4. Plug-In Extender

   Rigid plug-in extender, Tektronix Part Number 067-0589-00. (Permits operation of the 7B92A outside the plug-in compartment of the oscilloscope for better access during troubleshooting.)

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 7B92A, 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 Amplifier plug-in units can be checked for proper operation by substituting another time-base unit that is known to be operating properly (preferably another 7B92A or similar unit). If the trouble persists after substitution, the oscilloscope or Amplifier 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 only one circuit. The apparent trouble may 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, or damaged components.

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 damage.

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 but 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 plug-in 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 7B92A. Components that are soldered in place are best checked by disconnecting one end to isolate the measurement from the effects of surrounding circuitry.

a. 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).

b. 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.

NOTE

The ferrite beads placed on leads of some transistors and integrated circuits must be reinstalled on the proper lead when replacing these components.

c. Diodes. A diode can be checked for an open or for a short circuit by measuring the resistance between terminals with an ohmmeter set to the R X 1k scale. The diode resistance should be very high in one direction and very low when the meter leads are reversed. Do not check tunnel diodes or back diodes with an ohmmeter.

CAUTION

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

Tunnel diodes should be checked on a dynamic transistor checker, such as a Tektronix Type 577 Curve Tracer. Sockets are provided for at least one lead of each tunnel diode to facilitate removal.

d. 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.

e. 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.

f. 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 Corrective Maintenance. Be sure to check the performance of any circuit that has been repaired.

CORRECTIVE MAINTENANCE

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 parts replacements for the 7B92A 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.

Soldering Techniques

WARNING

Disconnect the instrument from the power source before soldering.

The following rules should be observed when removing or replacing parts:

1. Use a low-wattage soldering iron (not over 15 watts).
2. Do not apply more heat, or heat for a longer time, than is absolutely necessary.
3. Use some form of vacuum solder remover when removing multi-lead devices.
4. Do not apply any solvent containing ketones, esters or halogenated hydrocarbons.
5. To clean, use only water-soluble detergents, ethyl, methyl or isopropyl alcohol.

Component Removal and Replacement

WARNING

Disconnect the instrument from the power source before replacing components.

SEMICONDUCTORS. 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. Ferrite beads must be reinstalled on the proper leads. 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 a direct replacement. Install in the same manner as the original. Figure 8-1 (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 PINS. 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 that mates with the interconnecting pin is used. The following information provides the replacement procedure for the various interconnecting methods.

Coaxial-Type End-Lead Connectors. Replacement of the coaxial-type end-lead connectors requires special tools and techniques. Only experienced maintenance personnel should attempt 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.

Circuit Board Pins and Pin Sockets. A circuit board pin replacement kit, including necessary tools, instructions, and replacement pins, is available from Tektronix, Inc. (Tektronix Part Number 040-0542-00).

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 qualified service personnel. Refer to your local Tektronix Field Office or Service Center.

The pin sockets on the circuit boards are soldered to the board. To replace one of these sockets, first unsolder the pin socket (use 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 new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board; be careful not to get solder into the socket.

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 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.

SWITCHES. Pushbutton and cam-type switches are used in the 7B92A. Contact alignment and spacing is critical to the operation of these switches. Therefore, defective switches should be replaced as a unit or repaired only by personnel experienced with switches of this type. Your local Tektronix, Inc. Field Office can provide additional repair information and instructions.

Cam Switch. The cam switch (TIME/DIV OR DLY TIME and DLY'D Time/Division) consists of two rotating cams and the associated contacts mounted on the Interface and Readout boards. The cam switch can be disassembled for cleaning, repair, or replacement; however, it is recommended that the cam assembly be removed from the instrument as a unit.

Remove the cam switch as follows:

1. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 0.2 s and press the knob in.

2. Press and release the VARIABLE knob.

3. Loosen the set screws and remove the VARIABLE and DLY'D Time/Division knobs.

4. Loosen the set screw in the clear plastic flange (behind sub-panel) and remove the TIME/DIV OR DLY TIME flange.

5. Remove the pin connector from the micro-switch (in front of the cam) to the front of the Interface board.

6. Remove the Sweep Logic board.

7. Remove the 11 mounting screws holding the cam-switch assembly to the Interface board. Do not remove the mounting screws from the Readout board.

8. Carefully lift the cam-switch assembly and Readout board from the interconnecting pins at the rear of the Readout board.

9. To replace the cam-switch assembly, reverse the above procedure. Be sure to replace the TIME/DIV OR DLY TIME flange and the DLY'D Time/Division knob in the same position from which they were removed.

Triggering Switches. Remove the Main and Delayed Triggering switches as follows:

1. Perform steps 1 through 4 of the cam-switch replacement procedure.

2. Loosen the set screws and remove all front panel knobs except the DELAY TIME MULT dial.

3. Unsnap the front panel from the top and bottom of the subpanel.

4. Remove the spring from the 7B92A release latch.

5. Remove the 4 screws holding the subpanel to the chassis and pull the subpanel forward.

6. Remove all necessary multi-pin and coaxial connectors.

7. Remove the mounting screws from the desired switch(es).

8. The MAIN TRIGGERING switches must be removed as an assembly (all three switches) and then disassembled further.

9. To replace the triggering switches, reverse the above procedure.

PERFORMANCE CHECK / CALIBRATION

PRELIMINARY INFORMATION

Calibration Interval

To ensure instrument accuracy, check the calibration of the 7B92A 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

OUTLINE. To aid in locating a step in the Performance Check or Calibration Procedure, outlines are given preceding Part I—Performance Check and Part II—Calibration Procedure.

PERFORMANCE CHECK. The performance of this instrument can be checked without removing the covers or making internal adjustments by performing Part I—Performance Check. This procedure does not check every facet of the instrument's calibration; but is concerned primarily with those portions of the instrument essential to measurement accuracy and correct operation.

CALIBRATION PROCEDURE. Completion of Part II—Calibration Procedure ensures that this instrument meets the electrical specifications given in the Operators manual. Where possible, instrument performance is checked before an adjustment is made. For best overall instrument performance when performing a complete calibration procedure, make each adjustment to the exact setting, even if the CHECK— is within the allowable tolerance.

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.

The Calibration Procedure is divided into Triggering Calibration and Sweep Calibration. To perform a partial calibration, start at the beginning of the desired section. 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.

TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or their equivalents, are required for complete calibration of the 7B92A. Specifications given for the test equipment are the minimum necessary for accurate calibration. Therefore, some of the specifications listed here may differ from the actual performance capabilities of the test equipment. 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 test equipment instruction manual if more information is needed.

If only a Performance Check procedure is performed, not all of the listed test equipment will be required. Items used only for the Calibration Procedure are indicated by footnote 1. The remaining pieces of equipment are items common to both the Performance Check and the Calibration Procedure.

Special Calibration Fixtures

Special Tektronix calibration fixtures are used 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

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 Minimum Specifications column carefully to see if any other equipment is available which might suffice.

TABLE 4-1
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
1. Calibration Oscilloscope	Bandwidth 500 MHz	Used throughout procedure to provide a display.	a. Tektronix 7904 Oscilloscope.
2. Wide-Band Amplifier Plug-In Unit	Bandwidth 500 MHz; Deflection factor 50 mV to 5 V	Used throughout procedure to provide vertical input to oscilloscope system.	a. Tektronix 7A19 Amplifier plug-in unit.
3. Fast-Rise Pulse Generator[1]	200 mV positive-going output pulse; risetime, 70 ps or less	Time Position check and adjustment.	a. Tektronix Type 284 Pulse Generator.
4. Time-Mark Generator	Marker outputs, 2 ns to 0.5 s within 0.1%	Sweep timing checks and adjustments. Sweep delay checks and adjustments.	a. Tektronix TG501 Time-Mark Generator.[2] b. Tektronix 2901 Time-Mark Generator.
5. Low-Frequency Sine-wave Generator	Frequency, 30 Hz to 50 kHz; output amplitude, variable from 200 mV to 8 V	Low-frequency triggering checks and adjustments.	a. Tektronix FG503 Function Generator.[2] b. General Radio 1310-B Oscillator.
6. Medium-Frequency Signal Generator	Frequency, 20 MHz to 100 MHz; output amplitude, variable from 100 mV to 500 mV	20 megahertz triggering checks.	a. Tektronix SG503 Sine-Wave Generator.[2] b. Tektronix Type 191 Sine-Wave Generator.
7. High-Frequency Signal Generator	Frequency, 100 MHz to 500 MHz; output amplitude variable from 0.5 V to 4 V.	High Frequency triggering checks. HF SYNC operation checks. Trigger jitter checks.	a. Wavetek 1002 Sweep/Signal Generator. b. General Radio 1362 UHF Oscillator with 1263-C Amplitude-Regulating Power Supply. c. Wiltron Model 610B Swept Frequency Generator with Model 6108B, 10 to 1220 megahertz plug-in.
8. Plug-In Extender[1]	Provides access to 7B92A adjustments	Used throughout procedure to provide access to internal adjustments and test points.	a. Tektronix Part 067-0589-00 Calibration Fixture.
9. T-Connector	Connectors, BNC	External trigger checks, adjustments. HF SYNC operation checks. Trigger jitter checks.	a. Tektronix Part 103-0030-00.

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

[2] Requires a TM 500-Series Power Module.

TABLE 4-1 (continued)
Test Equipment

Description	Minimum Specifications	Purpose	Examples of Applicable Test Equipment
10. Cable	Impedance, 50 ohms; type RG-58/U; length, 18 inches; connectors, BNC	Used throughout procedure for signal interconnection.	a. Tektronix Part 012-0076-00.
11. Cable	Impedance, 50 ohms; type RG-58/U; length, 42 inches; connectors, BNC	Used throughout procedure for signal interconnection.	a. Tektronix Part 012-0057-01.
12. Screwdriver	Three-inch shaft, 3/32 inch bit	Used to adjust variable resistors.	a. Xcelite R-3323.
13. Low Capacitance[1] Screwdriver	1-1/2 inch shaft.	Used to adjust variable capacitors.	a. Tektronix Part 003-0000-00.

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

PART I—PERFORMANCE CHECK

The following procedure is intended to be used for inspection and periodic calibration checks to confirm that the 7B92A is operating within acceptable limits. This procedure is concerned with those portions of the instrument calibration that are essential to measurement accuracy and correct operation. Removal of the side covers is not necessary to perform this procedure in that all checks are made from the front panel.

OUTLINE FOR PART I—PERFORMANCE CHECK

Preliminary Procedure

1. Install Amplifier plug-in unit in a vertical compartment of the oscilloscope.

2. Install 7B92A in a horizontal compartment of the oscilloscope.

3. Turn on oscilloscope and allow 20 minutes warm-up before proceeding with Performance Check.

4. Set oscilloscope Intensity control fully counterclockwise.

A. TRIGGER SENSITIVITY

Equipment Required

1. Calibration oscilloscope
2. Wide-band amplifier plug-in unit
3. High-frequency signal generator
4. Medium-frequency signal generator
5. Low-frequency sine-wave generator
6. Time-mark generator
7. BNC T-connector
8. BNC cable (2)

Control Settings

Set 7B92A controls as follows:

Main Triggering

SLOPE	(+)
LEVEL	Midrange
MODE	AUTO
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	10 μs/PULL FOR ALT
VARIABLE (CAL IN)	In
DELAY TIME MULT	1.0
TRACE SEP	Clockwise
INTENSITY	As desired
CONTRAST	As desired

Delayed Triggering

LEVEL	RUNS AFTER DELAY TIME

Delayed Triggering (cont.)

SLOPE	(+)
COUPLING	AC
SOURCE	INT

Inputs

TERM	1 MΩ (in)

1. CHECK MAIN TRIGGERING LEVEL RANGE

a. Perform Preliminary Procedure at the beginning of this section.

b. Set Amplifier plug-in unit controls as follows:

Position	Midrange
Polarity	+ Up
Input Coupling	Dc

c. Connect BNC T-connector to input of Amplifier plug-in unit.

d. Connect BNC cable from low-frequency sine-wave generator to T-connector.

e. Connect BNC cable from T-connector to 7B92A MAIN TRIG IN.

f. Set Amplifier plug-in unit Volts/Division switch to 1 V.

g. Adjust low-frequency sine-wave generator to display 8 divisions of 50 kilohertz signal. Center display vertically.

h. CHECK—Rotate Main Triggering LEVEL throughout its range and observe that triggering occurs at least 3.5 divisions above and below the center horizontal graticule line. (See Figure 4-1.)

i. Change Main Triggering SLOPE to negative (—).

j. Repeat part h of this step.

k. Set Main Triggering SOURCE to EXT.

l. Repeat part h of this step.

m. Change Main Triggering SLOPE to positive (+).

n. Repeat part h of this step.

2. CHECK DELAYED TRIGGER LEVEL RANGE

a. Remove BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

b. Set 7B92A Delayed Triggering SOURCE and Main Triggering SOURCE to INT.

c. CHECK—Rotate Delayed Triggering LEVEL control throughout its range and observe that intensified zone

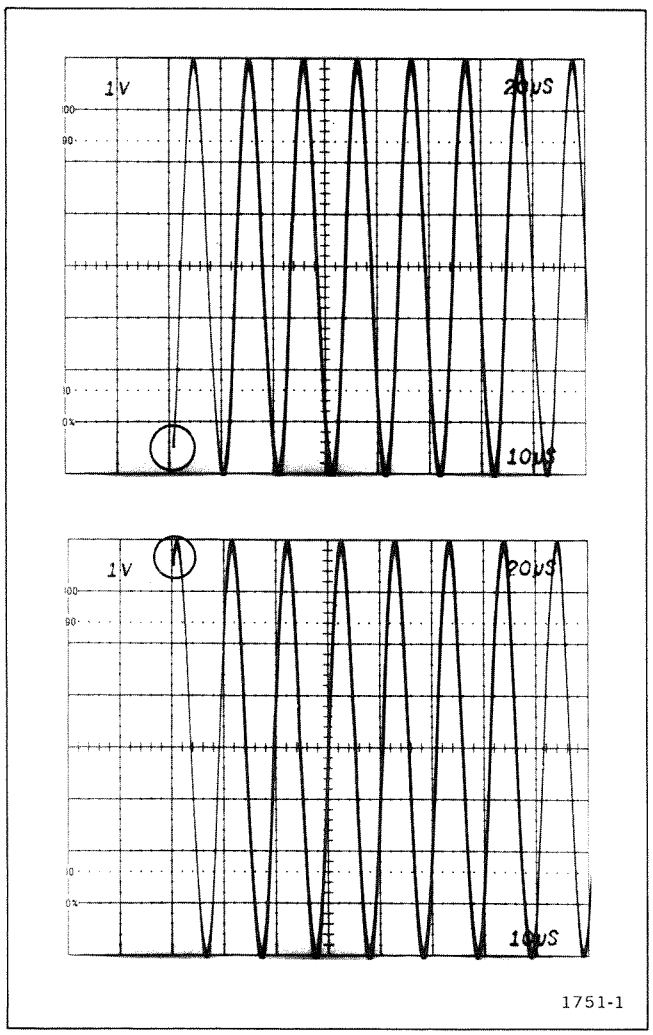


Figure 4-1. Main Triggering LEVEL range.

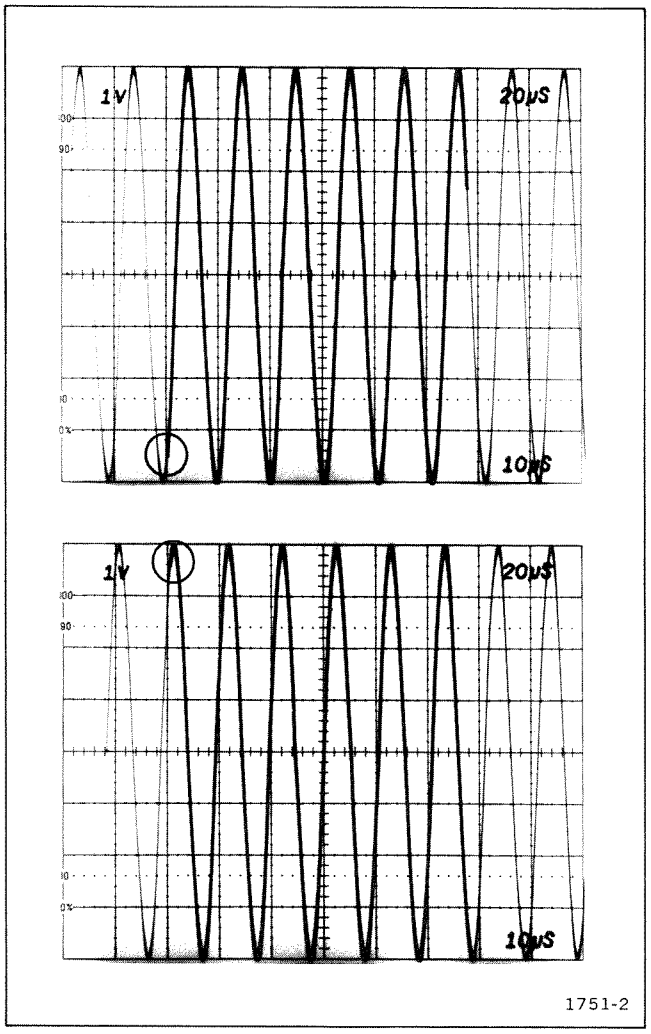


Figure 4-2. Delayed Triggering LEVEL range.

triggering occurs at least 3.5 divisions above and below the graticule horizontal center line. (See Figure 4-2.)

d. Change Delayed Triggering SLOPE to negative (−).

e. Repeat part c of this step.

f. Set Delayed Triggering SOURCE to EXT.

g. Repeat part c of this step.

h. Change Delayed Triggering SLOPE to positive (+).

i. Repeat part c.

3. CHECK LOW-FREQUENCY TRIGGERING

a. Disconnect BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

b. Set following 7B92A controls:

Main Triggering COUPLING	AC
Delayed Triggering SLOPE	(+)
Delayed Triggering COUPLING	AC
Delayed Triggering SOURCE	INT
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME
TIME/DIV OR DLY TIME	10 ms
DLY'D Time/Division	2 ms/PULL FOR ALT
DELAY TIME MULT	1.0

c. Set Amplifier plug-in unit Volts/Division switch to 0.2 V.

d. Set Low-frequency sine-wave generator for 0.5 division (100 millivolts) display at 30 hertz.

e. CHECK—For stable display with Main Triggering COUPLING set to:

1. AC
2. AC HF REJ
3. DC

If necessary, adjust Main Triggering LEVEL.

f. Change Main Triggering SOURCE to EXT.

g. Repeat part e of this step.

h. Disconnect BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

i. Change the following control settings:

Main Triggering SOURCE	INT
Delayed Triggering LEVEL	Near "O"
Delayed Triggering SOURCE	EXT

j. CHECK—For Stable display with Delayed Triggering COUPLING set to:

1. AC
2. DC

If necessary, adjust both MAIN and Delayed Triggering LEVEL.

k. Change Delayed Trigger SOURCE to INT.

l. Repeat part j of this step.

4. CHECK AC LF REJ OPERATION

a. Disconnect BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

b. Change Amplifier plug-in unit Volts/Division switch to 0.5 V.

c. Set Low-frequency sine-wave generator for 8 division display at 60 hertz. Center display vertically.

d. Rotate Main Triggering LEVEL for stable display.

e. Change Main Triggering COUPLING to AC LF REJ.

f. CHECK—Rotate Main Triggering LEVEL throughout its range and check that stable display cannot be obtained (TRIG'D indicator off).

g. Change Main Triggering COUPLING to AC.

h. Change Main Triggering SOURCE to EXT.

i. Reduce output of signal generator to provide 6 division display (3.0 volts) at 60 hertz (adjust Main Triggering LEVEL to maintain stability).

j. Change Main Triggering COUPLING to AC LF REJ.

k. Repeat part f of this step.

5. CHECK 20 MEGAHERTZ TRIGGERING

a. Change Amplifier plug-in unit Volts/Division switch to 0.2 V.

b. Set following 7B92A controls:

Main Triggering COUPLING	AC
Main Triggering SOURCE	INT
Delayed Triggering COUPLING, SOURCE, and SLOPE	All In
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME
TIME/DIV OR DLY TIME	50 ns
DLY'D Time/Division	5 ns/PULL FOR ALT

c. Connect output of medium frequency signal generator to input of Amplifier plug-in unit. Set signal generator for 0.5 division (100 mV) display at 20 megahertz.

d. CHECK—For stable display with Main Triggering COUPLING set to:

1. AC
2. AC LF REJ
3. DC

(If necessary, adjust Main Triggering LEVEL).

e. Change Main Triggering SOURCE to EXT.

f. Repeat part d of this step.

g. Remove BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

h. Set Delayed Triggering LEVEL near "0".

i. Change Main Triggering SOURCE to INT and Main Triggering COUPLING to AC.

j. CHECK—For stable intensified zone triggering with Delayed Triggering COUPLING set to:

1. AC
2. DC

k. Change Delayed Triggering SOURCE to EXT.

l. Repeat part j of this step.

m. Remove BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

n. Disconnect medium Frequency Signal Generator from test setup.

6. CHECK 500 MEGAHERTZ TRIGGERING

a. Connect high-frequency signal generator to BNC-T-connector at input of Amplifier plug-in unit.

b. Set following 7B92A controls:

Main Triggering COUPLING	DC
Main Triggering SOURCE	EXT
TIME/DIV OR DLY TIME	1 ns
DLY'D Time/Division	1 ns/Knob in

c. Adjust oscilloscope Intensity control for adequate viewing.

d. Set Amplifier plug-in unit Volts/Division switch to 0.5 V.

e. Set high-frequency signal generator for 1.0 division display at 500 megahertz.

f. CHECK—For stable display with less than 0.5 minor division of jitter. If necessary, adjust Main Triggering LEVEL.

g. Change Main Triggering SOURCE to INT.

h. Repeat part f of this step.

i. Remove BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

j. Change following 7B92A controls:

DLY'D Time/Division	PULL FOR ALT
Delayed Triggering LEVEL	Out of detent, near "O"
Delayed Triggering SOURCE	EXT

k. CHECK—For stable display with less than 0.5 minor division of jitter. If necessary, adjust Delayed Triggering LEVEL.

l. Change Delayed Triggering SOURCE to INT.

m. Repeat part k of this step.

7. CHECK HF SYNC TRIGGERING

a. Remove BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

b. Change DLY'D Time/Division to Normal mode (knob in).

c. Change Main Triggering MODE to HF SYNC.

d. Change Amplifier plug-in unit Volts/Division switch to 1 V.

e. CHECK—For stable display with less than 0.5 minor division jitter. If necessary, adjust Main Triggering LEVEL.

f. Increase signal generator output for 1.0 division display.

g. Change Main Triggering SOURCE to EXT ÷ 10.

h. Repeat part e of this step.

i. Disconnect high-frequency signal generator from test set-up.

8. CHECK LINE TRIGGERING

a. Set following 7B92A controls:

Main Triggering MODE	AUTO
Main Triggering SOURCE	LINE
Main Triggering COUPLING	AC
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms/Knob in
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME

b. CHECK—TRIG'D light must be on with Main Triggering LEVEL set near midrange.

9. CHECK SINGLE SWEEP OPERATION

a. Remove BNC cable (to DLY'D TRIG IN) from BNC T-connector.

b. Connect time-mark generator to input of Amplifier plug-in unit.

c. Set time-mark generator for 1 millisecond markers.

d. Change Main Triggering SOURCE to INT.

e. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display and adjust Main Triggering LEVEL for stable display.

f. Change Main Triggering MODE to SINGLE SWEEP and SOURCE to EXT.

g. Press SINGLE SWEEP-RESET.

h. CHECK—That SINGLE SWEEP-RESET pushbutton is lit.

i. CHECK—Change Main Triggering SOURCE to INT and observe that only one sweep is displayed and RESET indicator goes out.

j. Change DLY'D Time/Division to Alternate mode (PULL FOR ALT).

k. Change Main Triggering SOURCE to EXT.

l. Press SINGLE SWEEP-RESET.

m. CHECK—Change Main Triggering SOURCE to INT and observe that only one sweep is displayed.

n. Press SINGLE SWEEP-RESET several times and observe that display alternates between Delaying and Delayed sweeps.

B. SWEEP CALIBRATION

Equipment Required

1. Calibration oscilloscope
2. Wide-band amplifier plug-in unit
3. Time-mark generator
4. BNC cable

1. SET BASIC SWEEP CALIBRATION

a. Connect time-mark generator to Amplifier plug-in unit and set for 1 ms markers.

b. Set following 7B92A controls:

Main Triggering

SLOPE	(+)
LEVEL	Midrange
MODE	NORM
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms/Knob in

Delayed Triggering

LEVEL	RUNS AFTER DELAY TIME

c. Set oscilloscope Intensity control for adequate display brightness.

d. Set front-panel SWP CAL adjustment for exactly 1 marker/division (excluding the first and last graticule lines).

2. CHECK TRACE SEPARATION RANGE

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.2 ms/PULL FOR ALT
TRACE SEP	Fully clockwise

b. CHECK—For Delaying sweep (with intensified zone) positioned at least 3.5 divisions above Delayed sweep.

3. CHECK DELAY TIME MULTIPLIER LINEARITY

a. Set DELAY TIME MULT to 0.9.

b. Change DLY'D Time/Division to 10 μs.

c. Change time-mark generator to 50 microseconds.

d. With 7B92A POSITION, align first marker with center vertical graticule line.

e. Rotate DELAY TIME MULT to each of the following settings and record any displacement of markers from center vertical graticule line:

0.5	5.20
1.0	6.60
2.40	8.00
3.80	9.50

f. CHECK—Greatest difference between any two displacements must not exceed 2.5 divisions.

4. CHECK SWEEP TIMING ACCURACY

NOTE

The tolerance in step 4 is for an ambient temperature range of +15°C to +35°C. If outside this range, see Specifications in the 7B92A Operator's Manual for applicable tolerances.

a. Refer to Table 4-2. Set TIME/DIV OR DLY TIME and DLY'D Time/Division in Alternate mode (PULL FOR ALT).

b. Set DELAY TIME MULT to 0.0.

c. For each sweep rate, rotate Main Triggering LEVEL and POSITION to stabilize and position display so second marker of each sweep is aligned with second vertical graticule line.

d. CHECK—For one marker/division over center 8 graticule divisions within tolerance given in Table 4-2.

TABLE 4-2
Sweep Timing Check

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Marks	Tolerance (+15°C to +35°C)	
			Delaying Sweep	Delayed Sweep
0.2 s	0.2 s	0.2 s	Within 0.16 div.	Within 0.16 div.
0.1 s	0.1 s	0.1 s	Within 0.16 div.	Within 0.16 div.
50 ms	50 ms	50 ms	Within 0.16 div.	Within 0.16 div.
20 ms	20 ms	20 ms	Within 0.16 div.	Within 0.16 div.
10 ms	10 ms	10 ms	Within 0.16 div.	Within 0.16 div.
5 ms	5 ms	5 ms	Within 0.16 div.	Within 0.16 div.
2 ms	2 ms	2 ms	Within 0.16 div.	Within 0.16 div.
1 ms	1 ms	1 ms	Within 0.16 div.	Within 0.16 div.
0.5 ms	0.5 ms	0.5 ms	Within 0.16 div.	Within 0.16 div.
0.2 ms	0.2 ms	0.2 ms	Within 0.16 div.	Within 0.16 div.
0.1 ms	0.1 ms	0.1 ms	Within 0.16 div.	Within 0.16 div.
50 μs	50 μs	50 μs	Within 0.16 div.	Within 0.16 div.
20 μs	20 μs	20 μs	Within 0.16 div.	Within 0.16 div.
10 μs	10 μs	10 μs	Within 0.16 div.	Within 0.16 div.
5 μs	5 μs	5 μs	Within 0.16 div.	Within 0.16 div.
2 μs	2 μs	2 μs	Within 0.16 div.	Within 0.16 div.
1 μs	1 μs	1 μs	Within 0.16 div.	Within 0.16 div.
0.5 μs	0.5 μs	0.5 μs	Within 0.16 div.	Within 0.16 div.
0.2 μs	0.2 μs	0.2 μs	Within 0.16 div.	Within 0.16 div.
0.1 μs	0.1 μs	0.1 μs	Within 0.16 div.	Within 0.16 div.
50 ns	50 ns	50 ns	Within 0.16 div.	Within 0.16 div.
20 ns	20 ns	20 ns	Within 0.16 div.	Within 0.16 div.
10 ns	10 ns	10 ns	Within 0.24 div.	Within 0.24 div.

TABLE 4-3
Fast Timing Check

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Marks	Display Markers/Division	Tolerance (+15°C to +35°C)
5 ns	5 ns	5 ns	1	Within 0.24 div
2 ns	2 ns	2 ns	1	Within 0.24 div
1 ns	1 ns	1 ns	1	Within 0.32 div
0.5 ns	0.5 ns	1 ns	1 cycle/2 div	Within 0.32 div

e. Refer to Table 4-3. Set TIME/DIV OR DLY TIME and DLY'D Time/Division in Normal mode (DLY'D Time/Division knob in).

f. For each sweep rate, rotate Main Triggering LEVEL and POSITION to stabilize display and align second marker with second vertical graticule line.

g. CHECK—For one marker/division (2 divisions between markers at 0.5 nanoseconds) over center 8 graticule divisions within tolerance given in Table 4-3.

NOTE

HF SYNC may provide a better display when checking fastest sweep rates.

5. CHECK SWEEP LINEARITY

a. Set TIME/DIV OR DLY TIME and DLY'D Time/Division at 1 ms and pull DLY'D Time/Division knob out for Alternate mode.

b. Set time-mark generator for 1 millisecond markers vertically centered on graticule.

c. Rotate 7B92A POSITION to align second marker of Delaying (top) sweep with second vertical graticule line.

d. CHECK—For fourth marker of Delaying sweep within 0.1 divisions of the fourth vertical graticule line.

e. CHECK—Continue linearity check, as in parts c and d for each successive 2 divisions of Delaying Sweep.

f. CHECK—Repeat parts c, d, and e to check linearity of Delayed (bottom) sweep.

g. Set TIME/DIV OR DLY TIME and DLY'D Time/Division to 10 ns in Alternate mode (DLY'D Time/Division knob pulled out).

h. Set time-mark generator for 10 nanosecond markers.

i. CHECK—Perform linearity check as in parts c through f. Tolerance is 0.1 division for each 2 divisions over center 8 graticule divisions.

j. Change DLY'D Time/Division to Normal mode (knob in).

k. CHECK—Continue linearity check for Delayed sweep rates as shown in Table 4-4.

TABLE 4-4
Fast Sweep Linearity

Time/ Division	Time Marker Output	Markers/ 2 Divisions	Tolerance/ 2 Divisions
5 ns	5 ns	2	0.2 divisions
2 ns	2 ns	2	0.2 divisions
1 ns	1 ns	2	0.2 divisions
0.5 ns	1 ns	1	0.2 divisions

6. CHECK VARIABLE TIME/DIVISION RANGE

a. Remove 7B92A from oscilloscope mainframe.

b. Place Time/Division Variable Selector jumper on P761 (Delaying Sweep).

c. Replace 7B92A into mainframe.

d. Set time-mark generator for 0.1 millisecond markers.

e. Change following 7B92A controls:

TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	20 μs
DELAY TIME MULT	0.0

f. Press and release VARIABLE control and rotate fully counterclockwise.

g. Change DLY'D Time/Division to Alternate mode (PULL FOR ALT).

h. CHECK—Distance between Delaying sweep markers must not exceed 2 major divisions. (See Figure 4-3.)

i. Remove 7B92A from mainframe, reset Time/Division Variable Selector for Delayed Sweep (P760) and reinstall into mainframe.

j. CHECK—With VARIABLE released and rotated fully counterclockwise, distance between Delayed Sweep markers must not exceed 2 major divisions.

7. CHECK DIFFERENTIAL DELAY TIME ACCURACY

a. Set following 7B92A controls:

VARIABLE (CAL IN)	CAL IN
TIME/DIV OR DLY TIME	0.2 s
DLY'D Time/Division	5 ms/PUSH FOR DLY'D
Main Triggering MODE	AUTO

b. Set time-mark generator for 0.1 second markers.

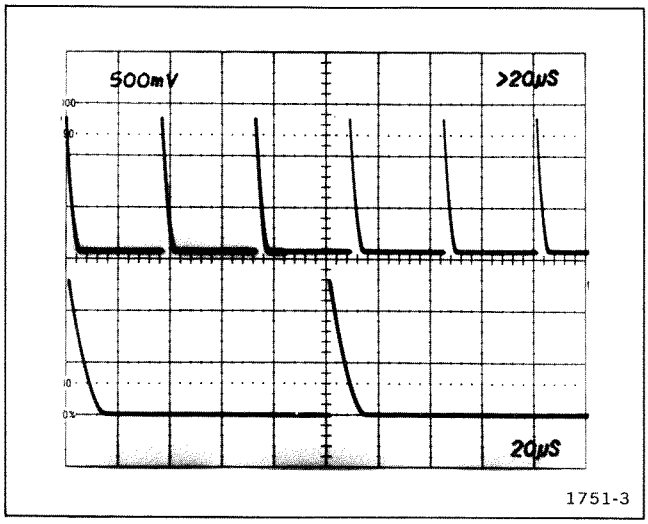


Figure 4-3. VARIABLE Time/Division range.

c. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display.

d. Adjust Main Triggering LEVEL for stable display.

e. Set DELAY TIME MULT to 0.90.

f. Align time mark with center vertical graticule line, using 7B92A POSITION.

g. Rotate DELAY TIME MULT to approximately 8.9 to align time mark with center vertical graticule line.

h. CHECK—DELAY TIME MULT must read within 3 minor divisions of 8.90 (8.84 to 8.96).

i. Repeat parts e through h for each sweep rate in Table 4-5. Maintain approximately 2 divisions of display.

8. CHECK FAST DELAY TIME ACCURACY

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	50 ns
DLY'D Time/Division	10 ns/PUSH FOR DLY'D
DELAY TIME MULT	9.00

TABLE 4-5
Differential Delay Time Accuracy

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Marks
.2 s	5 ms	0.1 s
.1 s	2 ms	50 ms
50 ms	1 ms	10 ms
20 ms	0.5 ms	10 ms
10 ms	0.2 ms	5 ms
5 ms	0.1 ms	1 ms
2 ms	50 μs	1 ms
1 ms	20 μs	0.5 ms
.5 ms	10 μs	0.1 ms
.2 ms	5 μs	0.1 ms
.1 ms	2 μs	50 μs
50 μs	1 μs	10 μs
20 μs	.5 μs	10 μs
10 μs	.2 μs	5 μs
5 μs	.1 μs	1 μs
2 μs	50 ns	1 μs
1 μs	20 ns	0.5 μs
.5 μs	10 ns	0.1 μs
.2 μs	5 ns	50 ns
.1 μs	5 ns	50 ns

b. Set time-mark generator for 50 ns markers.

c. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display.

d. Rotate Main Triggering LEVEL for stable display.

e. Adjust Amplifier plug-in unit and 7B92A POSITION controls to locate leading edge of time mark at intersection of horizontal and vertical center graticule lines. (See Figure 4-4.)

f. Change DELAY TIME MULT to approximate settings listed in Table 4-6 to align leading edge of marker at intersection of center graticule lines.

g. CHECK—Error in minor divisions of DELAY TIME MULT must not exceed those listed in Table 4-6.

TABLE 4-6
Fast Differential Delay Time Accuracy

DELAY TIME MULT	Maximum Error (Minor Dial Divisions)
9.0	0 (step e)
8.0	Within 3.0
7.0	Within 3.5
6.0	Within 4.0
5.0	Within 4.5
4.0	Within 5.0
3.0	Within 3.0
2.0	Within 6.0
1.0	Within 6.5

h. Set TIME/DIV OR DLY TIME and DLY'D Time/Division in Delayed mode (PUSH FOR DLY'D) at 20 ns and 2 ns respectively.

i. Set time-mark generator for 20 nanosecond markers.

j. Repeat parts c through g of this step.

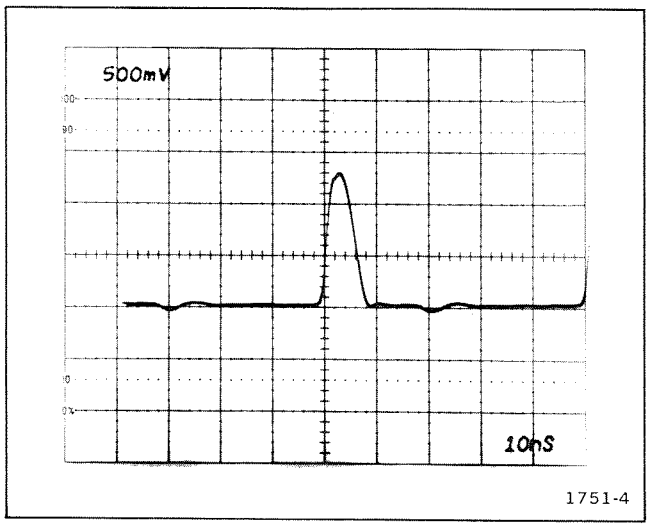


Figure 4-4. Fast delay time accuracy.

k. Set TIME/DIV OR DLY TIME and DLY'D Time/Division in Delayed mode (PUSH FOR DLY'D) at 10 ns and 1 ns respectively.

l. Set time-mark generator for 10 nanosecond markers.

m. Repeat parts c through g of this step. Delete check at DELAY TIME MULT setting of 1.0.

9. CHECK DELAY JITTER

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	5 μs/PUSH FOR DLY'D
DELAY TIME MULT	1.0
Main Triggering MODE	AUTO
POSITION	Midrange

b. Set time-mark generator for 1 ms markers.

c. Rotate Main Triggering LEVEL for stable display.

d. Change DLY'D Time/Division to 0.2 μs.

e. Rotate DELAY TIME MULT to position marker near graticule center.

f. CHECK—Jitter must not exceed 1 division (disregard slow drift).

g. Set TIME/DIV OR DLY TIME and DLY'D Time/Division for Delayed mode at 20 μs and 50 ns respectively (PUSH FOR DLY'D).

h. Set time-mark generator for 50 nanosecond markers.

i. Adjust Main Triggering LEVEL for stable display.

j. Change DLY'D Time/Division to 5 ns.

k. CHECK—Jitter must not exceed 0.9 division.

l. Rotate DELAY TIME MULT to about 9.0 to position marker on graticule.

m. CHECK—Jitter must not exceed 0.9 division.

PART II—CALIBRATION

The following procedure returns the 7B92A to correct calibration. All limits and tolerances given in this procedure are calibration guides and should not be interpreted as instrument specifications except as specified in the Specifications section of the 7B92A Operators Manual. Where possible, instrument performance is checked before an adjustment is made. When performing a complete calibration procedure, make each adjustment to the exact setting, even if the CHECK— is within the allowable tolerance.

OUTLINE FOR PART II—CALIBRATION

@

PRELIMINARY PROCEDURE

1. Install Amplifier plug-in unit in a vertical compartment of the calibration oscilloscope.

2. Remove side covers from 7B92A and install in the plug-in extender.

3. Install extender and 7B92A into a horizontal compartment of the calibration oscilloscope.

4. Turn on oscilloscope and allow 20 minutes warm-up before proceeding with Calibration Procedure.

5. Set oscilloscope Intensity control fully counterclockwise.

A. TRIGGERING

Equipment Required

1. Calibration oscilloscope
2. Wide-Band Amplifier plug-in unit
3. Low-frequency signal generator
4. Medium-frequency signal generator
5. High-frequency signal generator
6. Time-mark generator
7. BNC T-connector
8. BNC cable

BEFORE YOU BEGIN, see TRIGGER ADJUSTMENT LOCATIONS in the Diagrams section.

1. PRELIMINARY MAIN TRIGGERING ADJUSTMENTS

a. Perform Preliminary Procedure at the front of the Calibration section.

b. Set 7B92A controls as follows:

Main Triggering

SLOPE	(+)
LEVEL	Midrange
MODE	AUTO
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	10 μs/PULL FOR ALT
VARIABLE (CAL IN)	In
DELAY TIME MULT	1.0
TRACE SEP	Clockwise
INTENSITY	As desired
CONTRAST	As desired

Delayed Triggering

LEVEL	RUNS AFTER DELAY TIME
SLOPE	(+)
COUPLING	AC
SOURCE	INT

Inputs

TERM	1 MΩ (in)

c. Set Amplifier plug-in unit controls as follows:

Position	Midrange
Polarity	+ Up
Input Coupling	Dc
Volts/Division	50 mV

d. Connect BNC T-connector to input of Amplifier plug-in unit.

e. Connect BNC cable from low-frequency sine-wave generator to T-connector.

f. Connect BNC cable from T-connector to 7B92A MAIN TRIG IN.

g. Set low-frequency sine-wave generator for 4 divisions of display amplitude (200 mV) at 50 kilohertz, vertically centered on the graticule.

h. Set Int DC Bal R25, Ext DC Bal R59, and Trig Sens R125 (internal adjustments) to midrange.

i. Set Arming TD Bias R145 and Gate TD Bias R155 (internal adjustments) fully clockwise. The TRIG'D indicator should be on and sweep should be free running.

j. Adjust Gate TD Bias R155 counterclockwise until triggering occurs, then clockwise until sweep free-runs.

2. ADJUST MAIN TRIGGERING ARMING TUNNEL DIODE BIAS

a. Adjust Arming TD Bias R145 counterclockwise until sweep just triggers. Record voltage at TP145. Continue counterclockwise rotation of R145 until TRIG'D indicator just goes out. Record voltage at TP145.

b. Adjust R145 for the average of the two voltage readings.

3. ADJUST MAIN TRIGGERING GATE TUNNEL DIODE BIAS

a. Disconnect delay line at connector J170.

b. If TRIG'D indicator is on and sweep is triggered, adjust Gate TD Bias R155 counterclockwise until TRIG'D indicator just goes out.

c. Record voltage at TP155.

d. Connect delay line to J170. TRIG'D indicator should light.

e. Adjust R155 counterclockwise until TRIG'D indicator just goes out; then clockwise until solid triggering is achieved. Record voltage at TP155.

f. Adjust R155 for the average of the readings recorded in parts c and e of this step.

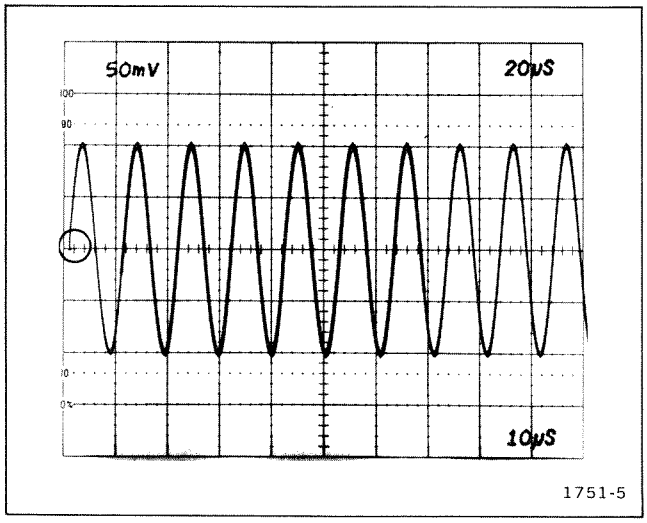


Figure 4-5. Dc balance.

4. ADJUST MAIN TRIGGERING INTERNAL DC BALANCE

a. Set Main Triggering COUPLING to AC.

b. Set Main Triggering LEVEL control to exactly "0".

c. Adjust Int DC Bal R25 to trigger sweep at graticule horizontal center line. (See Figure 4-5.)

5. ADJUST MAIN TRIGGERING SENSITIVITY

a. Adjust Trig Sens R125 to trigger sweep at 0.3 division from bottom of waveform as LEVEL is rotated through negative (—) portion of its range. (See Figure 4-6.)

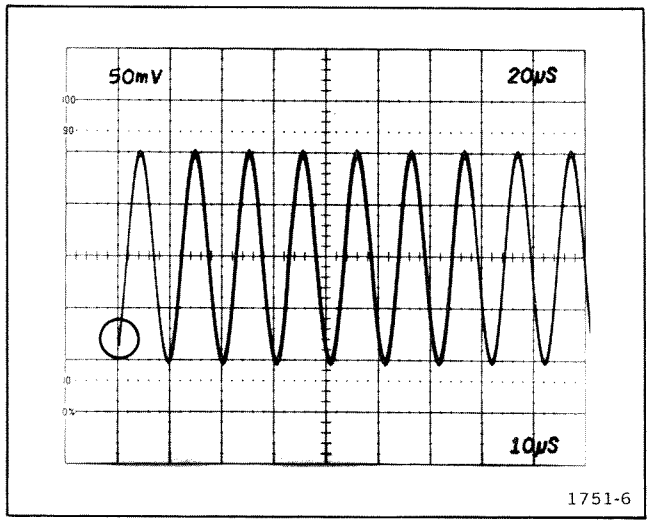


Figure 4-6. Trigger sensitivity.

b. Reset LEVEL to exactly "O".

6. ADJUST EXTERNAL DC BALANCE

a. Set Main Triggering SOURCE to EXT.

b. Set Main Triggering COUPLING to AC.

c. Adjust Ext DC Bal R59 to trigger sweep at graticule horizontal center line.

7. CHECK MAIN TRIGGERING LEVEL RANGE

a. Set Main Triggering SOURCE to INT.

b. Set Amplifier plug-in unit Volts/Division switch to 1 V.

c. Adjust low-frequency sine-wave generator to display 8 divisions of 50 kilohertz signal. Center display vertically.

d. CHECK—Rotate Main Triggering LEVEL throughout its range and check that triggering occurs at least 3.5 divisions above and below graticule horizontal center line. (See Figure 4-7.)

e. Change Main Triggering SLOPE to (—).

f. Repeat part d of this step.

g. Set Main Triggering SOURCE to EXT.

h. Repeat part d of this step.

i. Change Main Triggering SLOPE to (+).

j. Repeat part d of this step.

8. PRELIMINARY DELAYED TRIGGERING ADJUSTMENTS

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

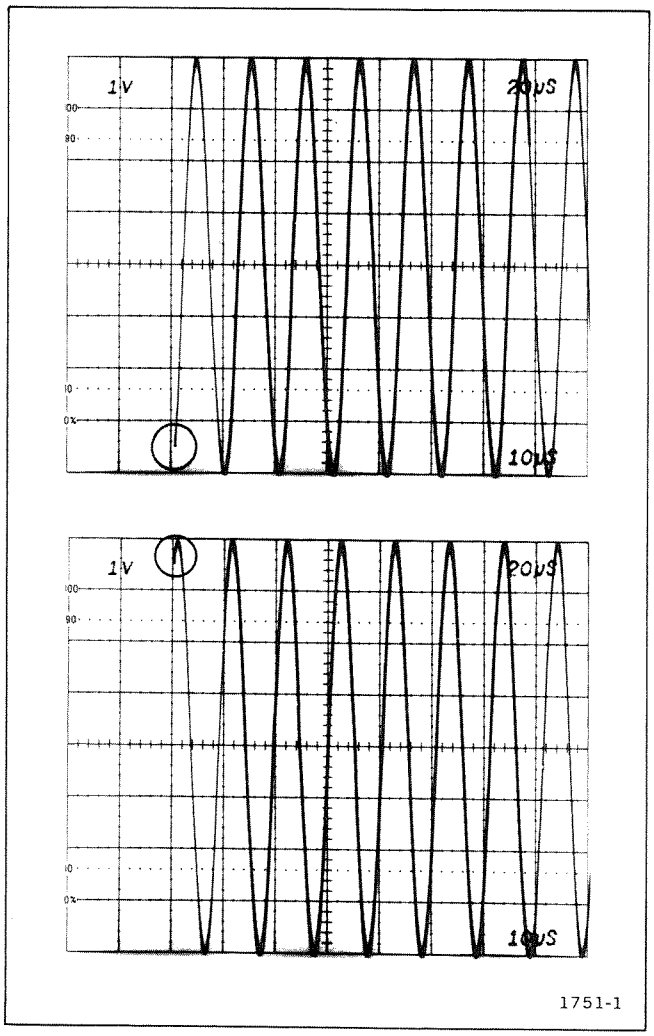


Figure 4-7. Main Triggering LEVEL range.

b. Set following 7B92A controls:

Main Triggering SOURCE	INT
Main Triggering LEVEL	Near "O"
Delayed Triggering SLOPE	(+)
Delayed Triggering COUPLING	AC
Delayed Triggering SOURCE	INT
Delayed Triggering LEVEL	"O"
DELAY TIME MULT	5.0
TIME/DIV OR DELAY TIME	20 μs
DLY'D Time/Division	10 μs

c. Set Amplifier plug-in unit Volts/Division switch to 50 mV.

d. Set low-frequency sine-wave generator to display 4 divisions at 50 kilohertz, vertically centered on the graticule.

e. Preset following 7B92A Delayed Triggering internal adjustments:

Ext DC Bal R225	Midrange
Int DC Bal R245	Midrange
Trig Sens R325	Midrange
Arming TD Bias R345	Fully clockwise
Gate TD Bias R355	Fully clockwise

NOTE

Intensified zone should start at beginning of Delaying (top) sweep.

f. Adjust Gate TD Bias R355 counterclockwise until intensified zone moves to right and shuts down.

9. ADJUST DELAYED TRIGGERING ARMING TUNNEL DIODE BIAS

a. Adjust Arming TD Bias R345 counterclockwise until Delayed sweep starts again. Record voltage at TP345. Continue counterclockwise rotation of R345 until Delayed sweep again shuts down. Record voltage at TP345.

b. Adjust R345 for the average of the two readings taken in part a. Delayed sweep should be running.

10. ADJUST DELAYED TRIGGERING GATE TUNNEL DIODE BIAS

a. Record voltage at TP355.

b. Adjust Gate Bias R355 counterclockwise until Delayed sweep stops running. Record voltage at TP355.

c. Adjust R355 for the average of the two readings (parts a and b).

11. ADJUST DELAYED TRIGGERING INTERNAL DC BALANCE

a. Set Delayed Triggering LEVEL to exactly "O".

b. Adjust Int DC Bal R245 to trigger Delayed sweep at graticule horizontal center line.

12. ADJUST DELAYED TRIGGERING SENSITIVITY

a. Adjust Trig Sens R325 to trigger Delayed sweep at 0.3 division from bottom of waveform as Delayed Triggering LEVEL is rotated through the negative (—) portion of its range.

13. ADJUST DELAYED TRIGGERING EXTERNAL DC BALANCE

a. Set Delayed Triggering SOURCE to EXT.

b. Set Delayed Triggering LEVEL to exactly "O".

c. Adjust Ext DC Bal R225 to trigger Delayed sweep at graticule horizontal center line.

14. CHECK DELAYED TRIGGERING LEVEL RANGE

a. Set 7B92A Delayed Triggering SOURCE to INT.

b. Set Amplifier plug-in unit Volts/Division switch to 1 V.

c. Adjust low-frequency sine-wave generator for an 8 division display at 50 kilohertz. Center display vertically.

d. CHECK—Rotate Delayed Triggering LEVEL throughout its range and check that triggering occurs at least 3.5 divisions above and below graticule horizontal center line with Delayed Triggering SLOPE set to (+). (See Figure 4-8).

e. Change Delayed Triggering SLOPE to (—).

f. Repeat part d of this step.

g. Set Delayed Triggering SOURCE to EXT.

h. Repeat part d of this step.

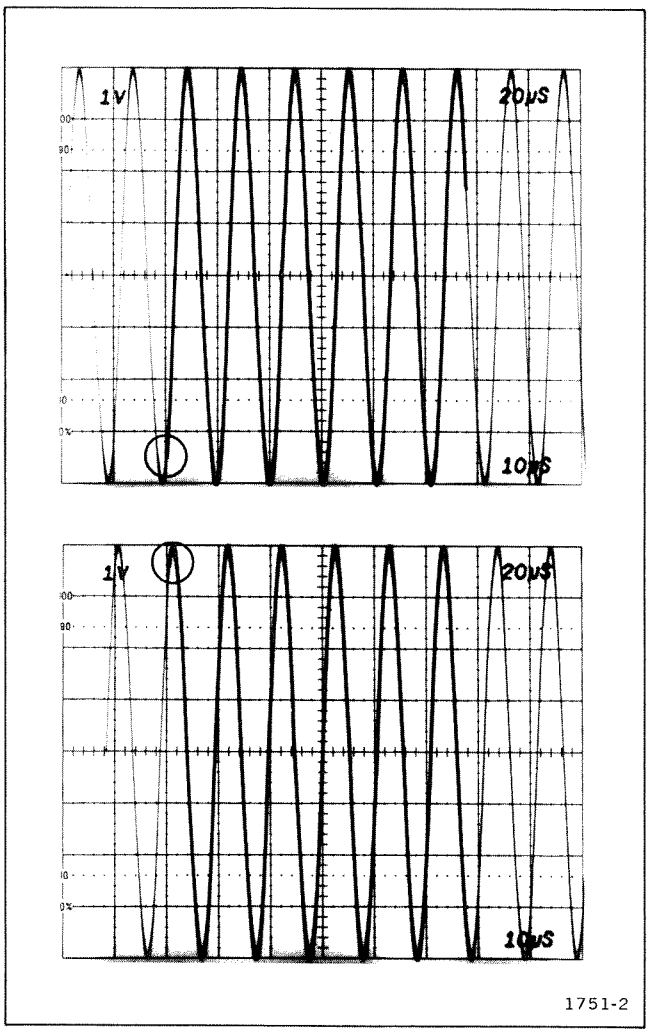


Figure 4-8. Delayed Triggering LEVEL range.

i. Change Delayed Triggering SLOPE to (+).

j. Repeat part d of this step.

15. CHECK LOW-FREQUENCY TRIGGERING

a. Disconnect BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

b. Set following 7B92A controls:

Main Triggering COUPLING	AC
Delayed Triggering SLOPE	(+)
Delayed Triggering COUPLING	AC
Delayed Triggering SOURCE	INT
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME
TIME/DIV OR DLY TIME	10 ms
DLY'D Time/Division	2 ms/PULL FOR ALT
DELAY TIME MULT	1.0

c. Set Amplifier plug-in unit Volts/Division switch to 0.2 V.

d. Set low-frequency sine-wave generator for 0.5 division display at 30 hertz.

e. CHECK—For stable display with Main Triggering COUPLING set to:

1. AC
2. AC HF REJ
3. DC

If necessary, adjust Main Triggering LEVEL.

f. Change Main Triggering SOURCE to EXT.

g. Repeat part e of this step.

h. Disconnect BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

i. Change following control settings:

Main Triggering SOURCE	INT
Delayed Triggering LEVEL	Near "O"
Delayed Triggering SOURCE	EXT

j. CHECK—For stable display with Delayed Triggering COUPLING set to:

1. AC

2. DC

If necessary, adjust both Main and Delayed Triggering LEVEL.

k. Change Delayed Triggering SOURCE to INT.

l. Repeat part j of this step.

16. CHECK AC LF REJ OPERATION

a. Disconnect BNC cable from DLY'D TRIG IN and reconnect to MAIN TRIG IN.

b. Change Amplifier plug-in unit Volts/Division switch to 0.5 V.

c. Set generator for an 8 division display at 60 hertz.

d. Adjust Main Triggering LEVEL for stable display.

e. Change Main Triggering COUPLING to AC LF REJ.

f. CHECK—Rotate Main Triggering LEVEL throughout its range and check that stable display cannot be obtained (TRIG'D indicator off).

g. Change Main Triggering COUPLING to AC.

h. Change Main Triggering SOURCE to EXT.

i. Reduce generator output to provide a 6 division display (3.0 volts) at 60 hertz (adjust LEVEL to maintain stability).

j. Change Main Triggering COUPLING to AC LF REJ.

k. Repeat part f of this step.

17. CHECK 20 MEGAHERTZ TRIGGERING

a. Change Amplifier plug-in unit Volts/Division switch to 0.2 V.

b. Set following 7B92A controls:

Main Triggering COUPLING	AC
Main Triggering SOURCE	INT
Delayed Triggering COUPLING, SOURCE and SLOPE	All in
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME
TIME/DIV OR DLY TIME	50 ns
DLY'D Time/Division	5 ns/PULL FOR ALT

c. Connect output of medium-frequency signal generator to Amplifier plug-in unit input. Set generator for 0.5 division (100 millivolts) display at 20 megahertz.

d. CHECK—For stable display with Main Triggering COUPLING set to:

1. AC

2. AC LF REJ

3. DC

If necessary, adjust Main Triggering LEVEL.

e. Change Main Triggering SOURCE to EXT.

f. Repeat part d of this step.

g. Remove BNC cable from MAIN TRIG IN and reconnect to DLY'D TRIG IN.

h. Change Main Triggering SOURCE to INT and Main Triggering COUPLING to AC.

i. Set Delayed Triggering LEVEL near "0".

j. CHECK—For stable intensified zone triggering with Delayed Triggering COUPLING set to:

1. AC
2. DC

k. Change Delayed Triggering SOURCE to EXT.

l. Repeat part j of this step.

18. CHECK 500 MEGAHERTZ TRIGGERING

NOTE

Better high frequency performance may result if plug-in extender is removed and 7B92A is inserted directly into oscilloscope.

a. Connect high-frequency signal generator to T-connector at input of Amplifier plug-in unit. Remove BNC cable from DLY'D TRIG IN and re-connect to MAIN TRIG IN.

b. Set following 7B92A controls:

Main Triggering COUPLING	DC
Main Triggering SOURCE	EXT
TIME/DIV OR DLY TIME	1 ns
DLY'D Time/Division	1 ns (knob pushed in)

c. Adjust oscilloscope Intensity for adequate viewing.

d. Set Amplifier plug-in unit Volts/Division switch to 0.5 V.

e. Set generator for 1.0 division display at 500 megahertz.

f. CHECK—For stable display with 0.5 minor division of jitter or less. If necessary, adjust Main Triggering LEVEL.

g. Change Main Triggering SOURCE to INT.

h. Repeat part f of this step.

i. Remove BNC cable from MAIN TRIG IN and re-connect to DLY'D TRIG IN.

j. Change following 7B92A controls:

DLY'D Time/Division	PULL FOR ALT
Delayed Triggering LEVEL	Out of detent, near "O"
Delayed Triggering SOURCE	EXT

k. CHECK—For stable display with 0.5 minor division of jitter or less. If necessary, adjust Delayed Triggering LEVEL.

l. Change Delayed Triggering SOURCE to INT.

m. Repeat part k of this step.

19. CHECK HF SYNC TRIGGERING

a. Remove BNC cable from DLY'D TRIG IN and re-connect to MAIN TRIG IN.

b. Push DLY'D Time/Division knob in for Normal mode.

c. Change Main Triggering MODE to HF SYNC.

d. Change Amplifier plug-in unit Volts/Division to 1 V.

e. CHECK—For stable display with 0.5 minor division jitter or less. If necessary, adjust Main Triggering LEVEL.

f. Change generator for 1 division of display amplitude.

g. Change Main Triggering SOURCE to EXT ÷ 10.

h. Repeat part e of this step.

i. Disconnect high-frequency signal generator from test set-up.

20. CHECK LINE TRIGGERING

a. Set following 7B92A controls:

Main Triggering MODE	AUTO
Main Triggering SOURCE	LINE
Main Triggering COUPLING	AC
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms (knob pushed in)
Delayed Triggering LEVEL	RUNS AFTER DELAY TIME

b. CHECK—TRIG'D indicator should be on with Main Triggering LEVEL set near "0".

21. CHECK SINGLE SWEEP OPERATION

a. Remove external trigger sources from MAIN and DLY'D TRIG IN.

b. Connect time-mark generator to input of Amplifier plug-in unit.

c. Set time-mark generator for 1 millisecond markers.

d. Change Main Triggering SOURCE to INT.

e. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display and adjust Main Triggering LEVEL for stable display.

f. Change Main Triggering MODE to SINGLE SWEEP and SOURCE to EXT.

g. Press SINGLE SWEEP-RESET.

h. CHECK—Observe that pushbutton is lit.

i. CHECK—Change Main Triggering SOURCE to INT and check that only one sweep is displayed and the RESET indicator goes out.

j. Pull DLY'D Time/Division knob out for Alternate mode.

k. Change Main Triggering SOURCE to EXT.

l. Press SINGLE SWEEP-RESET.

m. CHECK—Change Main Triggering SOURCE to INT and check that only one sweep is displayed.

n. Press SINGLE SWEEP-RESET several times and observe that display alternates between Delaying and Delayed sweeps.

B. SWEEP

Equipment Required

1. Calibration oscilloscope
2. Wide-Band Amplifier plug-in unit
3. Fast-rise pulse generator
4. Time-mark generator
5. Plug-in extender
6. BNC cable

BEFORE YOU BEGIN, see SWEEP ADJUSTMENT LOCATOR in the Diagrams section.

1. TEST EQUIPMENT SET-UP

a. Perform Preliminary Procedure at the front of the Calibration section.

b. Set 7B92A controls as follows:

Main Triggering

SLOPE	(+)
LEVEL	Midrange
MODE	NORM
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms (knob pushed in)
VARIABLE (CAL IN)	In
DELAY TIME MULT	1.0
TRACE SEP	Clockwise
INTENSITY	As desired
CONTRAST	As desired

Delayed Triggering

LEVEL	RUNS AFTER DELAY TIME
SLOPE	(+)
COUPLING	AC
SOURCE	INT

Inputs

TERM	1 MΩ (IN)

c. Set Amplifier plug-in unit controls as follows:

Position	Midrange
Polarity	+ Up
Input Coupling	Dc

d. Connect BNC cable from time-mark generator to input of Amplifier plug-in unit.

2. ADJUST SWEEP TIMING

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

b. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display, vertically centered on graticule.

c. Adjust Main Triggering LEVEL for stable display.

d. Adjust SWP CAL (front-panel adjustment) for 1 marker/division.

3. CHECK TRACE SEPARATION RANGE

a. Change following 7B92A controls:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.2 ms/PULL FOR ALT
TRACE SEP	Fully clockwise

b. CHECK—For Delaying sweep (with intensified zone) at least 3.5 divisions above Delayed sweep.

4. ADJUST DTM SCALE AND DELAY START

a. Change following 7B92A controls:

DLY'D Time/Division	10 μs
TRACE SEP	Fully clockwise

b. Set DELAY TIME MULT to 9.00.

c. Adjust DTM Scale R495 to start rising portion of tenth marker at start of Delayed sweep. (See Figure 4-9.)

d. Set DELAY TIME MULT to 1.00.

e. Adjust Delay Start R425 to position rising portion of second marker at start of Delayed sweep.

f. Repeat parts b through e of this step until rising portion of marker is positioned to start of Delayed sweep for both settings of DELAY TIME MULT.

5. CHECK DELAY TIME MULTIPLIER LINEARITY

a. Set DELAY TIME MULT to 0.9.

b. Change time-mark generator to 50 microseconds.

c. With 7B92A POSITION, align first marker with graticule vertical center line.

d. Set DELAY TIME MULT to each of following settings and record any displacement of markers from graticule vertical center line:

0.5	5.20
1.0	6.60
2.40	8.00
3.80	9.50

e. CHECK—Difference between any two displacements must not exceed 2.5 divisions.

6. ADJUST DELAYING SWEEP CALIBRATION

a. Set TIME/DIV OR DLY TIME and DLY'D Time/Division controls to 1 ms and pull DLY'D Time/Division knob out for Alternate mode.

b. Set time-mark generator for 1 millisecond markers.

c. Adjust Delaying Sweep Cal R458 for 1 marker/division over center 8 divisions of display.

7. ADJUST SWEEP REGISTRATION

a. Set DELAY TIME MULT to 0.0.

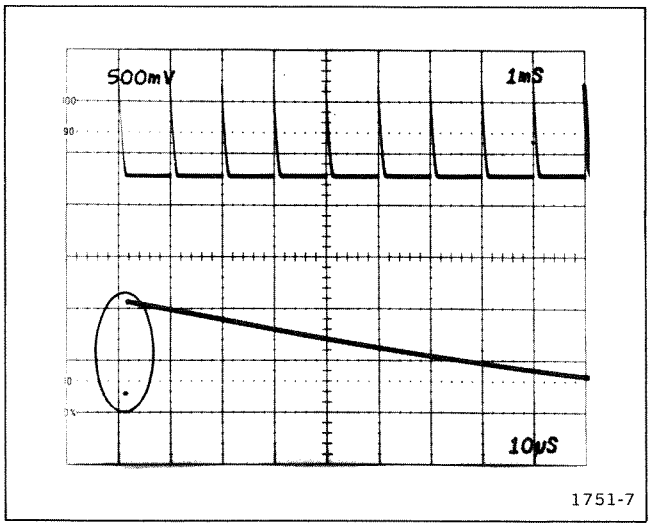


Figure 4-9. DTM Scale and Delay Start.

b. Adjust Sweep Registration R525 to align first marker of Delayed sweep with first marker of Delaying sweep.

c. If necessary, adjust DLY'G Sweep Cal R458 to align tenth marker of both traces.

8. ADJUST POSITION CENTERING

a. Set time-mark generator for 2 millisecond markers.

b. Set 7B92A POSITION fully counterclockwise.

c. Adjust Position Centering R935 to align second marker with left-hand edge of graticule.

d. Set POSITION fully clockwise.

e. CHECK—Sweeps must start to right of graticule center.

9. CHECK SWEEP LENGTH

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

b. CHECK—Both Delaying and Delayed sweeps must be 10.5 divisions within 0.3 division.

10. ADJUST 2 NANOSECOND TIMING

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	2 ns
DLY'D Time/Division	2 ns (Knob pushed in)

b. Set time-mark generator for 2 nanosecond markers.

c. Adjust Amplifier plug-in unit for an approximate 2 division display.

d. Adjust Main Triggering LEVEL for stable display.

e. Adjust 7B92A POSITION to align second marker with second vertical graticule line.

f. CHECK—Tenth marker must be within 0.24 division of tenth vertical graticule line.

g. ADJUST—2 ns Timing C540 for 1 marker/division over center 8 divisions.

11. ADJUST DELAYED SWEEP 20 NANOSECOND TIMING

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	20 ns
DLY'D Time/Division	20 ns (Knob pushed in)

b. Set time-mark generator for 20 nanosecond markers.

c. Adjust Amplifier plug-in unit for an approximate 2 division display.

d. Adjust Main Triggering LEVEL for stable display.

e. Adjust 7B92A POSITION to align second marker with second vertical graticule line.

f. CHECK—Tenth marker is within 0.16 division of tenth vertical graticule line.

g. ADJUST—20 ns Timing C721 for 1 marker/division over center 8 divisions of display.

12. ADJUST DELAYING SWEEP 20 NANOSECOND TIMING

a. Set oscilloscope Intensity control fully counterclockwise.

b. Change following 7B92A controls:

DLY'D Time/Division	2 ns/PULL FOR ALT
DELAY TIME MULT	3.00
INTENSITY	For adequate viewing of Delaying sweep.

c. Adjust Amplifier plug-in unit Position control to center display.

d. Adjust 7B92A POSITION to align second marker with second vertical graticule line.

e. CHECK—Tenth marker must be within 0.16 division of tenth vertical graticule line.

f. PRESET—20 ns Timing C440 (internal adjustment) for 1 marker/division over center 8 divisions of display.

g. Push DLY'D Time/Division knob in for Normal mode.

h. Increase mainframe Intensity for adequate viewing of Delayed sweep.

i. Adjust Amplifier plug-in unit and 7B92A POSITION to place leading edge of Delayed sweep marker across intersection of graticule horizontal and vertical center lines.

j. Set DELAY TIME MULT to 9.00.

k. Adjust Delaying 20 ns Timing C440 to position leading edge of marker across the intersection of graticule vertical and horizontal center lines.

l. Set DELAY TIME MULT to 3.00.

m. Adjust 7B92A POSITION to place the leading edge of marker across the intersection of graticule vertical and horizontal center lines.

n. Repeat parts j through m until leading edge of marker is no longer displaced at DELAY TIME MULT settings of 3.00 and 9.00.

o. Remove BNC cable from time-mark generator.

13. ADJUST TIME POSITION

a. Connect BNC cable from output of fast-rise pulse generator to input of Amplifier plug-in unit.

b. Remove 7B92A from extender and remove extender from oscilloscope.

c. Install 7B92A directly into oscilloscope.

d. Set following 7B92A controls:

TIME/DIV OR DLY TIME	2 ns
DLY'D Time/Division	2 ns (Knob pushed in)
Main Triggering LEVEL	Midrange

e. Adjust oscilloscope Intensity control clockwise for adequate viewing.

f. Adjust Amplifier plug-in unit for an approximate 3 division display.

g. Set 7B92A POSITION fully clockwise.

h. Adjust Main Triggering LEVEL for stable display.

i. CHECK—Leading edge of pulse must be to right of graticule center.

j. Remove 7B92A from oscilloscope and re-install 7B92A with extender into oscilloscope.

k. ADJUST—Time Positioning R925 (internal adjustment) to position leading edge of pulse 3.5 divisions from left-hand edge of graticule.

l. Repeat parts b, c, and i of this step. Do not change the previous front panel control settings.

m. Remove BNC cable from output of the fast-rise pulse generator.

14. CHECK SWEEP TIMING

NOTE

The tolerance in steps 14 and 15 are for an ambient temperature range of +15°C to +35°C. If outside this range, see Specifications in 7B92A/Operator's Manual for applicable tolerances.

a. Connect a BNC cable from time-mark generator to input of Amplifier plug-in unit. (The 7B92A should be installed directly into oscilloscope.)

b. Refer to Table 4-7. Set TIME/DIV OR DLY TIME and DLY'D Time/Division controls together in Alternate mode (PULL FOR ALT).

c. Set DELAY TIME MULT to 0.0.

d. For each sweep rate, adjust Main Triggering LEVEL and POSITION to stabilize and position display so second marker of each sweep is aligned with second vertical line.

e. CHECK—For 1 marker/division over center 8 divisions of graticule within tolerance given in Table 4-7.

TABLE 4-7
Sweep Timing Check

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Markers	Tolerance (+15°C to +35°C)	
			Delaying Sweep	Delayed Sweep
0.2 s	0.2 s	0.2 s	Within 0.16 div	Within 0.16 div
0.1 s	0.1 s	0.1 s	Within 0.16 div	Within 0.16 div
50 ms	50 ms	50 ms	Within 0.16 div	Within 0.16 div
20 ms	20 ms	20 ms	Within 0.16 div	Within 0.16 div
10 ms	10 ms	10 ms	Within 0.16 div	Within 0.16 div
5 ms	5 ms	5 ms	Within 0.16 div	Within 0.16 div
2 ms	2 ms	2 ms	Within 0.16 div	Within 0.16 div
1 ms	1 ms	1 ms	Within 0.16 div	Within 0.16 div
0.5 ms	0.5 ms	0.5 ms	Within 0.16 div	Within 0.16 div
0.2 ms	0.2 ms	0.2 ms	Within 0.16 div	Within 0.16 div
0.1 ms	0.1 ms	0.1 ms	Within 0.16 div	Within 0.16 div
50 µs	50 µs	50 µs	Within 0.16 div	Within 0.16 div
20 µs	20 µs	20 µs	Within 0.16 div	Within 0.16 div
10 µs	10 µs	10 µs	Within 0.16 div	Within 0.16 div
5 µs	5 µs	5 µs	Within 0.16 div	Within 0.16 div
2 µs	2 µs	2 µs	Within 0.16 div	Within 0.16 div
1 µs	1 µs	1 µs	Within 0.16 div	Within 0.16 div
0.5 µs	0.5 µs	0.5 µs	Within 0.16 div	Within 0.16 div
0.2 µs	0.2 µs	0.2 µs	Within 0.16 div	Within 0.16 div
0.1 µs	0.1 µs	0.1 µs	Within 0.16 div	Within 0.16 div
50 ns	50 ns	50 ns	Within 0.16 div	Within 0.16 div
20 ns	20 ns	20 ns	Within 0.16 div	Within 0.16 div
10 ns	10 ns	10 ns	Within 0.24 div	Within 0.24 div

TABLE 4-8
Fast Timing Check

TIME/DIV OR DLY TIME	DLY'D Time/Division	Time Markers	Display Markers/Division	Tolerance (+15°C to +35°C)
5 ns	5 ns	5 ns	1	Within 0.24 div
2 ns	2 ns	2 ns	1	Within 0.24 div
1 ns	1 ns	1 ns	1	Within 0.32 div
0.5 ns	0.5 ns	1 ns	1 cycle/2 div	Within 0.32 div

f. Refer to Table 4-8. Set TIME/DIV OR DLY TIME and DLY'D Time/Division together and push DLY'D Time/Division knob in for Normal mode.

g. For each sweep rate, adjust Main Triggering LEVEL and POSITION to stabilize display and align second marker with second vertical graticule line.

h. CHECK—For 1 marker/division (2 divisions between markers at 0.5 nanoseconds) over center 8 divisions of graticule, within tolerance given in Table 4-8.

NOTE

HF SYNC mode may provide a better display at faster sweep rates.

15. CHECK SWEEP LINEARITY

a. Set TIME/DIV or DLY TIME and DLY'D Time/Division together at 1 ms, and pull DLY'D Time/Division knob out for Alternate mode.

b. Set time-mark generator for 1 millisecond markers vertically centered on graticule.

c. Adjust 7B92A POSITION to align second marker of Delaying (top) sweep with second vertical graticule line.

d. CHECK—Fourth marker of Delaying sweep must be within 0.1 division of fourth vertical graticule line.

e. CHECK—Continue linearity check, as in parts c and d for each successive 2 divisions of Delaying Sweep.

f. CHECK—Repeats parts c, d, and e to check linearity of Delayed (bottom) sweep.

g. Set TIME/DIV or DLY TIME and DLY'D Time/Division together at 10 ns, and pull DLY'D Time/Division knob out for Alternate mode.

h. Set time-mark generator for 10 nanosecond markers.

i. CHECK—Perform linearity check as in parts c through f. Tolerance is 0.1 division for each 2 divisions over center 8 divisions.

j. Push DLY'D Time/Division knob in for Normal mode.

TABLE 4-9
Fast Sweep Linearity

DLY'D Time/Division	Time Marker Output	Markers/2 Div	Tolerance/2 Div
5 ns	5 ns	2	0.2 divisions
2 ns	2 ns	2	0.2 divisions
1 ns	1 ns	2	0.2 divisions
0.5 ns	1 ns	1	0.2 divisions

k. CHECK—Continue linearity check for Delayed sweep rates as shown in Table 4-9.

NOTE

Maintain sufficient signal amplitude for adequate triggering.

16. CHECK VARIABLE TIME/DIVISION RANGE

a. Remove 7B92A from oscilloscope.

b. Place Time/Division Variable Selector jumper of P761 (Delaying Sweep).

c. Replace 7B92A into oscilloscope.

d. Set time-mark generator for 0.1 millisecond markers.

e. Change following 7B92A controls:

TIME/DIV OR DLY TIME	20 μs
DLY'D Time/Division	20 μs
DELAY TIME MULT	0.0

f. Press and release VARIABLE and turn fully counterclockwise.

g. Pull DLY'D Time/Division knob out for Alternate mode.

h. CHECK—Distance between Delaying sweep markers must not exceed 2 major divisions. (See Figure 4-10.)

i. Remove 7B92A from oscilloscope, reset Time/Division Variable Selector for Delayed Sweep (P760) and reinstall into oscilloscope.

j. CHECK—With VARIABLE released and turned fully counterclockwise, distance between Delayed sweep markers must not exceed 2 major divisions.

17. CHECK DIFFERENTIAL DELAY TIME ACCURACY

a. Set following 7B92A controls:

VARIABLE (CAL IN)	CAL IN
TIME/DIV OR DLY TIME	0.2 s
DLY'D Time/Division	5 ms/PUSH FOR DLY'D
Main Triggering MODE	AUTO

b. Set time-mark generator for 0.1 second markers.

c. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display.

d. Adjust Main Triggering LEVEL for stable display.

e. Set DELAY TIME MULT to 0.90.

f. Align time mark with graticule vertical center line, using 7B92A POSITION.

g. Set DELAY TIME MULT to approximately 8.9 to align time marker with graticule vertical center line.

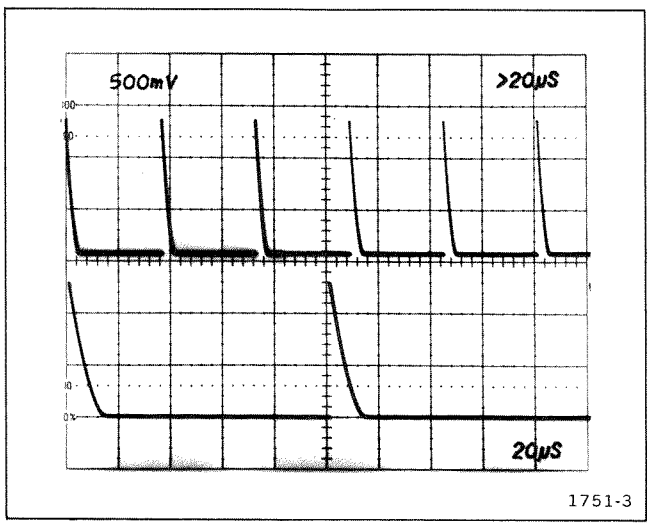


Figure 4-10. VARIABLE Time/Division range.

h. CHECK—DELAY TIME MULT setting is within 3 minor dial divisions of 8.90 (8.84 to 8.96).

i. Repeat parts e through f for each sweep rate in Table 4-10. Maintain approximately 2 divisions of display.

TABLE 4-10
Differential Delay Time Accuracy

TIME/DIV OR DLY TIME	DLY'D Time/ Division	Time Marks
0.2 s	5 ms	0.1 s
0.1 s	2 ms	50 ms
50 ms	1 ms	10 ms
20 ms	0.5 ms	10 ms
10 ms	0.2 ms	5 ms
5 ms	0.1 ms	1 ms
2 ms	50 μs	1 ms
1 ms	20 μs	0.5 ms
0.5 ms	10 μs	0.1 ms
0.2 ms	5 μs	0.1 ms
0.1 ms	2 μs	50 μs
50 μs	1 μs	10 μs
20 μs	0.5 μs	10 μs
10 μs	0.2 μs	5 μs
5 μs	0.1 μs	1 μs
2 μs	50 ns	1 μs
1 μs	20 ns	0.5 μs
0.5 μs	10 ns	0.1 μs
0.2 μs	5 ns	50 ns
0.1 μs	5 ns	50 ns

18. CHECK FAST DELAY TIME ACCURACY

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	50 ns
DLY'D Time/Division	10 ns/PUSH FOR DLY'D
DELAY TIME MULT	9.00

b. Set time-mark generator for 50 ns markers.

c. Set Amplifier plug-in unit Volts/Division switch for approximately 2 divisions of display.

d. Adjust Main Triggering LEVEL for stable display.

e. Adjust Amplifier plug-in unit and 7B92A POSITION to locate leading edge of time-mark at the intersection of graticule horizontal and vertical center lines. (See Figure 4-11.)

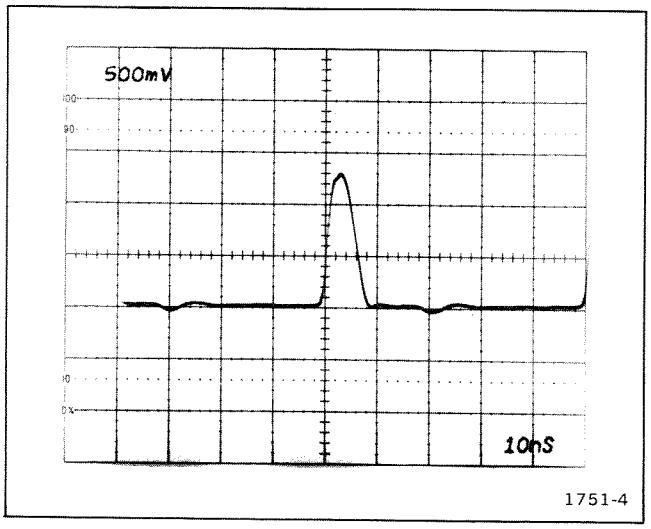


Figure 4-11. Fast delay time accuracy.

f. Change DELAY TIME MULT to approximate settings listed in Table 4-11 to align leading edge of marker at intersection of graticule vertical and horizontal center lines.

g. CHECK—Error in minor dial divisions must not exceed those listed in Table 4-11.

TABLE 4-11
Fast Delay Time Accuracy

DELAY TIME MULT	Maximum Error (Minor Dial Divisions)
9.0	0 (part e)
8.0	Within 3.0
7.0	Within 3.5
6.0	Within 4.0
5.0	Within 4.5
4.0	Within 5.0
3.0	Within 3.0
2.0	Within 6.0
1.0	Within 6.5

h. Set TIME/DIV OR DLY TIME and DLY'D Time/Division to 20 ns and 2 ns respectively, and push DLY'D Time/Division knob in for Delayed mode.

i. Set time-mark generator for 20 nanosecond markers.

j. Repeat parts c through g of this step.

k. Set TIME/DIV OR DLY TIME and DLY'D Time/Division to 10 ns and 1 ns respectively, and push DLY'D Time/Division knob in for Delayed mode.

l. Set time-mark generator for 10 nanosecond markers.

m. Repeat parts c through g of this step. Delete check at DELAY TIME MULT setting of 1.0.

19. CHECK DELAY JITTER

a. Set following 7B92A controls:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	5 μs/PUSH FOR DLY'D
DELAY TIME MULT	1.0
Main Triggering MODE	AUTO
POSITION	Midrange

b. Set time-mark generator for 1 ms markers.

c. Rotate Main Triggering LEVEL for stable display.

d. Change DLY'D Time/Division to 0.2 μs.

e. Set DELAY TIME MULT to position marker near graticule center.

f. CHECK—Jitter must not exceed 1 division (disregard slow drift).

g. Set TIME/DIV OR DLY TIME and DLY'D Time/Division for 20 μs and 50 ns respectively, and push DLY'D Time/Division knob in for Delayed mode.

h. Set time-mark generator for 50 nanosecond markers.

i. Adjust Main Triggering LEVEL for stable display.

j. Change DLY'D Time/Division to 5 ns.

k. CHECK—Jitter must not exceed 0.9 division.

l. Set DELAY TIME MULT to about 9.0 to position marker on graticule.

m. CHECK—Jitter must not exceed 0.9 division.

OPTIONS

No Options available at the time of this printing. Refer to the CHANGE INFORMATION in the back of this manual for Options available after this printing.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

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

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	Sangamo Electric Co., S. Carolina Div.	P. O. Box 128	Pickens, SC 29671
01002	General Electric Co., Industrial and Power Capacitor Products Dept.	John St.	Hudson Falls, NY 12839
01121	Allen-Bradley Co.	1201 2nd St. South	Milwaukee, WI 53204
01295	Texas Instruments, Inc., Semiconductor Group	P. O. Box 5012	Dallas, TX 75222
01963	Cherry Electrical Products Corp.	3600 Sunset Ave.	Waukegan, IL 60085
02111	Spectrol Electronics Corp.	17070 East Gale Ave.	City of Industry, CA 91745
03508	General Electric Co., Semi-Conductor Products Dept.	Electronics Park	Syracuse, NY 13201
04713	Motorola, Inc., Semiconductor Products Div.	5005 E. McDowell Rd.	Phoenix, AZ 85036
07263	Fairchild Semiconductor, A Div. of Fairchild Camera and Instrument Corp.	464 Ellis St.	Mountain View, CA 94042
07910	Teledyne Semiconductor	12515 Chadron Ave.	Hawthorne, CA 90250
08806	General Electric Co., Miniature Lamp Products Dept.	Nela Pk.	Cleveland, OH 44112
10389	Chicago Switch, Inc.	2035 Wabansia Ave.	Chicago, IL 60647
11237	CTS Keene, Inc.		Paso Robles, CA 93446
12617	Hamlin, Inc.	Grove & Lake Sts.	Lake Mills, WI 53551
12637	Fleet Products Co., Inc.	1920 E Pomona St.	Santa Ana, CA 92705
12697	Clarostat Mfg. Co., Inc.	Lower Washington St.	Dover, NH 03820
13715	Fairchild Semiconductor, A Div. of Fairchild Camera and Instrument Corp.	4300 Redwood Hwy.	San Rafael, CA 94903
14193	Cal-R, Inc.	1601 Olympic Blvd.	Santa Monica, CA 90404
14936	General Instrument Corp., Semiconductor Products Group	600 W. John St.	Hicksville, NY 11802
15818	Teledyne Semiconductor	1300 Terra Bella Ave.	Mountain View, CA 94040
18324	Signetics Corp.	811 E. Arques	Sunnyvale, CA 94086
21845	Solitron Devices, Inc., Transistor Div.	1177 Blue Heron Blvd.	Riviera Beach, FL 33404
22229	Solitron Devices, Inc., Diodes, Integrated Circuits and CMOS	8808 Balboa Ave.	San Diego, CA 92123
28480	Hewlett-Packard Co., Corporate Hq.	1501 Page Mill Rd.	Palo Alto, CA 94304
32293	Intersil, Inc.	10900 N. Tantau Ave.	Cupertino, CA 95014
56289	Sprague Electric Co.		North Adams, MA 01247
71590	Centralab Electronics, Div. of Globe-Union, Inc.	5757 N. Green Bay Ave.	Milwaukee, WI 53201
72982	Erie Technological Products, Inc.	644 W. 12th St.	Erie, PA 16512
73138	Beckman Instruments, Inc., Helipot Div.	2500 Harbor Blvd.	Fullerton, CA 92634
74970	Johnson, E. F., Co.	299 10th Ave. S. W.	Waseca, MN 56093
75042	TRW Electronic Components, IRC Fixed Resistors, Philadelphia Division	401 N. Broad St.	Philadelphia, PA 19108
78488	Stackpole Carbon Co.		St. Marys, PA 15857
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97077
80294	Bourns, Inc., Instrument Div.	6135 Magnolia Ave.	Riverside, CA 92506
81483	International Rectifier Corp.	9220 Sunset Blvd.	Los Angeles, CA 90069
90201	Mallory Capacitor Co., Div. of P. R. Mallory Co., Inc.	3029 E. Washington St.	Indianapolis, IN 46206
91637	Dale Electronics, Inc.	P. O. Box 609	Columbus, NB 68601

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3275-00			CKT BD ASSY:EXTERNAL INPUT	80009	670-3275-00
A2	670-3271-00			CKT BD ASSY:SOURCE SWITCH	80009	670-3271-00
A3	670-3272-00			CKT BD ASSY:COUPLING SWITCH	80009	670-3272-00
A4	670-3270-00			CKT BD ASSY:TRIGGER MODE	80009	670-3270-00
A5	670-3273-00			CKT BD ASSY:DELAY TRIGGER SWITCH	80009	670-3273-00
A6	670-3274-00			CKT BD ASSY:MAIN INTERFACE	80009	670-3274-00
A7	670-3276-00			CKT BD ASSY:LOGIC	80009	670-3276-00
A8	670-3277-00			CKT BD ASSY:MAIN TRIGGER	80009	670-3277-00
A9	670-3278-00			CKT BD ASSY:DELAYED TRIGGER	80009	670-3278-00
A12	670-3279-00			CKT BD ASSY:READOUT	80009	670-3279-00
C2	281-0619-00			CAP.,FXD,CER DI:1.2PF,+/-0.1PF,200V	72982	374-000C0K0129B
C8	281-0730-00			CAP.,FXD,CER DI:10.8PF,1%,500V	72982	301055C0G1089F
C10	281-0609-00			CAP.,FXD,CER DI:1PF,+/-0.1PF,500V	72982	374-005C0K0109B
C11	281-0617-00			CAP.,FXD,CER DI:15PF,10%,200V	72982	374-001C0G0150K
C12	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C17	281-0578-00			CAP.,FXD,CER DI:18PF,5%,500V	72982	301-000C0G0180J
C18	281-0578-00			CAP.,FXD,CER DI:18PF,5%,500V	72982	301-000C0G0180J
C20	283-0251-00			CAP.,FXD,CER DI:87 PF,5%,100V	72982	8121N116C0G870J
C22	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C24	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C25	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C27	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C34	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C37	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C43	281-0551-00			CAP.,FXD,CER DI:390PF,10%,500V	72982	301-000X5P0391K
C44	281-0525-00			CAP.,FXD,CER DI:470PF,+/-94PF,500V	72982	301-000X5U0471M
C46	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N063651223M
C61	283-0141-00			CAP.,FXD,CER DI:200PF,10%,600V	14193	PO-0321-201K
C64	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N038651105Z
C65	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C79	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C91	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C94	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C95	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C122	283-0253-00			CAP.,FXD,CER DI:10UF,10%,50V	72982	CC150W5P103K
C124	283-0140-00			CAP.,FXD,CER DI:4.7PF,5%,50V	72982	8101-003C0H479C
C127	283-0324-00			CAP.,FXD,CER DI:0.01PF,20%,50V	72982	CC080525U103Z
C128	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C141	283-0140-00			CAP.,FXD,CER DI:4.7PF,5%,50V	72982	8101-003C0H479C
C142	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C147	281-0523-00			CAP.,FXD,CER DI:500PF,+/-20PF,350V	72982	301-000U2M0101M
C151	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C152	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C162	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C191	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C193	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C195	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C202	281-0619-00			CAP.,FXD,CER DI:1.2PF,+/-0.1PF,200V	72982	374-000C0K0129B
C211	281-0617-00			CAP.,FXD,CER DI:15PF,10%,200V	72982	374-001C0G0150K
C212	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C214	283-0140-00			CAP.,FXD,CER DI:4.7PF,5%,50V	72982	8101-003C0H479C
C220	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N038651105Z
C224	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058651103M
C225	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C226	283-0251-00			CAP.,FXD,CER DI:87 PF,5%,100V	72982	8121N116C0G870J
C231	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C233	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058651103M
C246	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N063651223M
C261	283-0141-00			CAP.,FXD,CER DI:200PF,10%,600V	14193	PO-0321-201K
C279	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C289	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C291	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C295	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C297	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131-250651103P
C321	283-0324-00			CAP.,FXD,CER DI:0.01PF,20%,50V	72982	CC085Z5U103Z
C325	283-0253-00			CAP.,FXD,CER DI:10UF,10%,50V	72982	CC150W5P103K
C341	283-0140-00			CAP.,FXD,CER DI:4.7PF,5%,50V	72982	8101-003C0H479C
C342	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C352	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
C373	283-0318-00			CAP.,FXD,CER DI:10PF20%,100V	72982	CC1005C0G100F
C385	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N058651103M
C387	281-0550-00			CAP.,FXD,CER DI:120PF,10%,500V	72982	301-000X5P0121K
C391	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C393	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C395	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C411	283-0051-00			CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G332J
C415	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C431	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C432	285-0889-00			CAP.,FXD,PLSTC:0.0027UF,5%,100V	01002	61F10BC272
C438	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C440	281-0153-00			CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C441	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
C446	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C448	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C473	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C484	283-0648-00			CAP.,FXD,MICA D:10PF,5%,100V	00853	D151C100DC
C489	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C491	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
C492	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C493	281-0584-00			CAP.,FXD,CER DI:100PF,5%,500V	72982	301-000Y5D0101J
C508	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
C511	283-0051-00			CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G332J
C515	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C531	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0025HA1
C532	285-0889-00			CAP.,FXD,PLSTC:0.0027UF,5%,100V	01002	61F10BC272
C538	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C540	281-0168-00			CAP.,VAR,AIR DI:1.3-5.4PF,250V	74970	187-0103-035
C546	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C548	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C573	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C607	281-0572-00			CAP.,FXD,CER DI:6.8PF,+/-0.5PF,500V	72982	301-000C0H0689D
C705	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
C706	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
C707	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
C709	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
C710	290-0183-00			CAP.,FXD,ELCTLT:1UF,10%,35V	56289	162D105X9035CD2
C715	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
					01002	61F10AC103
C716	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
C717	295-0172-00			CAP.,SET,MTCHD:10UF,0.1UF,898PF,MTCHD,1.5%	80009	295-0172-00
C721	281-0166-00			CAP.,VAR,AIR DI:1.9-15.7PF,250V	74970	187-0109-005
C722	283-0647-00			CAP.,FXD,MICA D:70PF,1%,100V	00853	D151E700F0
C750	290-0420-00			CAP.,FXD,ELCTLT:0.68UF,20%,75V	56289	150D684X0075A2
C819	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-000C0G0100F
C822	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C825	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C828	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C830	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C834	283-0728-00			CAP.,FXD,MICA:120PF,1%,500V	00853	DM15-5F121F0
C835	283-0646-00			CAP.,FXD,MICA D:170PF,1%,100V	00853	D151E171F0
C837	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C844	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C852	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
C874	281-0603-00			CAP.,FXD,CER DI:39PF,5%,500V	72982	308-000C0G0390J
C886	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C891	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C893	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C895	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C905	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C915	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C935	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C938	281-0540-00			CAP.,FXD,CER DI:51PF,5%,500V	72982	301-000U2J0510J
C942	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C944	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C952	281-0578-00			CAP.,FXD,CER DI:18PF,5%,500V	72982	301-000C0G0180J
C954	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-505B102J
C971	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651104Z
C972	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C973	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
C974	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C975	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
C976	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020NLF
C978	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131N075651104M
CR6	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR7	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR21	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR91	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR105	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR113	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR114	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR131	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR172	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR176	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR221	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR289	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR291	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR313	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR314	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR335	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR336	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR337	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR338	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR372	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR376	152-0177-02			SEMICOND DEVICE:TUNNEL,10MA,+/-0.5MA,2PF	80009	152-0177-02
CR381	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR410	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR429	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR433	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR434	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR443	150-1004-00			LAMP,LED:RED,2.5V,15MA	08806	SSL-12
CR444	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR447	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR456	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR471	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR472	152-0322-00			SEMICOND DEVICE:SILICON,15V	28480	5082-2672
CR474	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR483	152-0182-00			SEMICOND DEVICE:TUNNEL,10MA,50PF	03508	1N3719
CR488	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR493	152-0182-00			SEMICOND DEVICE:TUNNEL,10MA,50PF	03508	1N3719
CR498	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR508	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR510	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	14936	GD238
CR529	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR534	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR543	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR547	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR571	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR572	152-0322-00			SEMICOND DEVICE:SILICON,15V	28480	5082-2672
CR574	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR602	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR606	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR611	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR612	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR613	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR616	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR617	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR618	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR751	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR752	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR753	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR755	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR758	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR761	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR762	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR763	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR764	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR765	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR766	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR771	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR772	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR773	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR774	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR775	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR776	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR781	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR785	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR786	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR799	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR802	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR806	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR811	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR824	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR825	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR826	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR876	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR882	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	13715	FD7003
CR892	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	14936	GD238
CR894	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR922	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR930	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR932	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR934	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR938	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
CR963	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	07910	1N4152
DS10	150-0048-01			LAMP,INCAND:NO.683,SELECTED	08806	683AS15
DS20	150-0048-01			LAMP,INCAND:NO.683,SELECTED	08806	683AS15
DS100	150-0048-01			LAMP,INCAND:NO.683,SELECTED	08806	683AS15
DS820	150-0048-01			LAMP,INCAND:NO.683,SELECTED	08806	683AS15
DS845	150-0048-01			LAMP,INCAND:NO.683,SELECTED	08806	683AS15
K6	108-0358-00			COIL,REED SW:12V	80009	108-0358-00
L4	108-0170-01			COIL,RF:0.5UH	80009	108-0170-01
L61	276-0543-00			SHIELDING BEAD,:	80009	276-0543-00
L62	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L84	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L91	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L101	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L112	276-0543-00			SHIELDING BEAD,:	80009	276-0543-00
L204	108-0170-01			COIL,RF:0.5UH	80009	108-0170-01
L261	276-0543-00			SHIELDING BEAD,:	80009	276-0543-00
L262	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L284	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L291	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L301	108-0331-00			COIL,RF:0.75UH	80009	108-0331-00
L312	276-0543-00			SHIELDING BEAD,:	80009	276-0543-00
L558	108-0170-01			COIL,RF:0.5UH	80009	108-0170-01
L574	276-0507-00			SHIELDING BEAD,:0.6UH	78488	57-0180-7D
L938	276-0507-00			SHIELDING BEAD,:0.6UH	78488	57-0180-7D
LR482	108-0408-00			COIL,RF:100NH	80009	108-0408-00
LR891	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR893	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR895	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR971	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR972	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR973	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR976	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR981	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR982	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR983	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR985	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR986	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
LR987	108-0543-00			COIL,RF:1.1UH	80009	108-0543-00
Q22A,B	151-1011-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	22229	FD1167
Q24	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q52	151-0190-00			TRANSISTOR:SILICON,NPN	04713	2N3904
Q56	151-0188-00			TRANSISTOR:SILICON,PNP	04713	2N3906
Q58	151-0188-00			TRANSISTOR:SILICON,PNP	04713	2N3906
Q72	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q74	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q82	151-0190-00			TRANSISTOR:SILICON,NPN	04713	2N3904
Q84	151-0190-00			TRANSISTOR:SILICON,NPN	04713	2N3904
Q104	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q112	151-0362-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	04713	SMT1105
Q122	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q132	151-0188-00			TRANSISTOR:SILICON,PNP	04713	2N3906
Q148	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q151	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q158	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q162	151-0188-00			TRANSISTOR:SILICON,PNP	04713	2N3906
Q164	151-0188-00			TRANSISTOR:SILICON,PNP	04713	2N3906
Q222A,B	151-1011-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	22229	FD1167
Q224	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q256	151-0190-00			TRANSISTOR:SILICON,NPN	04713	2N3904
Q312	151-0362-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	04713	SMT1105
Q332	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q334	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q348	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q358	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q382	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q385	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q387	151-0190-00			TRANSISTOR:SILICON,NPN	04713	2N3904
Q402	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q404	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q410	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q412	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q420	151-0236-00			TRANSISTOR:SILICON,NPN	15818	SA2700
Q430	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q436	151-0410-00			TRANSISTOR:SILICON,PNP	04713	SPS6765
Q446A,B	151-1036-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	21845	FD1551
Q450	151-0427-00			TRANSISTOR:SILICON,NPN	80009	151-0427-00
Q456	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q458	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q462	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q464	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q468	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q472	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q474	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q482A,B	151-0354-00			TRANSISTOR:SILICON,PNP,DUAL	32293	ITS1200A
Q486	151-0410-00			TRANSISTOR:SILICON,PNP	04713	SPS6765
Q492	151-0271-00			TRANSISTOR:SILICON,PNP	01295	SKA4504
Q493	151-0271-00			TRANSISTOR:SILICON,PNP	01295	SKA4504
Q494	151-0410-00			TRANSISTOR:SILICON,PNP	04713	SPS6765
Q502	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q504	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q510	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q512	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q520	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q522	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0333-00
Q530	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q536	151-0410-00			TRANSISTOR:SILICON,PNP	04713	SPS6765
Q546A,B	151-1036-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	21845	FD1551
Q550	151-0427-00			TRANSISTOR:SILICON,NPN	80009	151-0427-00
Q890	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q562	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q568	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q572	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q574	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q582	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q584	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q602	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q606	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q798	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q802	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q804	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q806	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q810	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q812	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q816	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q818	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q844	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
Q852	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q854	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q864	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q874	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q876	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q882	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q884	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q890	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q892	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q894	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q900	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q902	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q904	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q910	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q912	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0367-00
Q914	151-0223-00			TRANSISTOR:SILICON,NPN	80009	151-0223-00
Q922	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q926	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q928	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q932	151-0424-00			TRANSISTOR:SILICON,NPN	07263	2N5769
Q934	151-0221-00			TRANSISTOR:SILICON,PNP	80009	151-0221-00
Q938	151-0410-00			TRANSISTOR:SILICON,PNP	04713	SPS6765
Q940	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
Q942	151-0437-00			TRANSISTOR:SILICON,NPN,SEL FROM 2N5769	80009	151-0437-00
Q952	151-0437-00			TRANSISTOR:SILICON,NPN,SEL FROM 2N5769	80009	151-0437-00
Q960	151-0302-00			TRANSISTOR:SILICON,NPN	04713	2N2222A
Q978	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
R2	317-0680-00			RES.,FXD,COMP:68 OHM,5%,0.125W	01121	BB6805
R3	303-0680-00			RES.,FXD,COMP:68 OHM,5%,1W	01121	GB6805
R4	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R7	315-0131-00			RES.,FXD,COMP:130 OHM,5%,0.25W	01121	CB1315
R8	315-0105-00			RES.,FXD,COMP:1M OHM,5%,0.25W	01121	CB1055
R9	317-0510-00			RES.,FXD,COMP:51 OHM,5%,0.125W	01121	BB5105
R10	315-0915-00			RES.,FXD,COMP:9.1M OHM,5%,0.25W	01121	CB9155
R11	317-0471-00			RES.,FXD,COMP:470 OHM,5%,0.125W	01121	BB4715
R12	315-0824-00			RES.,FXD,COMP:820K OHM,5%,0.25W	01121	CB8245
R13	315-0274-00			RES.,FXD,COMP:270K OHM,5%,0.25W	01121	CB2745
R14	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R15	315-0204-00			RES.,FXD,COMP:200K OHM,5%,0.25W	01121	CB2045
R17	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R18	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R20	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R21	315-0393-00			RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R22	315-0750-00			RES.,FXD,COMP:75 OHM,5%,0.25W	01121	CB7505
R24	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R25	311-1268-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	62PT-351-0
R28	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R29	315-0301-00			RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R34	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R36	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R37	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R38	315-0123-00			RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB1235
R41	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R42	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R43	315-0203-00			RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R44	315-0203-00			RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R46	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R48	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R50	311-1192-00			RES.,VAR,NONWIR:10K OHM,20%,1W	12637	381-CM39695
R51	315-0363-00			RES.,FXD,COMP:36K OHM,5%,0.25W	01121	CB3635
R52	315-0160-00			RES.,FXD,COMP:16 OHM,5%,0.25W	01121	CB1605
R53	315-0392-00			RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R54	315-0563-00			RES.,FXD,COMP:56K OHM,5%,0.25W	01121	CB5635
R55	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R56	315-0160-00			RES.,FXD,COMP:16 OHM,5%,0.25W	01121	CB1605
R58	315-0513-00			RES.,FXD,COMP:51K OHM,5%,0.25W	01121	CB5135
R59	311-1559-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R61	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R63	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R64	315-0822-00			RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R65	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R66	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R67	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R68	315-0682-00			RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R71	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R72	315-0511-00			RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R73	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R74	315-0511-00			RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R75	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R76	315-0160-00			RES.,FXD,COMP:16 OHM,5%,0.25W	01121	CB1605
R77	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R78	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R79	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R80	315-0162-00			RES.,FXD,COMP:1.6K OHM,5%,0.25W	01121	CB1625
R81	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R82	315-0681-00			RES.,FXD,COMP:680 OHM,5%,0.25W	01121	CB6815
R83	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R84	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R86	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R87	315-0361-00			RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R88	315-0361-00			RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R91	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R92	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R94	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R95	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R96	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R97	315-0132-00			RES.,FXD,COMP:1.3K OHM,5%,0.25W	01121	CB1325
R102	315-0750-00			RES.,FXD,COMP:75 OHM,5%,0.25W	01121	CB7505
R103	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R104	315-0201-00			RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R105	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R106	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R107	317-0511-00			RES.,FXD,COMP:510 OHM,5%,0.125W	01121	BB5115
R108	317-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.125	01121	BB5125
R111	317-0270-00			RES.,FXD,COMP:27 OHM,5%,0.125W	01121	BB2705
R112	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R113	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R114	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R115	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R116	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R117	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R118	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R121	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R122	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	75042	CEAT0-4991F
R123	315-0201-00			RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R124	317-0240-00			RES.,FXD,COMP:24 OHM,5%,0.125W	01121	BB2405
R125	311-1258-00			RES.,VAR,NONWIR:50 OHM,10%,0.50W	73138	62PT-342-0
R127	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R128	315-0244-00			RES.,FXD,COMP:240K OHM,5%,0.25W	01121	CB2445
R129	315-0823-00			RES.,FXD,COMP:82K OHM,5%,0.25W	01121	CB8235
R132	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R133	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R135	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R142	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R143	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R145	311-1267-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	62PT-3500-502K
R146	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R148	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R149	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R151	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R152	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R153	315-0113-00			RES.,FXD,COMP:11K OHM,5%,0.25W	01121	CB1135
R155	311-1267-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	62PT-3500-502K
R156	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R158	315-0201-00			RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R159	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R161	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R162	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R164	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R165	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R171	317-0470-00			RES.,FXD,COMP:47 OHM,5%,0.125W	01121	BB4705
R173	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R175	317-0470-00			RES.,FXD,COMP:47 OHM,5%,0.125W	01121	BB4705
R176	317-0201-00			RES.,FXD,COMP:200 OHM,5%,0.125W	01121	BB2015
R177	317-0510-00			RES.,FXD,COMP:51 OHM,5%,0.125W	01121	BB5105
R202	317-0680-00			RES.,FXD,COMP:68 OHM,5%,0.125W	01121	BB6805
R203	303-0680-00			RES.,FXD,COMP:68 OHM,5%,1W	01121	GB6805
R204	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R207	315-0131-00			RES.,FXD,COMP:130 OHM,5%,0.25W	01121	CB1315
R212	317-0824-00			RES.,FXD,COMP:820K OHM,5%,0.125W	01121	BB8245
R213	317-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.125	01121	BB5125
R214	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R215	315-0244-00			RES.,FXD,COMP:240K OHM,5%,0.25W	01121	CB2445
R217	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R225	311-1268-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	62PT-351-0
R226	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R228	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R229	315-0301-00			RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R231	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R233	315-0750-00			RES.,FXD,COMP:75 OHM,5%,0.25W	01121	CB7505
R238	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R241	315-0432-00			RES.,FXD,COMP:4.3K OHM,5%,0.25W	01121	CB4325
R243	315-0512-00			RES.,FXD,COMP:5.1K OHM,5%,0.25W	01121	CB5125
R245	311-1559-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	73138	91A-10001M
R246	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R247	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R248	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R250	311-1322-00			RES.,VAR,NONWIR:5K OHM,10%,1W	12697	381-CM39701
R251	315-0203-00			RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R252	315-0513-00			RES.,FXD,COMP:51K OHM,5%,0.25W	01121	CB5135
R253	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R254	315-0473-00			RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R255	315-0113-00			RES.,FXD,COMP:11K OHM,(NOM VALUE),SEL	01121	CB1135
R256	315-0132-00			RES.,FXD,COMP:1.3K OHM,5%,0.25W	01121	CB1325
R257	315-0133-00			RES.,FXD,COMP:13K OHM,5%,0.25W	01121	CB1335
R258	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R259	315-0912-00			RES.,FXD,COMP:9.1K OHM,5%,0.25W	01121	CB9125
R261	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R262	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R263	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R266	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R267	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R273	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R275	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R277	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R278	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R279	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R284	315-0752-00			RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R285	315-0362-00			RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R286	315-0361-00			RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R287	315-0361-00			RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R291	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R292	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R295	317-0510-00			RES.,FXD,COMP:51 OHM,5%,0.125W	01121	BB5105
R296	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R297	315-0132-00			RES.,FXD,COMP:1.3K OHM,5%,0.25W	01121	CB1325
R298	317-0510-00			RES.,FXD,COMP:51 OHM,5%,0.125W	01121	BB5105
R302	315-0750-00			RES.,FXD,COMP:75 OHM,5%,0.25W	01121	CB7505
R303	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R311	317-0270-00			RES.,FXD,COMP:27 OHM,5%,0.125W	01121	BB2705
R312	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R313	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R314	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R315	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R316	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R317	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R322	315-0131-00			RES.,FXD,COMP:130 OHM,5%,0.25W	01121	CB1315
R324	317-0240-00			RES.,FXD,COMP:24 OHM,5%,0.125W	01121	BB2405
R325	311-1258-00			RES.,VAR,NONWIR:50 OHM,10%,0.50W	73138	62PT-342-0
R331	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R334	315-0562-00			RES.,FXD,COMP:5.6K OHM,5%,0.25W	01121	CB5625
R335	315-0242-00			RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R337	315-0682-00			RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R342	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R343	315-0112-00			RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R345	311-1267-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	62PT-3500-502K
R346	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R348	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R349	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R352	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R353	315-0362-00			RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R355	311-1267-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	62PT-3500-502K
R356	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R358	315-0201-00			RES.,FXD,COMP:200 OHM,5%,0.25W	01121	CB2015
R359	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R371	317-0430-00			RES.,FXD,COMP:43 OHM,5%,0.125W	01121	BB4305
R373	317-0101-00			RES.,FXD,COMP:100 OHM,5%,0.125W	01121	BB1015
R375	317-0470-00			RES.,FXD,COMP:47 OHM,5%,0.125W	01121	BB4705
R377	317-0510-00			RES.,FXD,COMP:51 OHM,5%,0.125W	01121	BB5105
R378	317-0102-00			RES.,FXD,COMP:1K OHM,5%,0125W	01121	BB1025
R383	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R385	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R386	321-0232-00			RES.,FXD,FILM:2.55K OHM,1%,0.125W	75042	CEAT0-2551F
R387	315-0360-00			RES.,FXD,COMP:36 OHM,5%,0.25W	01121	CB3605
R388	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	75042	CEAT0-4021F
R401	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R402	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEAT0-1401F
R403	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R404	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R405	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R406	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R408	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R409	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R411	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R412	323-0173-00			RES.,FXD,FILM:619 OHM,1%,0.50W	75042	CECT0-6190F
R414	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R415	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R421	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R422	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R423	321-0275-00			RES.,FXD,FILM:7.15K OHM,1%,0.125W	75042	CEAT0-7151F
R425	311-1245-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	72X-23-0-501K
R426	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R427	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R429	321-0173-00			RES.,FXD,FILM:619 OHM,1%,0.125W	75042	CEAT0-6190F
R430	315-0161-00			RES.,FXD,COMP:160 OHM,5%,0.25W	01121	CB1615
R431	321-0047-00			RES.,FXD,FILM:30.1 OHM,1%,0.125W	75042	CEAT0-30R10F
R432	315-0330-00			RES.,FXD,COMP:33 OHM,5%,0.25W	01121	CB3305
R433	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R436	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R438	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R440	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R441	315-0330-00			RES.,FXD,COMP:33 OHM,5%,0.25W	01121	CB3305
R442	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R443	315-0823-00			RES.,FXD,COMP:82K OHM,5%,0.25W	01121	CB8235
R444	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R445	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R446	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R447	315-0271-00			RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R450	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R451	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R452	315-0204-00			RES.,FXD,COMP:200K OHM,5%,0.25W	01121	CB2045
R453	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	75042	CEAT0-1502F
R454	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	75042	CEAT0-4991F
R455	321-0262-00			RES.,FXD,FILM:5.23K OHM,1%,0.125W	75042	CEAT0-5231F
R456	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R457	315-0431-00			RES.,FXD,COMP:430 OHM,5%,0.25W	01121	CB4315
R458	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72X-37-0-200
R459	315-0242-00			RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R460	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R461	315-0910-00			RES.,FXD,COMP:91 OHM,5%,0.25W	01121	CB9105
R462	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R463	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R464	315-0751-00			RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R465	321-0196-00			RES.,FXD,FILM:1.07K OHM,1%,0.125W	75042	CEAT0-1071F
R466	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R467	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R468	321-0183-00			RES.,FXD,FILM:787 OHM,1%,0.125W	75042	CEAT0-7870F
R469	321-0124-00			RES.,FXD,FILM:191 OHM,1%,0.125W	75042	CEAT0-1910F
R470	315-0820-00			RES.,FXD,COMP:82 OHM,5%,0.25W	01121	CB8205
R471	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R472	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R473	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R474	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R475	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R476	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R477	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R478	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R479	315-0911-00			RES.,FXD,COMP:910 OHM,5%,0.25W	01121	CB9115
R480	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	75042	CEAT0-1301F
R481	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R483	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R484	315-0561-00			RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R485	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R486	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R487	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R488	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R489	321-0219-00			RES.,FXD,FILM:1.87K OHM,1%,0.125W	75042	CEAT0-1871F
R490	311-0946-00			RES.,VAR,WW:50K OHM,3%,2W	02111	534-70
R491	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	75042	CEAT0-1000F
R494	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R495	311-1239-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.50W	73138	72Y-26-0-252K
R496	321-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.125W	75042	CEAT0-3482F
R497	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	75042	CEAT2-5KC
R498	315-0122-00			RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R499	315-0821-00			RES.,FXD,COMP:820 OHM,5%,0.25W	01121	CB8215
R501	315-0390-00			RES.,FXD,COMP:39 OHM,5%,0.25W	01121	CB3905
R502	321-0207-00			RES.,FXD,FILM:1.4K OHM,1%,0.125W	75042	CEAT0-1401F
R504	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R505	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R506	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R509	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R511	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R512	323-0173-00			RES.,FXD,FILM:619 OHM,1%,0.50W	75042	CECT0-6190F
R514	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R515	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R521	321-0275-00			RES.,FXD,FILM:7.15K OHM,1%,0.125W	75042	CEAT0-7151F
R525	311-1245-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	72X-23-0-501K
R526	315-0682-00			RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R527	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R528	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R529	321-0200-00			RES.,FXD,FILM:1.18K OHM,1%,0.125W	75042	CEAT0-1181F
R531	321-0076-00			RES.,FXD,FILM:60.4 OHM,1%,0.125W	75042	CEAT0-60R40F
R532	315-0300-00			RES.,FXD,COMP:30 OHM,5%,0.25W	01121	CB3005
R536	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R538	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R541	315-0330-00			RES.,FXD,COMP:33 OHM,5%,0.25W	01121	CB3305
R542	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R544	315-0560-00			RES.,FXD,COMP:56 OHM,5%,0.25W	01121	CB5605
R545	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R546	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R547	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R548	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R551	315-0470-00			RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R552	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R553	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R554	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R557	321-0773-03			RES.,FXD,FILM:400 OHM,0.25%,0.125W	75042	CEAT2-4000C
R558	321-0773-03			RES.,FXD,FILM:400 OHM,0.25%,0.125W	75042	CEAT2-4000C

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R559	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R561	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R562	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R563	315-0432-00			RES.,FXD,COMP:4.3K OHM,5%,0.25W	01121	CB4325
R564	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R565	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R566	315-0132-00			RES.,FXD,COMP:1.3K OHM,5%,0.25W	01121	CB1325
R568	315-0820-00			RES.,FXD,COMP:82 OHM,5%,0.25W	01121	CB8205
R569	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R571	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R572	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R573	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R574	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R577	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R578	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R579	315-0242-00			RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R581	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R582	315-0752-00			RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R585	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R586	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R600	311-1162-00			RES.,VAR,NONWIR:2 X 10K OHM,10%,1W	12697	381-CM39691
R602	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R603	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R605	311-1162-00			RES.,VAR,NONWIR:2 X 10K OHM,10%,1W	12697	381-CM39691
R606	315-0562-00			RES.,FXD,COMP:5.6K OHM,5%,0.25W	01121	CB5625
R607	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R608	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R609	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R613	315-0563-00			RES.,FXD,COMP:56K OHM,5%,0.25W	01121	CB5635
R615	311-0546-00			RES.,VAR,NONWIR:10K OHM,20%,0.75W	01121	W-8154
R616	315-0392-00			RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R701	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R702	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R711	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R712	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R713	315-0564-00			RES.,FXD,COMP:560K OHM,5%,0.25W	01121	CB5645
R714	315-0114-00			RES.,FXD,COMP:110K OHM,5%,0.25W	01121	CB1145
R715	315-0393-00			RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R731	323-1500-07			RES.,FXD,FILM:1.6M OHM,0.1%,5W	91637	MF7CE1R603B
R732	323-1500-07			RES.,FXD,FILM:1.6M OHM,0.1%,5W	91637	MF7CE1R603B
R733	323-0620-07			RES.,FXD,FILM:800K OHM,0.1%,5W	91637	MF7CE80002B
R734	323-0806-07			RES.,FXD,FILM:266.7K OHM,0.1%,5W	91637	MF7CE266R7E
R735	323-1404-07			RES.,FXD,FILM:160K OHM,0.1%,5W	91637	MF7CE16002B
R736	323-0805-07			RES.,FXD,FILM:80K OHM,0.1%,5W	91637	MF7CE80001B
R737	323-0802-07			RES.,FXD,FILM:26.67K OHM,0.1%,5W	91637	MF7CE26R67B
R738	323-1308-07			RES.,FXD,FILM:16K OHM,0.1%,5W	91637	MF7E16001B
R741	323-0810-07			RES.,FXD,FILM:4M OHM,0.1%,5W	91637	MF7F40002B
R742	323-0810-07			RES.,FXD,FILM:4M OHM,0.1%,5W	91637	MF7CE4002B
R743	323-0510-07			RES.,FXD,FILM:2M OHM,0.1%,5W	91637	MF7CE20003B
R744	323-0808-07			RES.,FXD,FILM:666.7K OHM,0.1%,5W	91637	MF7CE666R7B
R745	323-0807-07			RES.,FXD,FILM:400K OHM,0.1%,5W	91637	MF7CE4002B
R746	323-0414-07			RES.,FXD,FILM:200K OHM,0.1%,5W	91637	MFF1226C20002B
R747	323-0804-07			RES.,FXD,FILM:66.67K OHM,0.1%,5W	91637	MF7CE66R67B

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R748	323-0803-07			RES.,FXD,FILM:40K OHM,0.1%,5W	91637	MF7CE40001B
R749	323-0318-00			RES.,FXD,FILM:20K OHM,1%,0.50W	75042	CECT0-2002F
R750	311-0467-00			RES.,VAR,NONWIR:100K OHM,20%,0.50W	11237	41334
R751	321-0432-00			RES.,FXD,FILM:309K OHM,1%,0.125W	75042	CEAT0-3093F
R752	321-0366-00			RES.,FXD,FILM:63.4K OHM,1%,0.125W	75042	CEAT0-6342F
R753	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R754	315-0562-00			RES.,FXD,COMP:5.6K OHM,5%,0.25W	01121	CB5625
R755	311-0959-00			RES.,VAR,WW10K OHM,5%,1.5W	71590	BA165-007
R756	321-0452-00			RES.,FXD,FILM:499K OHM,1%,0.125W	75042	CEAT0-4993F
R758	315-0133-00			RES.,FXD,COMP:13K OHM,5%,0.25W	01121	CB1335
R761	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R762	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	75042	CEAT0-7152F
R763	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R764	321-0342-00			RES.,FXD,FILM:35.7K OHM,1%,0.125W	75042	CEAT0-3572F
R765	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R766	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	75042	CEAT0-7152F
R770	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R771	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R772	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	75042	CEAT0-7152F
R773	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R774	321-0342-00			RES.,FXD,FILM:35.7K OHM,1%,0.125W	75042	CEAT0-3572F
R775	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	75042	CEAT0-1433F
R776	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	75042	CEAT0-7152F
R781	315-0753-00			RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R782	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R783	315-0513-00			RES.,FXD,COMP:51K OHM,5%,0.25W	01121	CB5135
R784	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	75042	CEAT0-3742F
R785	315-0753-00			RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R786	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R787	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R788	315-0513-00			RES.,FXD,COMP:51K OHM,5%,0.25W	01121	CB5135
R789	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	75042	CEAT0-3742F
R791	315-0753-00			RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R792	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R794	315-0753-00			RES.,FXD,COMP:75K OHM,5%,0.25W	01121	CB7535
R795	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R796	315-0154-00			RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R798	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R799	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R801	315-0223-00			RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R802	315-0391-00			RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R803	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R806	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	75042	CEAT0-3011F
R807	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R811	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R812	315-0473-00			RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R813	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R814	321-0257-00			RES.,FXD,FILM:4.64K OHM,1%,0.125W	75042	CEAT0-4641F
R816	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R817	321-0212-00			RES.,FXD,FILM:1.58K OHM,1%,0.125W	75042	CEAT0-1581F
R818	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R819	315-0304-00			RES.,FXD,COMP:300K OHM,5%,0.25W	01121	CB3045
R822	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R824	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R825	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025NLF
R826	315-0392-00			RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R827	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R828	315-0184-00			RES.,FXD,COMP:180K OHM,5%,0.25W	01121	CB1845
R829	315-0241-00			RES.,FXD,COMP:240 OHM,5%,0.25W	01121	CB2415
R831	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R832	315-0302-00			RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R834	321-0310-00			RES.,FXD,FILM:16.5K OHM,1%,0.125W	75042	CEAT0-1652C
R839	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R841	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R842	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R844	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R845	315-0220-00			RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R851	315-0222-00			RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R852	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R854	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R861	315-0680-00			RES.,FXD,COMP:68 OHM,5%,0.25W	01121	CB6805
R862	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R863	315-0472-00			RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R864	321-0136-00			RES.,FXD,FILM:255 OHM,1%,0.125W	75042	CEAT0-2550F
R865	315-0392-00			RES.,FXD,COMP:3.9K OHM,5%,0.25W	01121	CB3925
R871	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R872	315-0222-00			RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R874	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R876	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R881	315-0471-00			RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R882	315-0202-00			RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R884	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R885	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R886	315-0510-00			RES.,FXD,COMP:51 OHM,5%,0.25W	01121	CB5105
R888	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R891	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R892	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R893	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R894	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R895	315-0511-00			RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R901	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R902	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R903	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R905	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R911	315-0272-00			RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R912	315-0102-00			RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R915	315-0101-00			RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R916	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R921	315-0103-00			RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R922	321-0266-00			RES.,FXD,FILM:5.76K OHM,1%,0.125W	75042	CEAT0-5761F
R923	315-0151-00			RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R925	311-1248-00			RES.,VAR,NONWIR:500 OHM,10%,0.50W	73138	72X-23-0-501K
R926	321-0208-00			RES.,FXD,FILM:1.43K OHM,1%,0.125W	75042	CEAT0-1431F
R927	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	75042	CEAT0-2321F
R929	321-0258-00			RES.,FXD,FILM:4.75K OHM,1%,0.125W	75042	CEAT0-4751F
R930	311-1482-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	01121	W-8070

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R932	321-0343-00			RES.,FXD,FILM:36.5K OHM,1%,0.125W	75042	CEAT0-3652F
R935	311-1198-00			RES.,VAR,NONWIR:20K OHM,20%,0.5W	80294	3389H
R936	321-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.125W	75042	CEAT0-3482F
R937	315-0332-00			RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R938	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R939	315-0911-00			RES.,FXD,COMP:910 OHM,5%,0.25W	01121	CB9115
R941	315-0152-00			RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R942	315-0270-00			RES.,FXD,COMP:27 OHM,5%,0.25W	01121	CB2705
R944	315-0361-00			RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R945	322-0218-00			RES.,FXD,FILM:1.82K OHM,1%,0.25W	75042	CEBT0-1821F
R947	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R951	321-0118-00			RES.,FXD,FILM:165 OHM,1%,0.125W	75042	CEAT0-1650F
R952	315-0330-00			RES.,FXD,COMP:33 OHM,5%,0.25W	01121	CB3305
R954	315-0181-00			RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R955	322-0218-00			RES.,FXD,FILM:1.82K OHM,1%,0.25W	75042	CEBT0-1821F
R957	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R961	315-0121-00			RES.,FXD,COMP:120 OHM,5%,0.25W	01121	CB1215
R962	321-0206-00			RES.,FXD,FILM:1.37K OHM,1%,0.125W	75042	CEAT0-1371F
R963	321-0152-00			RES.,FXD,FILM:374 OHM,1%,0.125W	75042	CEAT0-3740F
R964	321-0122-00			RES.,FXD,FILM:182 OHM,1%,0.125W	75042	CEAT0-1820F
R974	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R975	315-0100-00			RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R976	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEAT0-1002F
R977	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	75042	CEAT0-4991F
R978	315-0221-00			RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
S6	260-0721-00			SWITCH,REED:SPDT,35A	12617	MBH-DT
S10[1]	670-3271-00			PUSHBUTTON ASSY:4 BUTTON	80009	670-3271-00
S20[1]	670-3272-00			PUSHBUTTON ASSY:4 BUTTON	80009	670-3272-00
S50	311-1192-00			RES.,VAR,NONWIR:10K OHM,20%,1W	12637	381-CM39695
S100[1]	670-3270-00			PUSHBUTTON ASSY:4 BUTTON	80009	670-3270-00
S205	260-1132-00			SWITCH,PUSH:1 BUTTON,DOUBLE POLE	80009	260-1132-00
S210	260-1133-00			SWITCH,PUSH:3 BUTTON,DOUBLE POLE	80009	260-1133-00
S220	260-1133-00			SWITCH,PUSH:3 BUTTON,DOUBLE POLE	80009	260-1133-00
S250	311-1322-00			RES.,VAR,NONWIR:5K OHM,10%,1W,SPST	12697	381-CM39701
S285	260-1133-00			SWITCH,PUSH:3 BUTTON,DOUBLE POLE	80009	260-1133-00
S490	260-1309-00			SWITCH,PUSH:4 PDT,DOUBLE POLE	01963	E63-10M
S755A,B	214-1136-00			ACTUATOR,SL SW:DUAL DPST	80009	214-1136-00
S800	260-0960-01			SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
T250	120-0444-00			XFMR,TOROID:5 TURNS,BIFILAR	80009	120-0444-00
T958	120-0444-00			XFMR,TOROID:5 TURNS,BIFILAR	80009	120-0444-00
U64	155-0061-00			MICROCIRCUIT,DI:16 ID DUAL	80009	155-0061-00
U84	155-0061-00			MICROCIRCUIT,DI:16 ID DUAL	80009	155-0061-00
U104	155-0061-00			MICROCIRCUIT,DI:16 ID DUAL	80009	155-0061-00
U128A,B	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	S5558V
U240	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U264	155-0061-00			MICROCIRCUIT,DI:16 LD DUAL	80009	155-0061-00
U284	155-0061-00			MICROCIRCUIT,DI:16 LD DUAL	80009	155-0061-00
U304	155-0061-00			MICROCIRCUIT,DI:16 LD DUAL	80009	155-0061-00
U492	156-0200-00			MICROCIRCUIT,LI:LOW INPUT/OFFSET CURRENT	18324	N5556V
U752	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
U820	155-0049-01			MICROCIRCUIT,DI:MONOLITHIC,SWEEP CONTROL	80009	155-0049-01
U856A,B	156-0118-00			MICROCIRCUIT,DI:DUAL J-K MASTER-SLAVE F-F	01295	SN74S112N

[1]See Mechanices Parts List for replacement parts.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U978	156-0067-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0067-00
VR322	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR420	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	1N755A
VR904	152-0055-00			SEMICOND DEVICE:ZENER,0.4W,11V,5%	04713	1N962B
VR914	152-0055-00			SEMICOND DEVICE:ZENER,0.4W,11V,5%	04713	1N962B
VR916	153-0030-00			SEMICOND DVC SE:MTCHD WITHIN 0.1V AT 400MW	80009	153-0030-00
VR937	153-0030-00			SEMICOND DVC SE:MTCHD WITHIN 0.1V AT 400MW	80009	153-0030-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

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

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

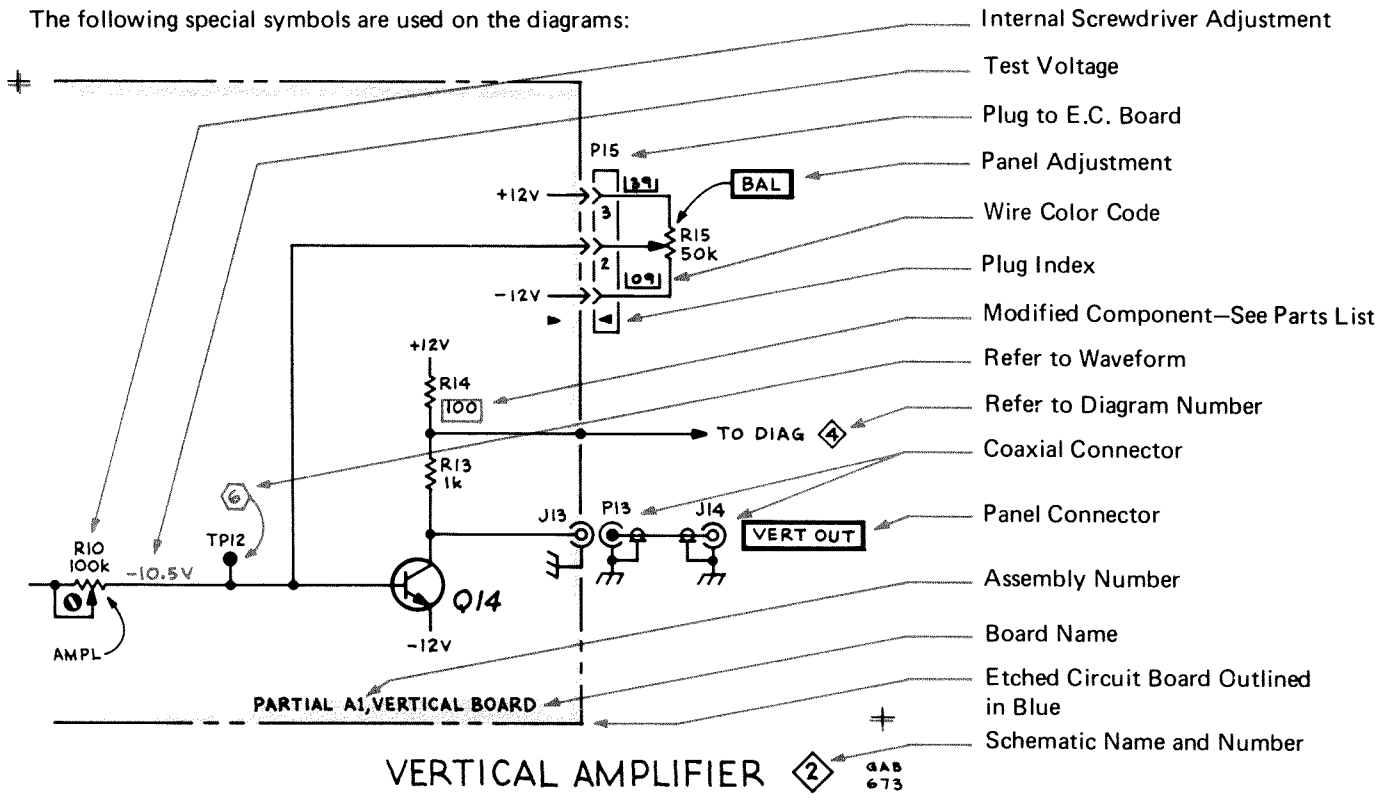
Symbols used on the diagrams are based on ANSI Standard Y32.2-1970.

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

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

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

The following special symbols are used on the diagrams:



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VOLTAGE AND WAVEFORM CONDITIONS

The voltages and waveforms shown on the diagrams were obtained using the test equipment and test conditions listed below.

RECOMMENDED TEST EQUIPMENT

Item	Specifications		Recommended Type
Oscilloscope	Bandwidth Deflection Factor Sweep Rate Input Impedance Probe	Dc to 65 MHz 20 mV to 2 V to 500 ns/div 10 MΩ 10X, fast rise	Tektronix 7603 or 7613 equipped with 7A15A Amplifier, 7B53A Time Base, and P6053B Probe. (A 7A13 Differential Comparator was used for calibrated offset voltages)
Voltmeter (Digital Readout)	Input Impedance Range	10 MΩ 0 V dc to 200 V dc	Tektronix 7D13 Digital Multimeter (oscilloscope system must have readout) or Tektronix DM501 Digital Multimeter with Power Module

CONTROL SETTINGS

Main Triggering

MODE	AUTO
COUPLING	AC
SOURCE	INT
LEVEL	0
SLOPE	+

Delayed Triggering

SLOPE	+
COUPLING	AC
SOURCE	INT
LEVEL	0

Sweep Controls

POSITION	Midrange
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms/PULL FOR ALT
TRACE SEP	Fully clockwise
DELAY TIME MULT	1.0

Inputs

TERM	IN-1 MΩ

WAVEFORMS

Waveforms were obtained under the following conditions:

1. 7B92A front-panel controls set as shown above.
2. Four-volt calibrator signal applied to Amplifier plug-in unit.
3. Amplifier unit set for 2 division display.
4. Test oscilloscope triggered from + Gate output.

VOLTAGES

Voltages were obtained under the following conditions:

1. 7B92A front-panel controls set as shown above.
2. Amplifier unit Coupling set to Gnd.

NOTE

Voltages and waveforms are not absolute and may vary between instruments.

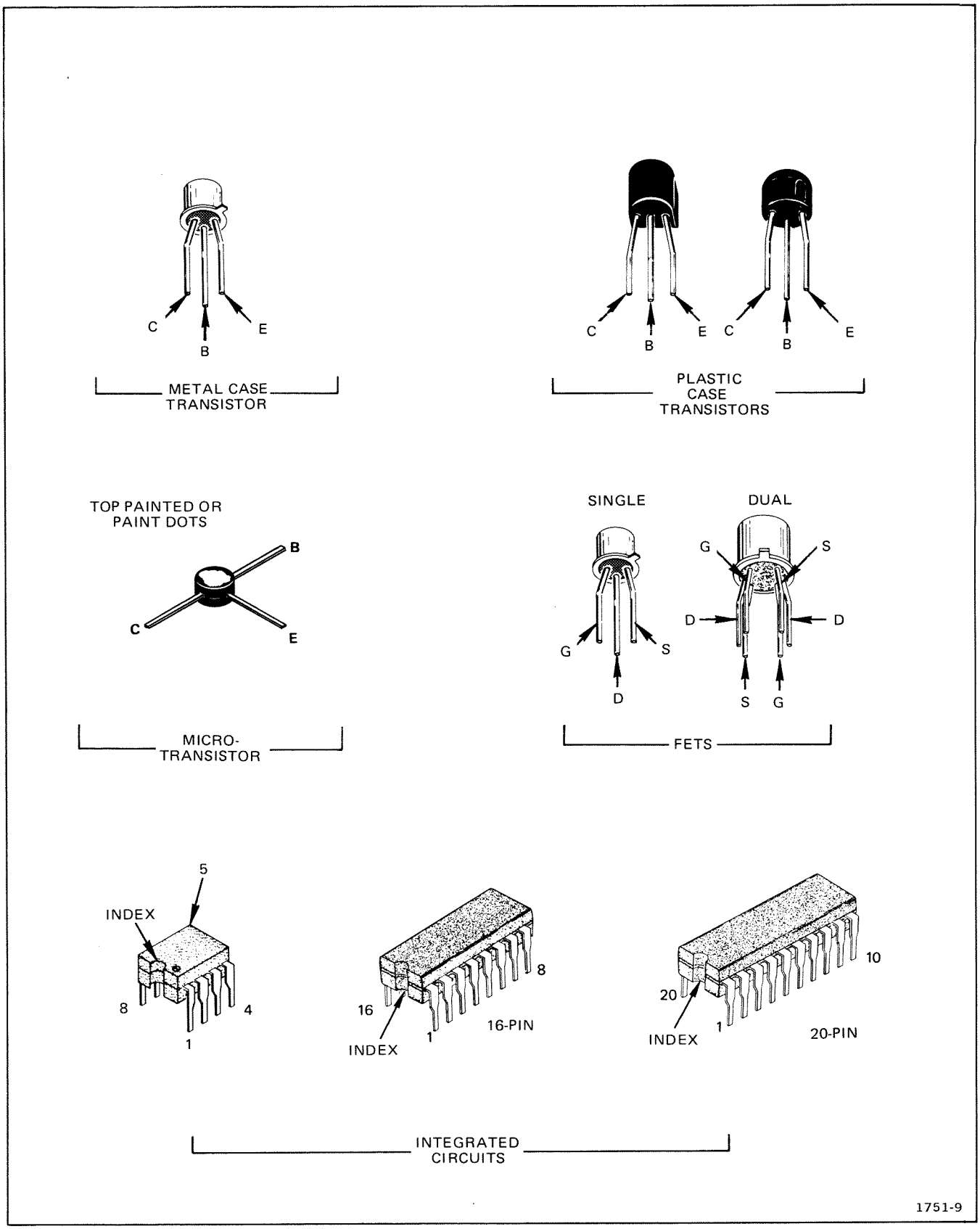
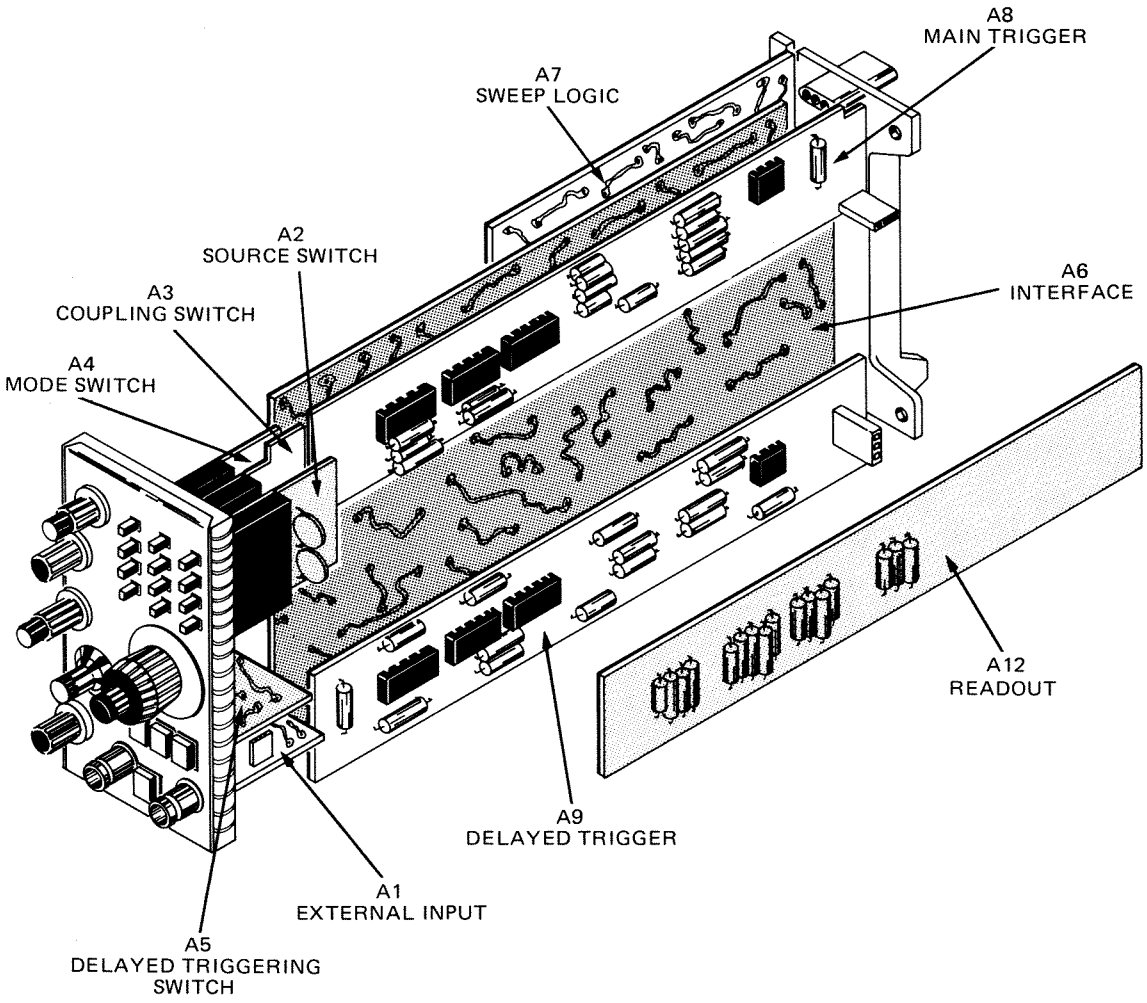
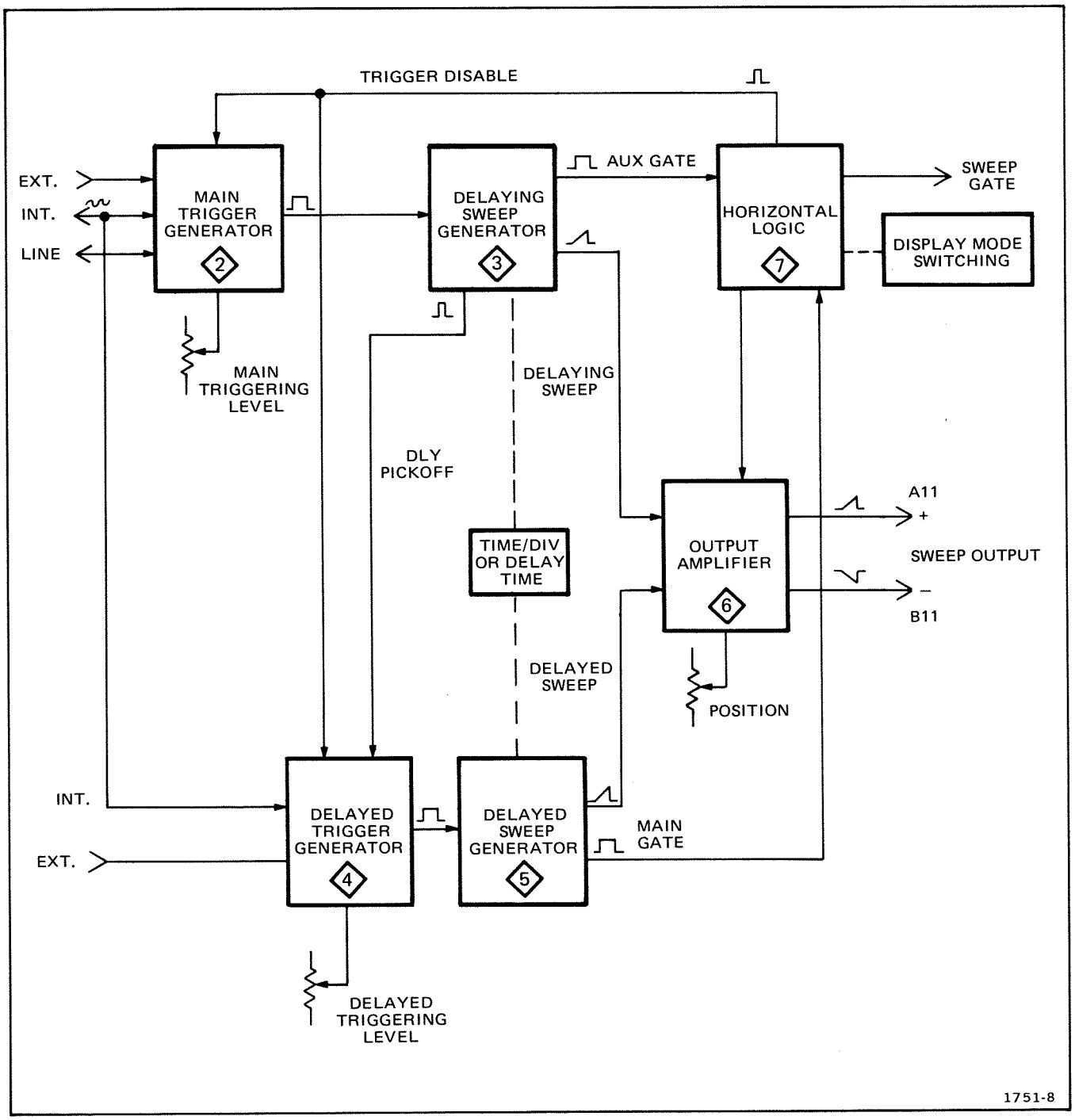


Fig. 7-1. Semiconductor Lead Configurations.



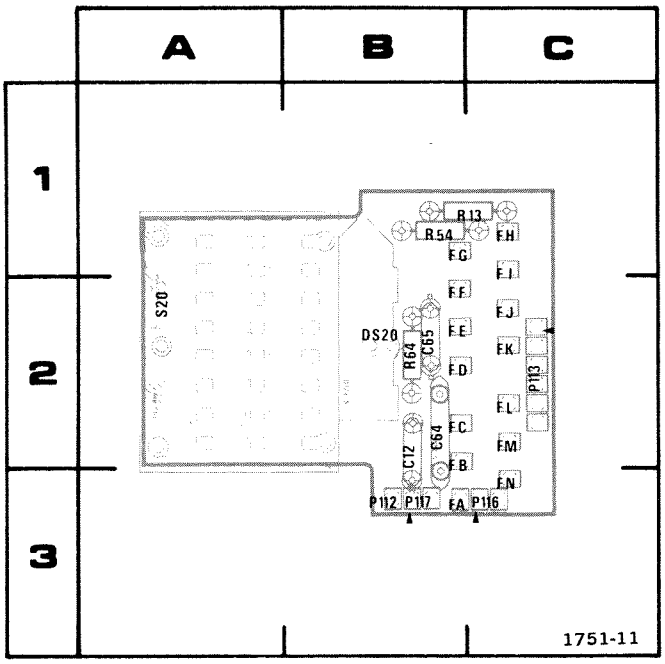
1751-10

Fig. 7-2. Circuit Board Locations.



REV. A, APR. 1975

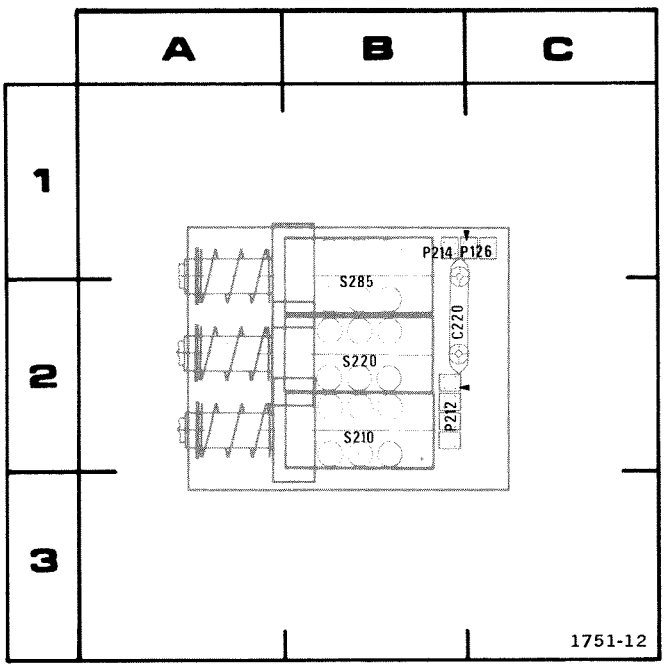
Fig. 7-3. Block Diagram.



CKT NO	GRID LOC
C12	3B
C64	2B
C65	2B
DS	2B
P112	3B
P113	2C
P116	3C
P117	3B
R13	1C
R54	1B
R64	2B
S20	2A

@

Fig. 7-4. A3—Coupling Switch Circuit Board.

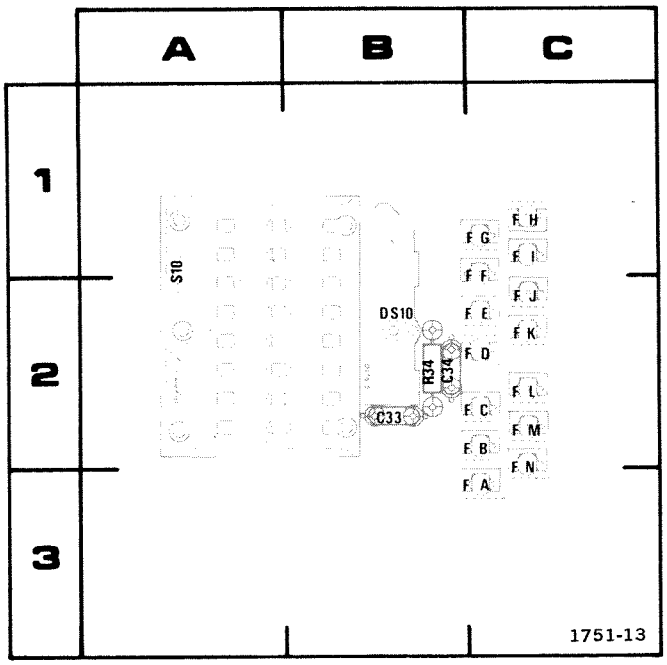


CKT NO	GRID LOC
C220	2B
P126	1C
P212	2B
P214	1B
S210	2B
S220	2B
S285	2B

@

Fig. 7-5. A5—Delayed Triggering Switch Circuit Board.

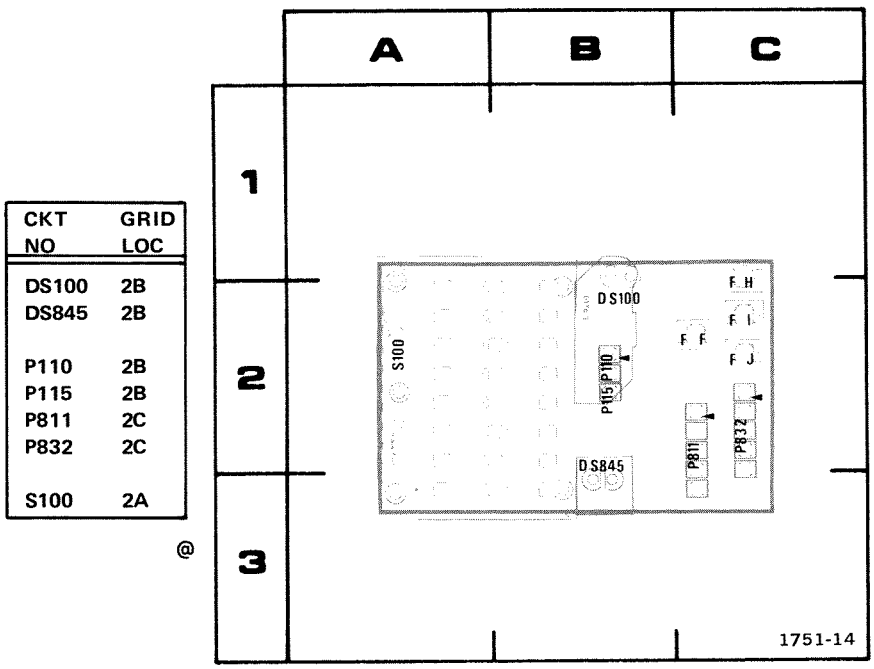
MORE



CKT NO	GRID LOC
C33	2B
C34	2B
DS10	2B
R34	
S10	1A

@

Fig. 7-6. A2—Source Switch Circuit Board.



CKT NO	GRID LOC
DS100	2B
DS845	2B
P110	2B
P115	2B
P811	2C
P832	2C
S100	2A

@

Fig. 7-7. A4—Mode Switch Circuit Board.

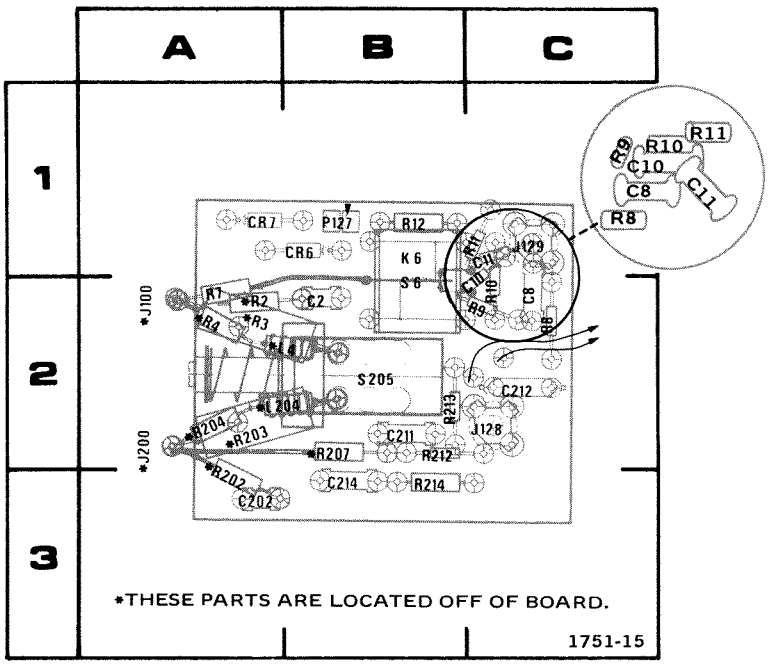
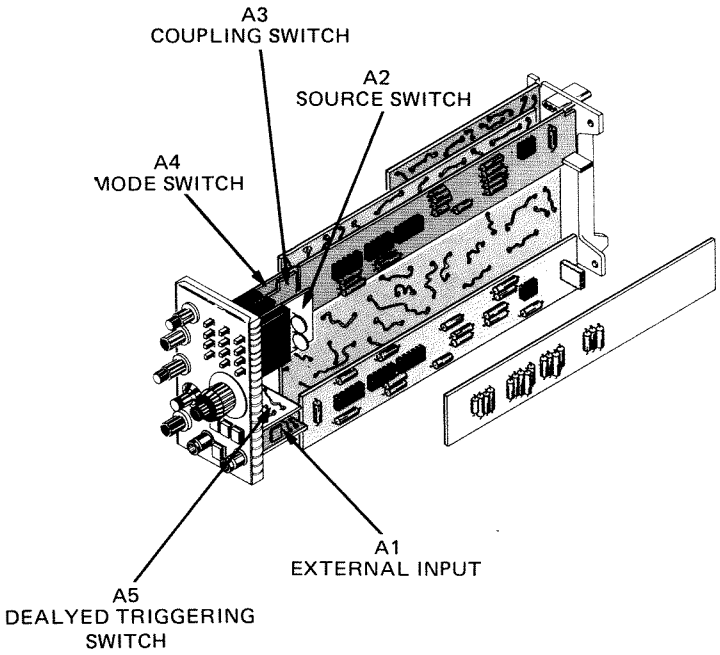
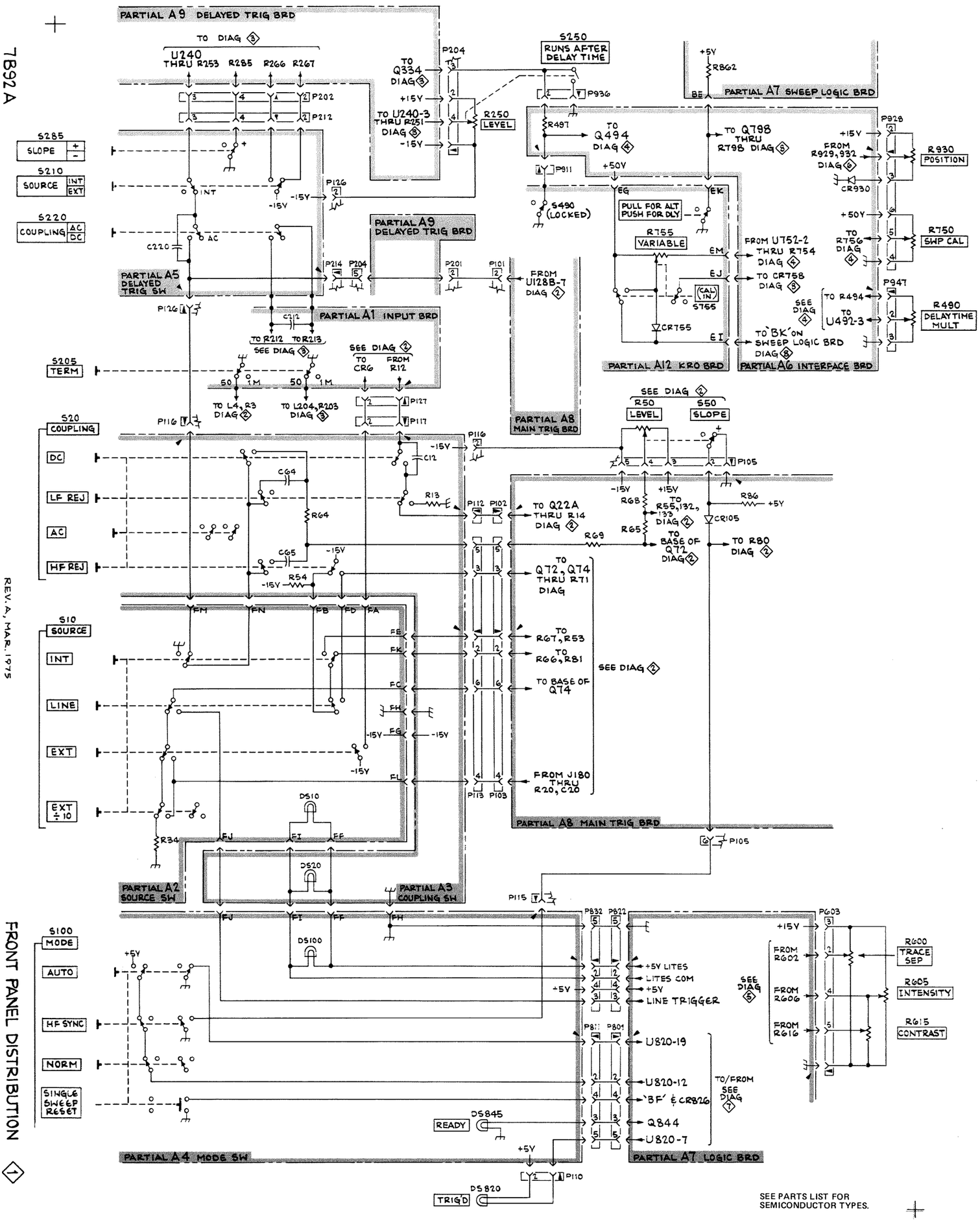


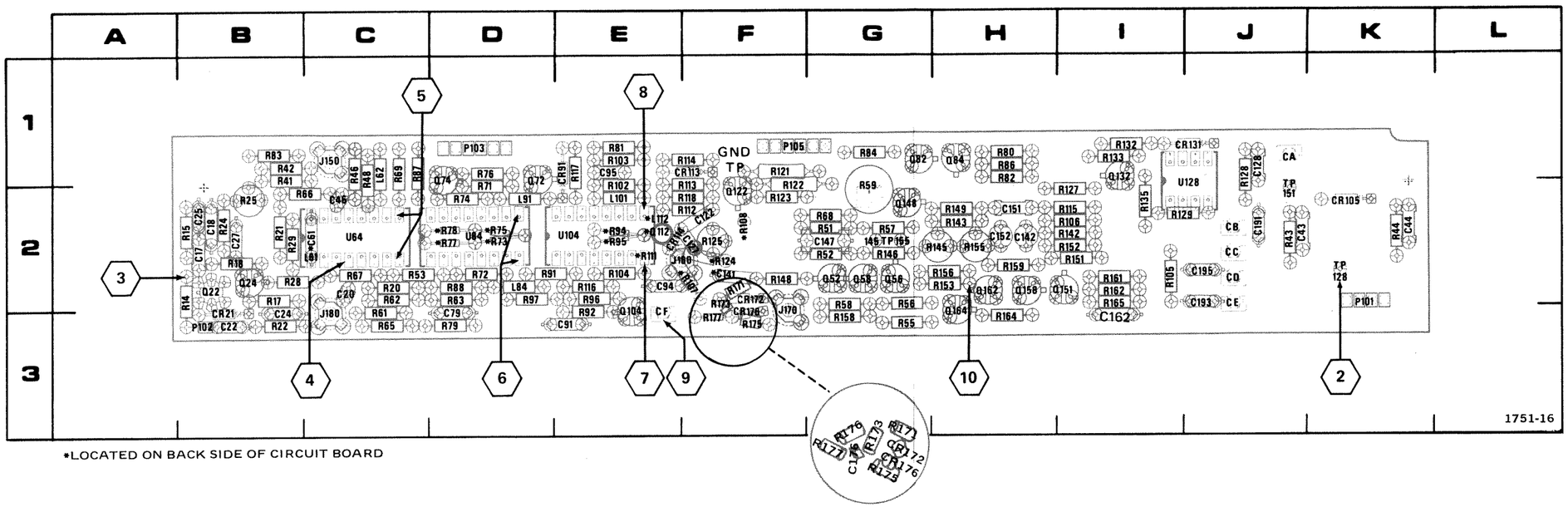
Fig. 7-8. A1—External Input Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC
C2	2B	R2	2A
C10	2C	R3	2A
C11	1C	R4	2A
C202	3A	R7	2A
C211	2B	R8	2C
C212	2C	R9	2C
C214	3B	R10	2C
		R11	1C
CR6	1B	R12	1B
CR7	1A	R202	3A
		R203	2A
J100	2A	R204	2A
J128	2C	R207	2B
J129	1C	R212	2B
J200	2A	R213	2B
		R214	2B
K6	1B		
		S6	2B
L4	2B	S205	2B
L204	2A		
P127	1B		

@

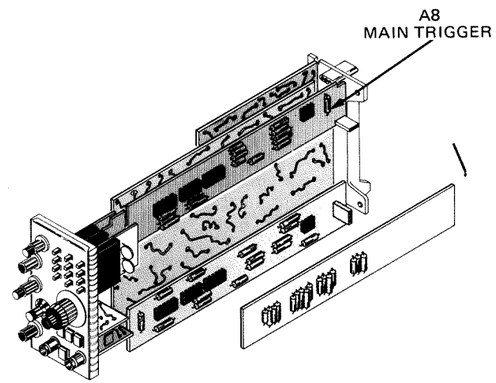



7B92A
FRONT PANEL DISTRIBUTION
REV. A, MAR. 1975
PARTIAL A9 DELAYED TRIG BRD
PARTIAL A5 DELAYED TRIG SW
PARTIAL A1 INPUT BRD
PARTIAL A8 MAIN TRIG BRD
PARTIAL A12 KRO BRD
PARTIAL A6 INTERFACE BRD
PARTIAL A7 SWEEP LOGIC BRD
PARTIAL A7 LOGIC BRD
PARTIAL A2 SOURCE SW
PARTIAL A3 COUPLING SW
PARTIAL A4 MODE SW
S285 SLOPE
S210 SOURCE
S220 COUPLING
S205 TERM
S20 COUPLING
S10 SOURCE
S100 MODE
S250 RUNS AFTER DELAY TIME
R250 LEVEL
R930 POSITION
R750 SWP CAL
R490 DELAY TIME MULT
R600 TRACE SEP
R605 INTENSITY
R615 CONTRAST
R755 VARIABLE
S490 (LOCKED)
S755
R50 LEVEL
S50 SLOPE
DS845 READY
DS820 TRIG'D
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.
FRONT PANEL DISTRIBUTION



*LOCATED ON BACK SIDE OF CIRCUIT BOARD

Fig. 7-9. A8—Main Trigger Circuit Board.



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C17	2B	Q104	3E	R94	2E
C18	2B	Q112	2E	R95	2E
C20	2C	Q122	2F	R96	2E
C22	3B	Q132	1I	R97	2D
C24	3B	Q148	2G	R102	1E
C25	2B	Q151	2I	R103	1E
C27	2B	Q158	2H	R104	2E
C43	2J	Q162	2H	R105	2I
C44	2K	Q164	3H	R106	2I
C46	2C			R107	2F
C61	2C	R14	2B	R108	2F
C79	3D	R15	2B	R111	2E
C91	3E	R17	2B	R112	2F
C94	2E	R18	2B	R113	1F
C95	1E	R20	2C	R114	1F
C122	2F	R21	2B	R115	2I
C127	2F	R22	3B	R116	2E
C128	1J	R24	2B	R117	1E
C141	2F	R25	2B	R118	2F
C142	2H	R28	2B	R121	1F
C147	2G	R29	2B	R122	1F
C151	2H	R41	1B	R123	2F
C152	2H	R42	1B	R124	2F
C162	3I	R43	2J	R125	2F
C193	2J	R44	2K	R127	2I
C195	2J	R46	1C	R128	1J
		R48	1C	R129	2I
CR21	3B	R51	2G	R132	1I
CR91	1E	R52	2G	R133	1I
CR105	2K	R53	2C	R135	2I
CR113	1F	R55	3G	R142	2I
CR114	2E	R56	2G	R143	2H
CR131	1J	R57	2G	R145	2H
CR172	2F	R58	2G	R146	2G
CR176	3F	R59	2G	R148	2F
		R61	3C	R149	2H
J150	1C	R62	2C	R151	2I
J160	2F	R63	2D	R152	2I
J170	3F	R65	3C	R153	2H
J180	3C	R67	2C	R155	2H
		R68	2G	R156	2H
L61	2C	R69	1C	R158	3G
L62	1C	R71	1D	R159	2H
L84	2D	R72	2D	R161	2I
L91	2D	R73	2D	R162	2I
L101	2E	R74	2D	R164	3H
L112	2E	R75	2D	R165	2I
		R76	1D	R171	2F
P101	2K	R77	2D	R173	2F
P102	3B	R78	2D	R175	3F
P103	1D	R79	3D	R177	3F
P105	1F	R80	1H		
		R81	1E	TP128	2K
Q22	2B	R82	1H	TP155	2G
Q24	2B	R83	1B	TP161	2J
Q52	2G	R84	1G	TPGND	1F
Q56	2G	R86	1H		
Q58	2G	R87	1C	U64	2C
Q72	1D	R88	2D	U104	2E
Q74	1D	R91	2D	U128	1J
Q82	1G	R92	3E		
Q84	1H	R94	2E		

VOLTAGE & WAVEFORM CONDITIONS

LINE TRIGGER

PARTIAL A6 INTERFACE BRD

PARTIAL A1 EXT INPUT BRD

PARTIAL A7 SWEEP LOGIC BRD

PARTIAL A4 MODE SW

PARTIAL A3 COUPLING SW

PARTIAL A2 SOURCE SW BD

PARTIAL A7 LOGIC BD

PARTIAL A6 INTERFACE BRD

MAIN TRIG IN

S205 TERM

S10 SOURCE

S20 COUPLING

DC

LF REJ

HF REJ

AC

EXT ÷10

EXT

LINE

INT

TRIG DISABLE FROM U820-17 DIAG 1

TO U820-13 DIAG 1

DELAY MODE CONTROL IN

TRIG DISABLE TO Q332 THRU P201 DIAG 3

GATE TD BIAS

ARMING TD BIAS

TP 151

TP 155

TP 145

INTERNAL TRIG IN

TO J35 DIAG 3

PARTIAL A5 DELAYED TRIG SW

INT TRIG SIGNAL TO COUPLING SW DIAG 3

PARTIAL A9 DLY'D TRIG BRD

FROM P201 DIAG 8

U64* INTERNAL-EXTERNAL AMP

U84* SLOPE SELECTOR AMP

U104* OUTPUT AMP

50 Ω EC RUN

INT DC BAL

EXT DC BAL

LEVEL

SLOPE

S100 HF SYNC

SEE DIAG 7

PARTIAL A4 MODE SW

MAIN TRIGGER TO U820-1 & Q402 THRU R401 DIAG 9

PARTIAL A8 MAIN TRIG BRD

* SEE DIAG 3 FOR DETAILS OF U64, U84, U104

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

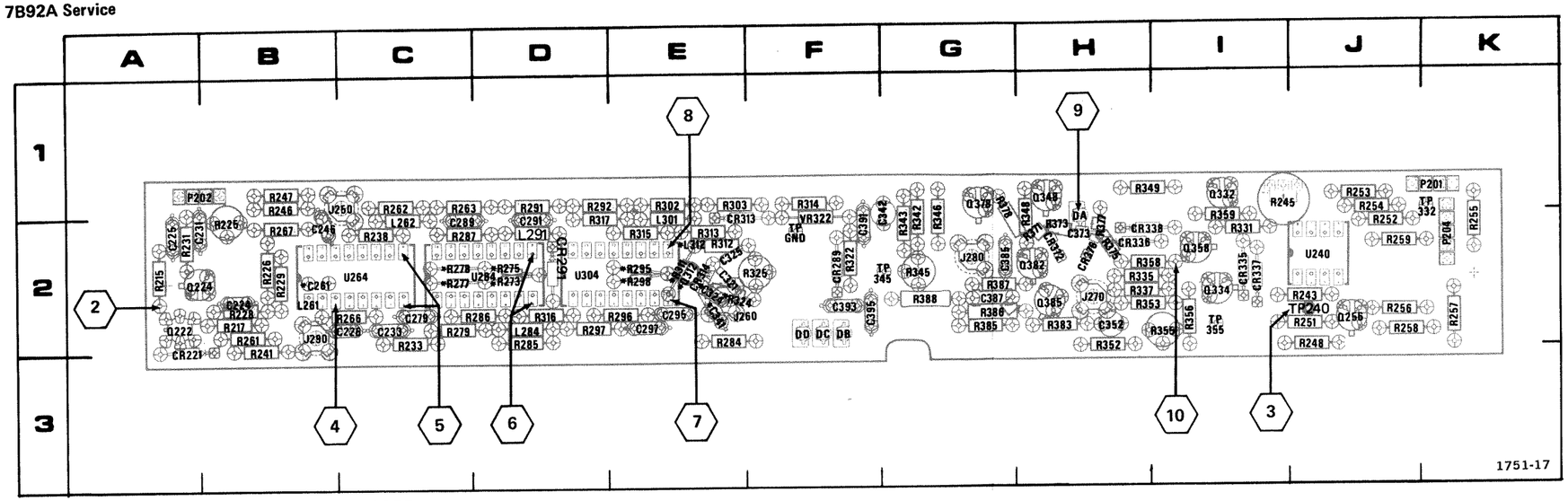
L.I.C. P1 P5

MAIN TRIG 2

MAIN TRIGGER

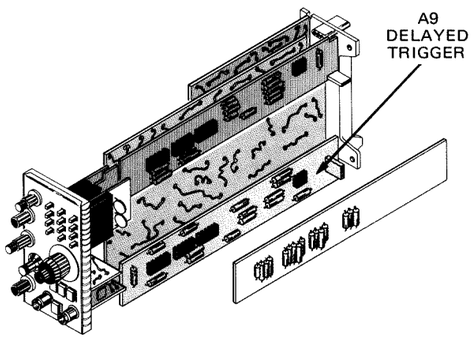
7B91A

@



*LOCATED ON BACK SIDE OF CIRCUIT BOARD

Fig. 7-10. A9—Delayed Trigger Circuit Board.



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C224	2B	J290	2B	R252	2J	R335	2H
C225	2A			R253	1J	R337	2H
C226	2C	L261	2B	R254	1J	R342	2G
C231	2A	L262	2C	R255	2K	R343	2G
C233	2C	L284	2D	R256	2J	R345	2G
C246	2B	L291	2D	R257	2K	R346	2G
C261	2B	L301	2E	R258	2J	R348	2H
C279	2C	L213	2E	R259	2J	R349	1H
C289	2C			R261	2B	R352	3H
C291	2D	P201	1K	R262	1C	R353	2H
C295	2E	P202	1A	R263	1C	R355	2I
C297	2E	P204	2K	R266	2C	R356	2I
C321	2E			R267	2B	R358	2H
C324	2E	Q222	2A	R273	2D	R359	2I
C325	2E	Q224	2A	R275	2D	R371	2H
C341	2E	Q256	2J	R277	2C	R373	2H
C342	2G	Q312	2E	R278	2C	R375	2G
C352	2H	Q332	1I	R279	2C	R377	2H
C373	2H	Q334	2I	R284	2E	R378	1G
C285	2G	Q348	1H	R285	2D	R383	2H
C387	2G	Q358	2I	R286	2D	R385	2G
C391	2F	Q378	1G	R287	2C	R386	2G
C393	2F	Q382	2H	R291	1D	R387	2G
C395	2F	Q385	2H	R295	2E	R388	2G
				R296	2E		
CR221	2A	R215	2A	R297	2D	TP240	2J
CR289	2F	R217	2B	R298	2E	TP332	1K
CR291	2D	R225	2B	R302	1E	TP345	2G
CR313	2E	R226	2B	R303	1E	TP355	2I
CR314	2E	R228	2B	R311	2E	TPGND	2F
CR335	2I	R229	2B	R312	2E		
CR336	2H	R231	2A	R313	2E	U240	2J
CR337	2I	R233	2C	R314	1F	U264	2C
CR338	2H	R238	2C	R315	2E	U284	2D
CR372	2H	R241	2B	R316	2D	U304	2D
CR376	2H	R243	2J	R317	2D		
		R245	1I	R322	2F	VR322	2F
J250	1C	R246	1B	R324	2E		
J260	2E	R247	1B	R325	2F		
J270	2H	R248	3J	R331	2I		
J280	2G	R251	2J	R335	2H		

MORE

@

VOLTAGE & WAVEFORM CONDITIONS

PARTIAL A5 DELAYED TRIG SW

PARTIAL A1 INPUT BRD

PARTIAL A6 INTERFACE BD

PARTIAL A5 DELAYED TRIG SW

PARTIAL A6 INTERFACE BRD

PARTIAL A9 DELAYED TRIG BRD

* DETAILS OF
U64, U84, U104 DIAG 2
U264, U284, U304 DIAG 3

U264 INTERNAL-EXTERNAL AMP

U284 SLOPE SELECTOR AMP

U304 OUTPUT AMP

S220 COUPLING AC DC

S205 TERM 50 1M

S285 SLOPE + −

S210 SOURCE INT EXT

S220 COUPLING AC DC

S250 RUNS AFTER DELAY TIME

DLY'D TRIG IN

INT TRIG IN

LEVEL R250 5k

INT DC BAL

EXT DC BAL

ARMING TD BIAS

GATE TD BIAS

DELAYED TRIGGER TO Q502 & R501 DIAG 5

DELAY PICKOFF PULSE FROM Q382 DIAG 4

TRIG DISABLE FROM P101-4 DIAG 2

INT TRIG SIGNAL FROM P214-1 DIAG 2

FROM P911-1 DIAG 4

TO U128-5 THRU P101-1 DIAG 2

T250 TO J25 DIAG 2

SEE DIAG 9

TRIG SENS

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L.I.C. B45 P5

7B92A

REV. A, MAR. 1975

DELAYED TRIG 3

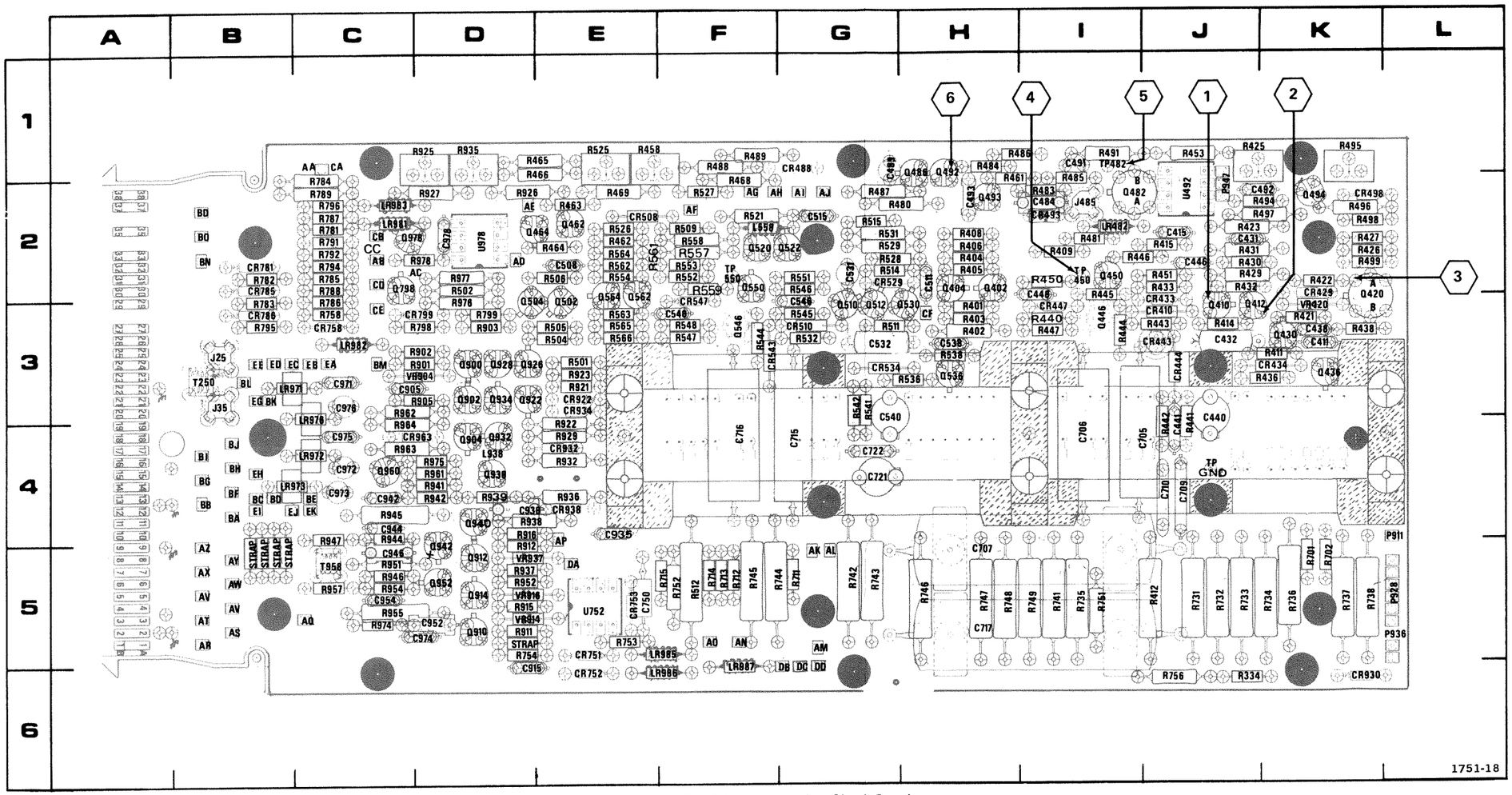
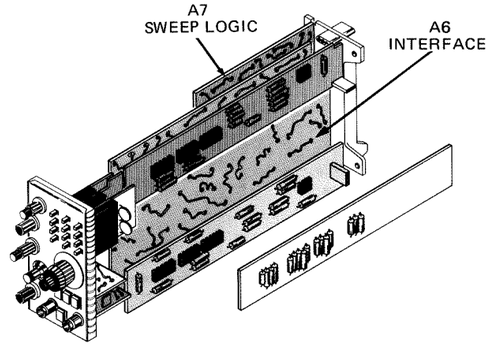
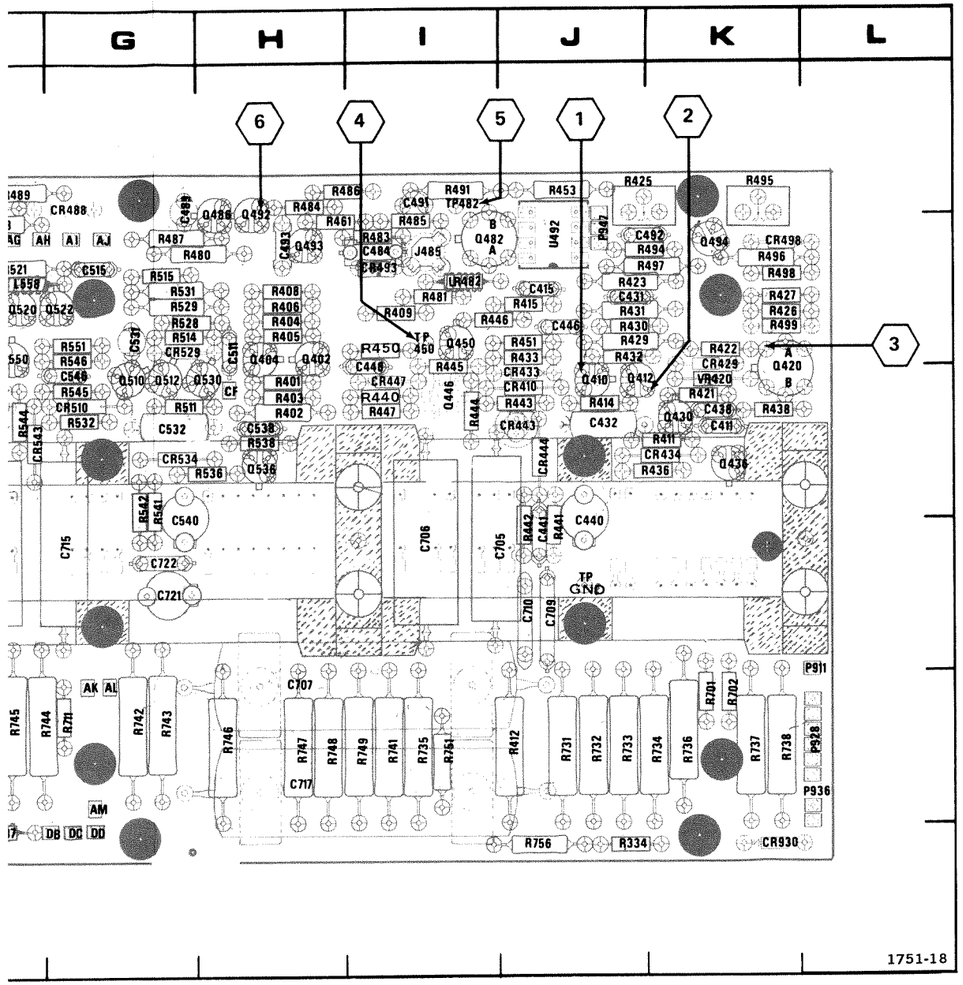


Fig. 7-11. A6—Interface Circuit Board.



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C411	3K	CR434	3K	Q404	2H
C415	2J	CR443	3J	Q410	3J
C431	2J	CR444	3J	Q412	3J
C432	3J	CR447	3I	Q420	2K
C438	3K	CR493	2I	Q430	3K
C440	3J	CR498	2K	Q436	3K
C441	4J	CR508	2E	Q446	3I
C446	2J	CR510	3G	Q450	2I
C448	2I	CR529	2G	Q462	2E
C484	2I	CR534	3G	Q482	2I
C489	1G	CR543	3F	Q484	2E
C491	1I	CR547	3F	Q486	1H
C492	2K	CR751	5E	Q492	1H
C493	2H	CR752	6E	Q493	2H
C508	2E	CR753	5E	Q494	2K
C511	2H	CR758	3C	Q502	2E
C515	2G	CR781	2B	Q504	2E
C531	2G	CR785	2B	Q510	3G
C532	3G	CR786	3B	Q512	3G
C538	3H	CR488	1G	Q520	2F
C540	3G	CR799	3D	Q522	2G
C546	3G	CR922	3E	Q530	3H
C548	3F	CR930	6K	Q536	3H
C705	4J	CR932	4E	Q546	3F
C706	4I	CR934	3E	Q550	2F
C707	5H	CR938	4E	Q562	2E
C709	4J	CR963	4D	Q564	2E
C710	4J			Q798	2C
C715	4F	J25	3B	Q900	3D
C716	4F	J35	3B	Q902	3D
C717	5H	J485	2I	Q904	4D
C721	4G			Q910	5D
C722	4G	L558	2F	Q912	5D
C750	5E	L938	4D	Q914	5D
C905	3D			Q922	3D
C915	6D	LR482	2I	Q926	3D
C935	4E	LR971	3B	Q928	3D
C938	4D	LR972	4C	Q932	4D
C942	4C	LR973	4C	Q934	3D
C944	4C	LR976		Q938	4D
C952	5D	LR981	2C	Q940	4D
C954	5C	LR982	3C	Q942	5D
C971	3C	LR983	2C	Q952	5D
C972	4C	LR985	5F	Q960	4C
C973	4C	LR986	6F	Q978	2D
C974	5D	LR987	6F		
C975	4C			R334	6J
C976	3C	P911	4L	R401	3H
C978	2D	P928	5L	R402	3H
		P936	5L	R403	3H
CR410	3J	P947	2J	R404	2H
CR429	2K			R405	2H
CR433	3J	Q402	2H	R406	2H



A6—Interface Circuit Board.

CKT NO	GRID LOC
C411	3K
C415	2J
C431	2J
C432	3J
C438	3K
C440	3J
C441	4J
C446	2J
C448	2I
C484	2I
C489	1G
C491	1I
C492	2K
C493	2H
C508	2E
C511	2H
C515	2G
C531	2G
C532	3G
C538	3H
C540	3G
C546	3G
C548	3F
C705	4J
C706	4I
C707	5H
C709	4J
C710	4J
C715	4F
C716	4F
C717	5H
C721	4G
C722	4G
C750	5E
C905	3D
C915	6D
C935	4E
C938	4D
C942	4C
C944	4C
C952	5D
C954	5C
C971	3C
C972	4C
C973	4C
C974	5D
C975	4C
C976	3C
C978	2D
CR410	3J
CR429	2K
CR433	3J

CKT NO	GRID LOC
CR434	3K
CR443	3J
CR444	3J
CR447	3I
CR493	2I
CR498	2K
CR508	2E
CR510	3G
CR529	2G
CR534	3G
CR543	3F
CR547	3F
CR751	5E
CR752	6E
CR753	5E
CR758	3C
CR781	2B
CR785	2B
CR786	3B
CR488	1G
CR799	3D
CR922	3E
CR930	6K
CR932	4E
CR934	3E
CR938	4E
CR963	4D
J25	3B
J35	3B
J485	2I
L558	2F
L938	4D
LR482	2I
LR971	3B
LR972	4C
LR973	4C
LR976	
LR981	2C
LR982	3C
LR983	2C
LR985	5F
LR986	6F
LR987	6F
P911	4L
P928	5L
P936	5L
P947	2J
Q402	2H

CKT NO	GRID LOC
Q404	2H
Q410	3J
Q412	3J
Q420	2K
Q430	3K
Q436	3K
Q446	3I
Q450	2I
Q462	2E
Q482	2I
Q484	2E
Q486	1H
Q492	1H
Q493	2H
Q494	2K
Q502	2E
Q504	2E
Q510	3G
Q512	3G
Q520	2F
Q522	2G
Q530	3H
Q536	3H
Q546	3F
Q550	2F
Q562	2E
Q564	2E
Q798	2C
Q900	3D
Q902	3D
Q904	4D
Q910	5D
Q912	5D
Q914	5D
Q922	3D
Q926	3D
Q928	3D
Q932	4D
Q934	3D
Q938	4D
Q940	4D
Q942	5D
Q952	5D
Q960	4C
Q978	2D
R334	6J
R401	3H
R402	3H
R403	3H
R404	2H
R405	2H
R406	2H

CKT NO	GRID LOC
R408	2H
R409	2I
R411	3K
R412	2J
R414	3J
R415	2J
R421	3K
R422	2K
R423	2J
R425	1J
R426	2K
R429	2J
R430	2J
R431	2J
R432	2J
R433	2J
R436	3K
R438	3K
R440	2I
R441	4J
R442	4J
R443	3J
R444	3I
R446	2I
R447	3I
R450	2I
R451	2J
R453	1J
R458	1E
R461	1H
R462	2E
R463	2E
R464	2E
R465	1E
R466	1E
R468	2F
R469	2E
R480	2H
R481	2I
R483	2I
R484	1H
R485	1I
R486	1H
R487	2G
R488	1F
R489	1F
R491	1I
R494	2K
R495	1K
R496	2K
R497	2K
R498	2K
R499	2K

CKT NO	GRID LOC
R501	3E
R502	2C
R504	3E
R505	3E
R506	2E
R509	2F
R511	3G
R512	5F
R514	2G
R515	2G
R512	2F
R521	2F
R525	1E
R526	2E
R527	2F
R528	2G
R529	2G
R532	3G
R536	3H
R538	3H
R541	3G
R542	3G
R544	3F
R545	3G
R546	2G
R547	3F
R548	3F
R551	2G
R552	2F
R553	2F
R554	2E
R557	2F
R558	2F
R559	2F
R561	2E
R562	2E
R563	3E
R564	2E
R565	3E
R566	3E
R701	5K
R702	5K
R711	5G
R712	5F
R713	5F
R714	5F
R715	5F
R731	5J
R732	5J
R733	5J
R734	5J
R735	5I
R736	5K

CKT NO	GRID LOC
R737	5K
R738	5K
R74	5I
R742	5G
R743	5G
R744	5F
R745	5F
R746	5H
R747	5H
R748	5H
R749	5I
R751	5I
R752	5F
R753	5E
R756	6J
R977	2D
R978	2D
T250	3B
T958	5C
TP450	2I
TP482	1I
TP550	2F
TPGND	4J
U492	2J
U752	5E
U978	2D
VR420	3K
VR904	3D
VR914	5D
VR916	5D
VR937	5D

REV. A, APR. 1975

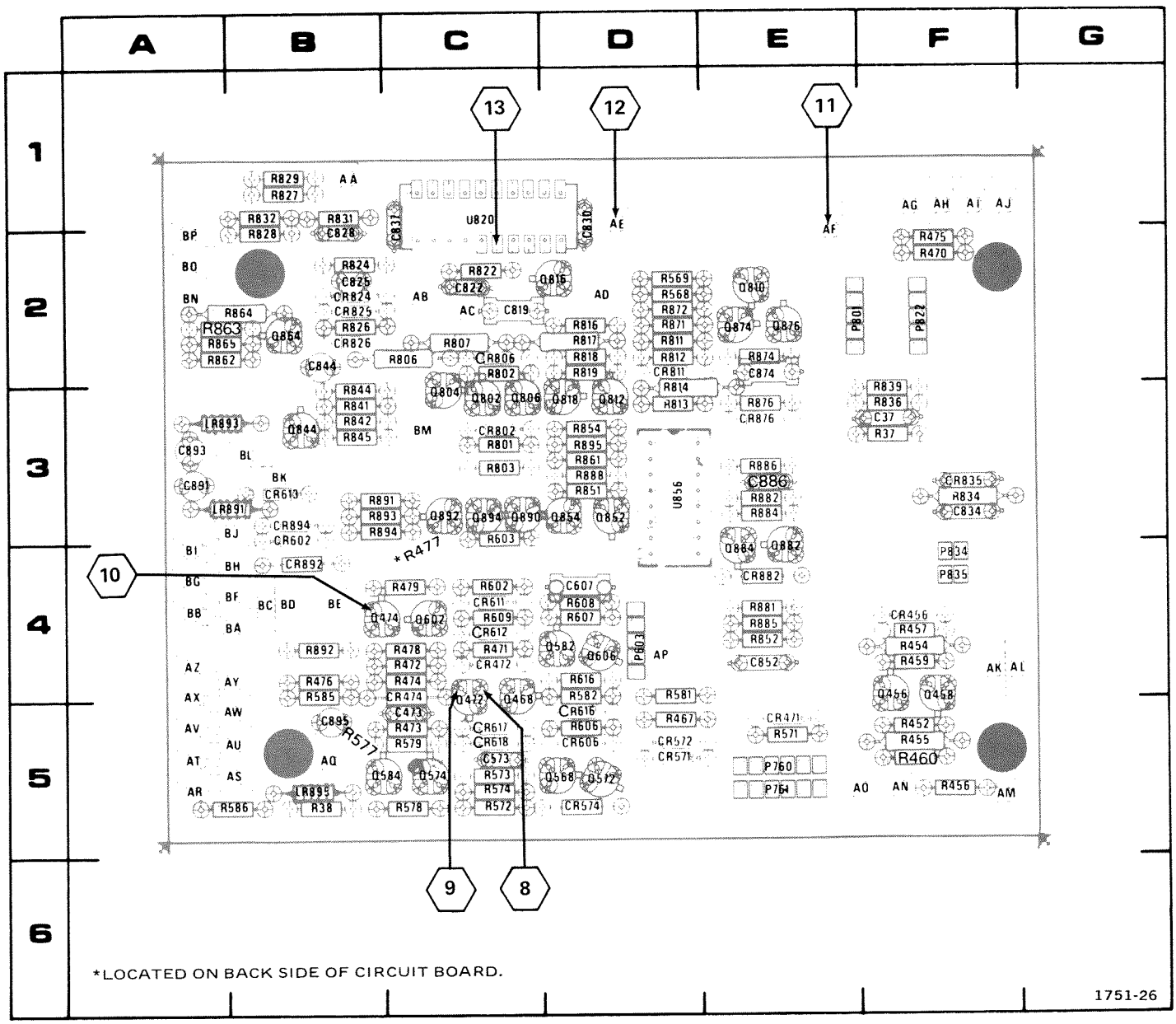


Fig. 7-12. A7—Logic Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C473	5C	Q474	4C	R472	4C	R812	2D
C819	2C	Q810	2E	R473	5C	R813	3D
		Q812	3D	R474	4C	R814	3D
CR471	5E	Q816	2D	R475	2F	R816	2D
CR472	4C	Q818	3D	R476	4B	R817	2D
CR474	4C			R477	4C	R818	2D
		R467	5D	R478	4C	R819	2D
Q468	4C	R470	2F	R479	4C		
Q472	4C	R471	4C	R811	2D		

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VOLTAGE & WAVEFORM CONDITIONS

SWP CAL R750 100k

REFERENCE TO R754 DIAG 8

REFERENCE VOLTAGE TO R538 DIAG 5

TO DELAYING RT SWITCHING DIAG 8

DELAY SCALE R495 2.5k, R496 34.3k, R498 1.2k, R499 820

TO R334 DIAG 3

LOCKED S490

DELAY TIME MULT R490 50k

DELAY START R425 10k

S700 TIME/DIV SEE DIAG 8

MATCHED SET

DELAYING SWEEP TO "AJ" ON SWEEP LOGIC BRD DIAG 6

DELAYING SWEEP TO BASE OF Q900 DIAG 6

DLY'G SWP CAL

TP450

TP 482

U492

LR482 0000

PARTIAL A7 SWP LOGIC BRD

AUTO FROM U820-3 DIAG 7 AH

MAIN TRIGGER FROM R177 DIAG 2 CF

PARTIAL A8 MAIN TRIG BRD

PARTIAL A6 INTERFACE BRD

PARTIAL A9 DELAYED TRIG BOARD

DELAY PICKOFF PULSE TO R348 DIAG 3

85 AUX GATE

AUTO DISABLE TO U820-1 DIAG 7

AUX GATE TO Q852 DIAG 7

AUX Z ENABLE TO CR618 DIAG 5

GATE END TO CR574 DIAG 5

DELAYED SWEEP END FROM Q568 & AF DIAG 5

LOCKOUT FROM Q806 DIAG 7

HOLDOFF START TO U820-16 DIAG 7

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

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P5	P5

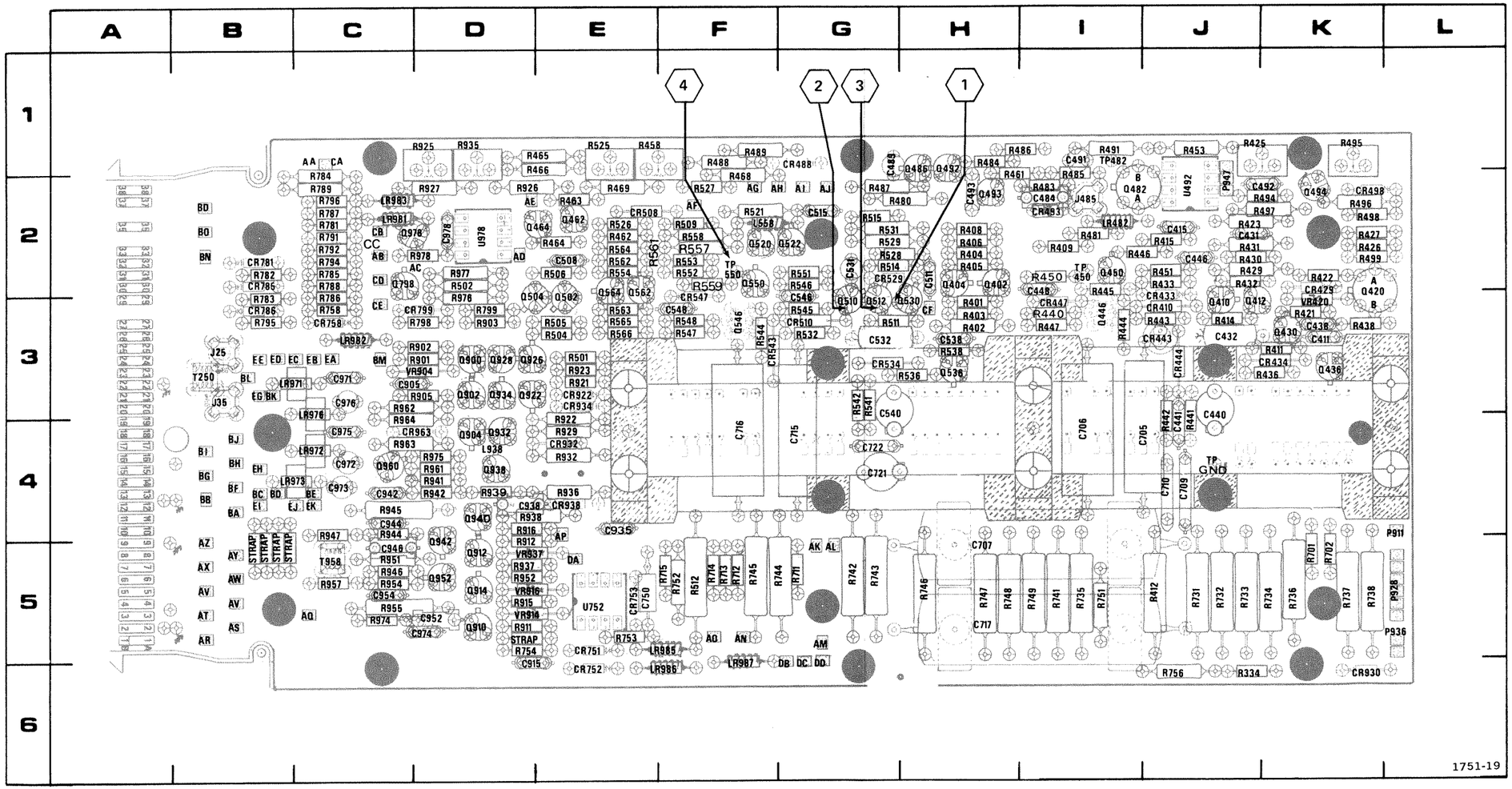
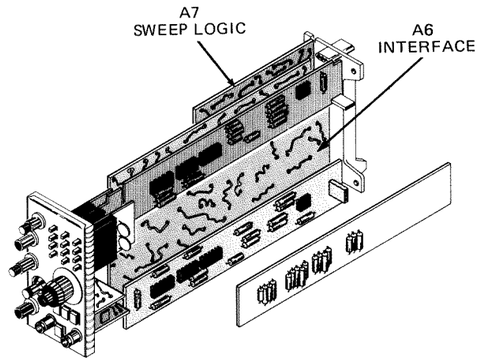
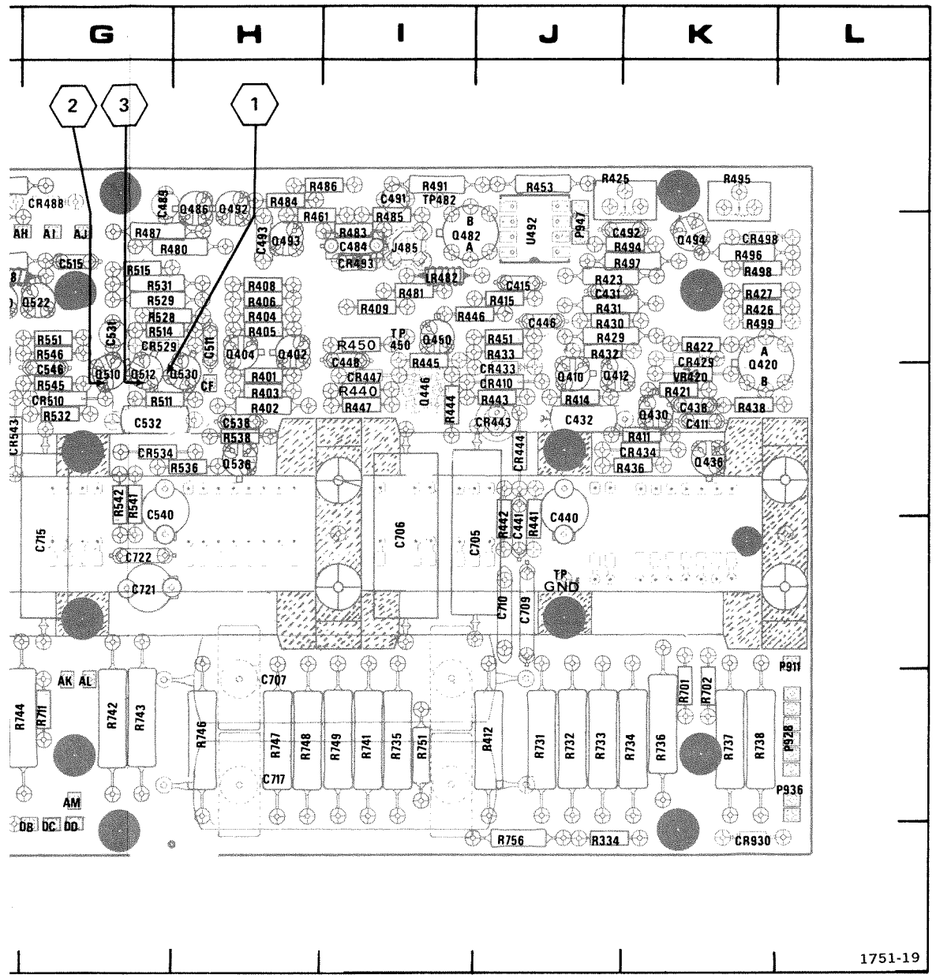


Fig. 7-13. A6—Interface Circuit Board.



MORE

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO
C411	3K	CR434	3K	Q404	2H	R408
C415	2J	CR443	3J	Q410	3J	R409
C431	2J	CR444	3J	Q412	3J	R511
C432	3J	CR447	3I	Q420	2K	R412
C438	3K	CR493	2I	Q430	3K	R414
C440	3J	CR498	2K	Q436	3K	R415
C441	4J	CR508	2E	Q446	3I	R421
C446	2J	CR510	3G	Q450	2I	R422
C448	2I	CR529	2G	Q462	2E	R423
C484	2I	CR534	3G	Q482	2I	R425
C489	1G	CR543	3F	Q484	2E	R426
C491	1I	CR547	3F	Q486	1H	R429
C492	2K	CR751	5E	Q492	1H	R430
C493	2H	CR752	6E	Q493	2H	R431
C508	2E	CR753	5E	Q494	2K	R432
C511	2H	CR758	3C	Q502	2E	R433
C515	2G	CR781	2B	Q504	2E	R436
C531	2G	CR785	2B	Q510	3G	R438
C532	3G	CR786	3B	Q512	3G	R440
C538	3H	CR488	1G	Q520	2F	R441
C540	3G	CR799	3D	Q522	2G	R442
C546	3G	CR922	3E	Q530	3H	R443
C548	3F	CR930	6K	Q536	3H	R444
C705	4J	CR932	4E	Q546	3F	R446
C706	4I	CR934	3E	Q550	2F	R447
C707	5H	CR938	4E	Q562	2E	R450
C709	4J	CR963	4D	Q564	2E	R451
C710	4J			Q798	2C	R453
C715	4F	J25	3B	Q900	3D	R458
C716	4F	J35	3B	Q902	3D	R461
C717	5H	J485	2I	Q904	4D	R462
C721	4G			Q910	5D	R463
C722	4G	L558	2F	Q912	5D	R464
C750	5E	L938	4D	Q914	5D	R465
C905	3D			Q922	3D	R466
C915	6D	LR482	2I	Q926	3D	R468
C935	4E	LR971	3B	Q928	3D	R469
C938	4D	LR972	4C	Q932	4D	R480
C942	4C	LR973	4C	Q934	3D	R481
C944	4C	LR976		Q938	4D	R483
C952	5D	LR981	2C	Q940	4D	R484
C954	5C	LR982	3C	Q942	5D	R485
C971	3C	LR983	2C	Q952	5D	R486
C972	4C	LR985	5F	Q960	4C	R487
C973	4C	LR986	6F	Q978	2D	R488
C974	5D	LR987	6F			R489
C975	4C			R334	6J	R491
C976	3C	P911	4L	R401	3H	R494
C978	2D	P928	5L	R402	3H	R495
		P936	5L	R403	3H	R496
CR410	3J	P947	2J	R404	2H	R497
CR429	2K			R405	2H	R498
CR433	3J	Q402	2H	R406	2H	R499



3. A6—Interface Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C411	3K	CR434	3K	Q404	2H	R408	2H	R501	3E	R737	5K
C415	2J	CR443	3J	Q410	3J	R409	2I	R502	2C	R738	5K
C431	2J	CR444	3J	Q412	3J	R511	3K	R504	3E	R74	5I
C432	3J	CR447	3I	Q420	2K	R412	5J	R505	3E	R742	5G
C438	3K	CR493	2I	Q430	3K	R414	3J	R506	2E	R743	5G
C440	3J	CR498	2K	Q436	3K	R415	2J	R509	2F	R744	5F
C441	4J	CR508	2E	Q446	3I	R421	3K	R511	3G	R745	5F
C446	2J	CR510	3G	Q450	2I	R422	2K	R512	5F	R746	5H
C448	2I	CR529	2G	Q462	2E	R423	2J	R514	2G	R747	5H
C484	2I	CR534	3G	Q482	2I	R425	1J	R515	2G	R748	5H
C489	1G	CR543	3F	Q484	2E	R426	2K	R512	2F	R749	5I
C491	1I	CR547	3F	Q486	1H	R429	2J	R521	2F	R751	5I
C492	2K	CR751	5E	Q492	1H	R430	2J	R525	1E	R752	5F
C493	2H	CR752	6E	Q493	2H	R431	2J	R526	2E	R753	5E
C508	2E	CR753	5E	Q494	2K	R432	2J	R527	2F	R977	2D
C511	2H	CR758	3C	Q502	2E	R433	2J	R528	2G	R978	2D
C515	2G	CR781	2B	Q504	2E	R436	3K	R529	2G		
C531	2G	CR785	2B	Q510	3G	R438	3K	R532	3G	T250	3B
C532	3G	CR786	3B	Q512	3G	R440	2I	R536	3H	T958	5C
C538	3H	CR488	1G	Q520	2F	R441	4J	R538	3H		
C540	3G	CR799	3D	Q522	2G	R442	4J	R541	3G	TP450	2I
C546	3G	CR922	3E	Q530	3H	R443	3J	R542	3G	TP482	1I
C548	3F	CR930	6K	Q536	3H	R444	3I	R544	3F	TP550	2F
C705	4J	CR932	4E	Q546	3F	R446	2I	R545	3G	TPGND	4J
C706	4I	CR934	3E	Q550	2F	R447	3I	R546	2G		
C707	5H	CR938	4E	Q562	2E	R450	2I	R547	3F	U492	2J
C709	4J	CR963	4D	Q564	2E	R451	2J	R548	3F	U752	5E
C710	4J			Q798	2C	R453	1J	R551	2G	U978	2D
C715	4F	J25	3B	Q900	3D	R458	1E	R552	2F		
C716	4F	J35	3B	Q902	3D	R461	1H	R553	2F	VR420	3K
C717	5H	J485	2I	Q904	4D	R462	2E	R554	2E	VR904	3D
C721	4G			Q910	5D	R463	2E	R557	2F	VR914	5D
C722	4G	L558	2F	Q912	5D	R464	2E	R558	2F	VR916	5D
C750	5E	L938	4D	Q914	5D	R465	1E	R559	2F	VR937	5D
C905	3D			Q922	3D	R466	1E	R561	2E		
C915	6D	LR482	2I	Q926	3D	R468	2F	R562	2E		
C935	4E	LR971	3B	Q928	3D	R469	2E	R563	3E		
C938	4D	LR972	4C	Q932	4D	R480	2H	R564	2E		
C942	4C	LR973	4C	Q934	3D	R481	2I	R565	3E		
C944	4C	LR976		Q938	4D	R483	2I	R566	3E		
C952	5D	LR981	2C	Q940	4D	R484	1H	R701	5K		
C954	5C	LR982	3C	Q942	5D	R485	1I	R702	5K		
C971	3C	LR983	2C	Q952	5D	R486	1H	R711	5G		
C972	4C	LR985	5F	Q960	4C	R487	2G	R712	5F		
C973	4C	LR986	6F	Q978	2D	R488	1F	R713	5F		
C974	5D	LR987	6F			R489	1F	R714	5F		
C975	4C			R334	6J	R491	1I	R715	5F		
C976	3C	P911	4L	R401	3H	R494	2K	R731	5J		
C978	2D	P928	5L	R402	3H	R495	1K	R732	5J		
		P936	5L	R403	3H	R496	2K	R733	5J		
CR410	3J	P947	2J	R404	2H	R497	2K	R734	5J		
CR429	2K			R405	2H	R498	2K	R735	5I		
CR433	3J	Q402	2H	R406	2H	R499	2K	R736	5K		

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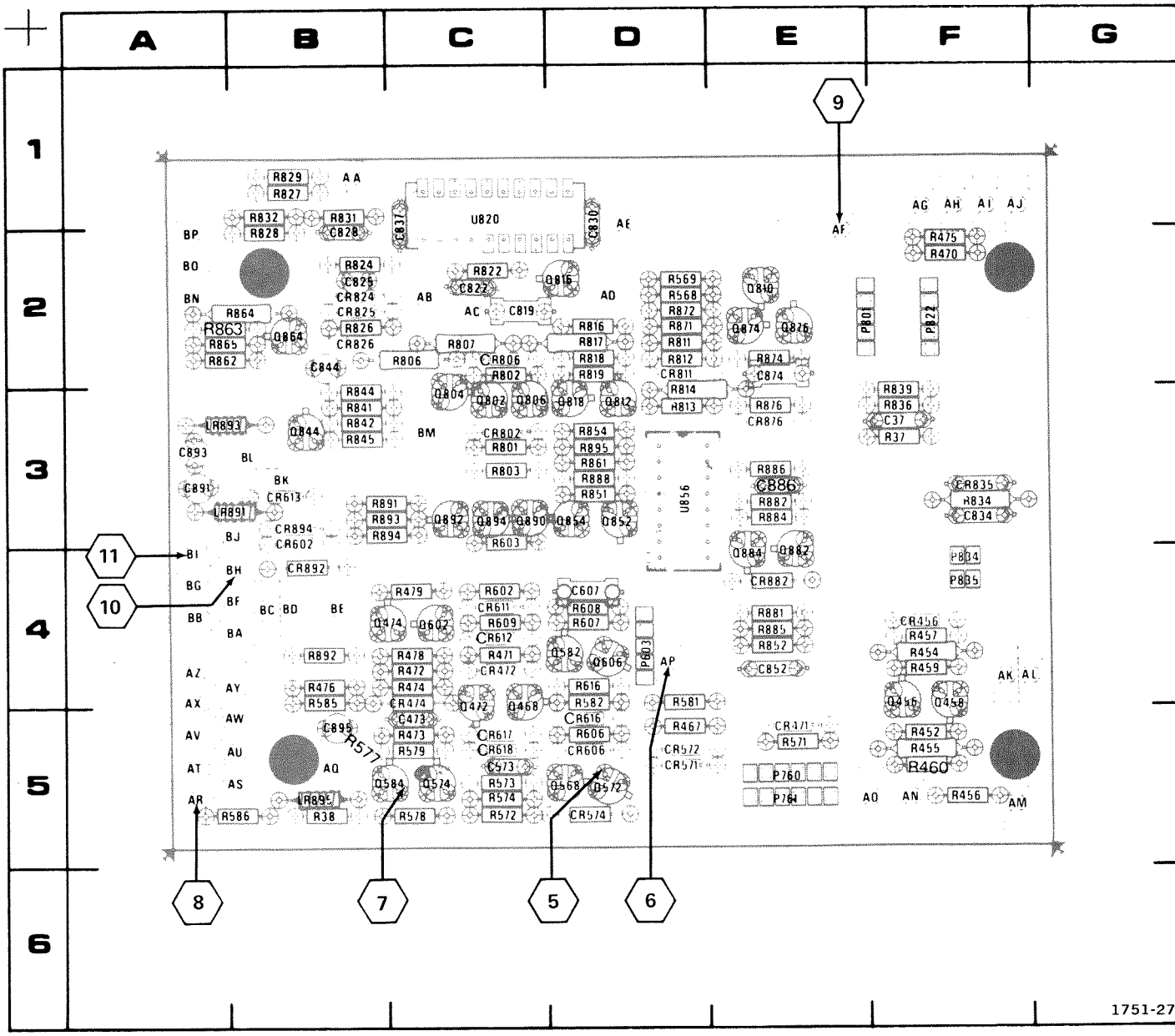

Fig. 7-14. A7—Logic Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C573	5C	CR618	5C	R572	5C	R607	4D
C607	4D			R573	5C	R608	4D
		Q568	5D	R574	5C	R609	4C
CR571	5D	Q572	5D	R577	5B	R613	3B
CR572	5D	Q574	5C	R578	5C	R616	4D
CR574	5D	Q582	4D	R579	5C		
CR602	3B	Q584	5B	R581	4D		
CR606	5D	Q602	4C	R582	4D		
CR611	4C	Q606	4D	R585	4B		
CR612	4C			R586	5B		
CR613	3B	R568	2D	R602	4C		
CR6161	5D	R569	2D	R603	3C		
CR617	5C	R571	5E	R606	5D		

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VOLTAGE & WAVEFORM CONDITIONS

TO DELAYED R_T SWITCHING DIAG 8

REFERENCE VOLTAGE FROM U752-6 DIAG 4

R538 220 +8.65 · C538 0.1 · Q536 · R536 100 · R541 33 · R542 51 · R544 56

+15V · R546 47 · C546 0.1 · R545 47 · R551 47 · Q546 A · Q546 B · Q550 · TP550 ~0.2

CR543 · +5V · C540 1.6-4.8 2ns TIMING · C721 2.3-14.1 20ns TIMING · C722 70

R547 100 · CR547 · -13.2 · R552 1.5k · C548 0.1 · R548 47 · -15V · R553 1k

S700 TIME/DIV SEE DIAG 8

C715 898 · C716 0.1 · C717 10μF · MATCHED SET

R559 180 · R557 400 · R558 400 · L558 315nH · 51 ÷1 · 50 ÷2

DELAYED SWEEP TO Q910 DIAG 6

+5V · R528 10 · C531 2.2 · R529 1.18k · CR529 · R531 60.4 · Q530 · +3.3 · CR534 · +3.1

R532 30 · C532 .0027 · CR510

SWEEP REGISTRATION · +15V · R525 10k · -15V · R526 6.8k · R527 47 · Q522 · Q520 · R521 7.15k · -15V

C511 .0033 · R511 100

DELAY COMP FROM R923 DIAG 6 · -4.2 · C508 30 · R509 100 · Q510 · R514 100 · C515 .1 · Q512 · R515 100 · -5V

CR508 · -5V · R512 619 · -15V

S700 TIME/DIV SEE DIAG 8 · 45 · 46 · R711 2.7k · R712 6.2k · -15V -15V

R506 47 · +15V · R504 3.3k · Q504 · R505 150 · R502 1.40k · +15V · R501 39 · Q502 · -0.3

DELAYED TRIGGER FROM R377 DIAG 3 · DA · +0.5

PARTIAL A9 DELAYED TRIG BD

PARTIAL A6 INTERFACE BD

PARTIAL A7 SWEEP LOGIC BD

AD · +15V · C573 0.1 · R573 51 · R574 27 · +13.8 · Q574 · +1.3 · R572 1k · CR574 · GATE END FROM Q472 DIAG 6 · DELAYED SWEEP END TO Q810 DIAG 4 · AF

+5V · R566 1.3k · +1.1 · R565 390 · R562 100 · Q564 · Q562 · +0.7 · -0.1 · R563 4.3k · R554 1k · R561 2.7k · -15V · R564 470 · 0V

R568 470 · CR571 · R569 2k · -15V · R570 4.7k · CR572 · Q572 · Q568

L574 · R577 100 · R578 470 · R579 2.4k · -15V · R586 51 · R585 4.7k · -15V

+15V · R582 7.5k · Q584 · Q582 · MAIN GATE INHIBIT FROM U856-6 DIAG 7 · R581 1k

AUX Y ENABLE FROM Q894 DIAG 7 · P603 · +15V · TRACE SEP R600 10k · INTENSITY R605 10k · CONTRAST R615 10k

R602 3.3k · CR602 · BH · B16 · AUX Y · +0.5 · R603 1k · Q602 · CR611 · CR612

R606 5.6k · CR606 · Q606 · -2.0 · R607 1k · C607 4.7 · R609 1k · +15V · R613 56k · CR613 · BI · A17 · AUX Z

R608 1k · -15V · R616 3.9k · CR617 · CR616 · CR618 · AUX Z ENABLE FROM Q474 THRU R478 DIAG 4 · AR · A1 · MAIN GATE

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L.I.C. P5 P5

7B92A

REV.A, MAR. 1975

DLY'D SWEEP GEN 5

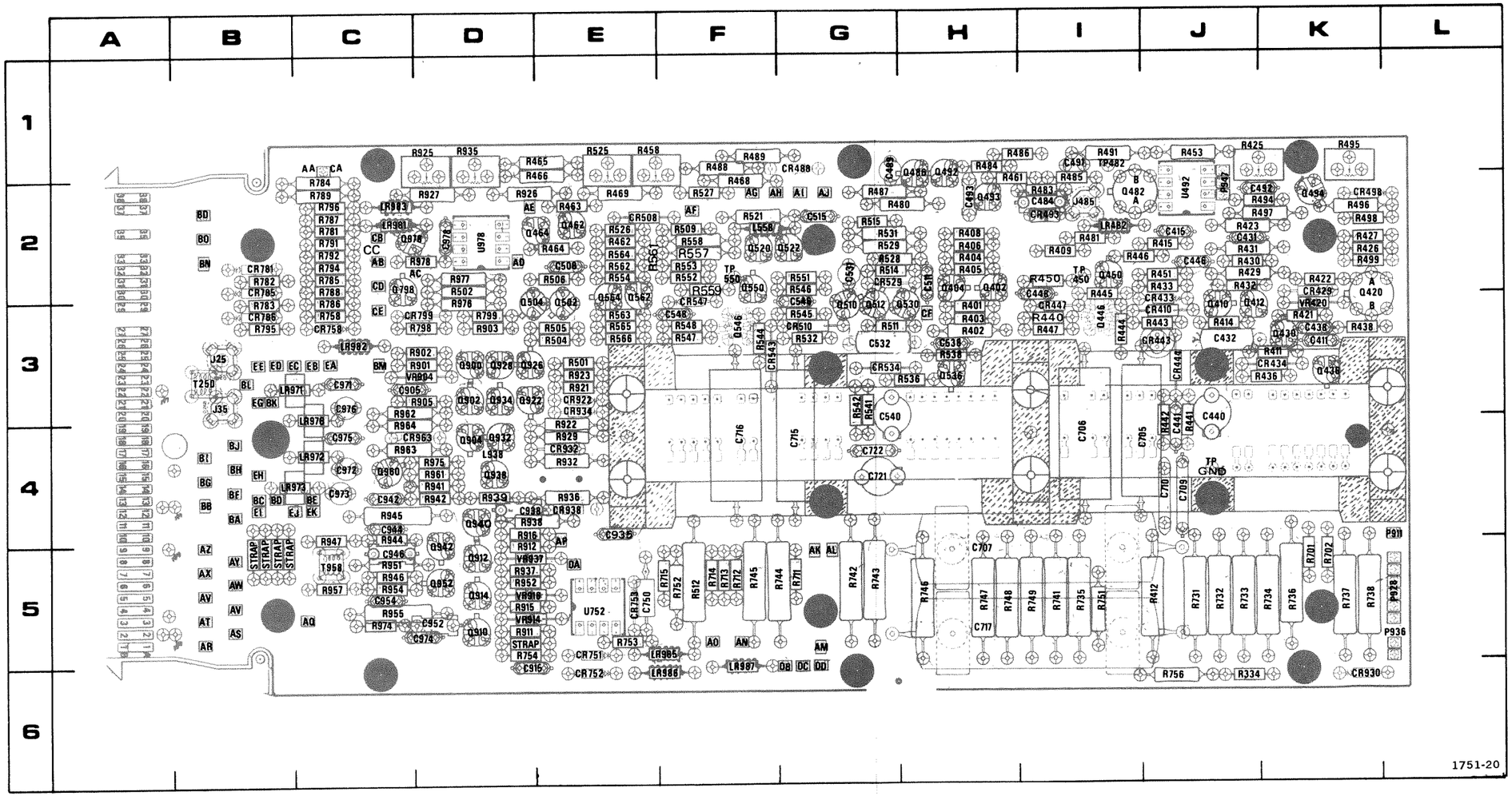
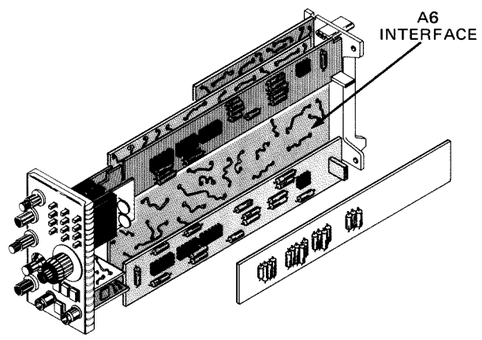
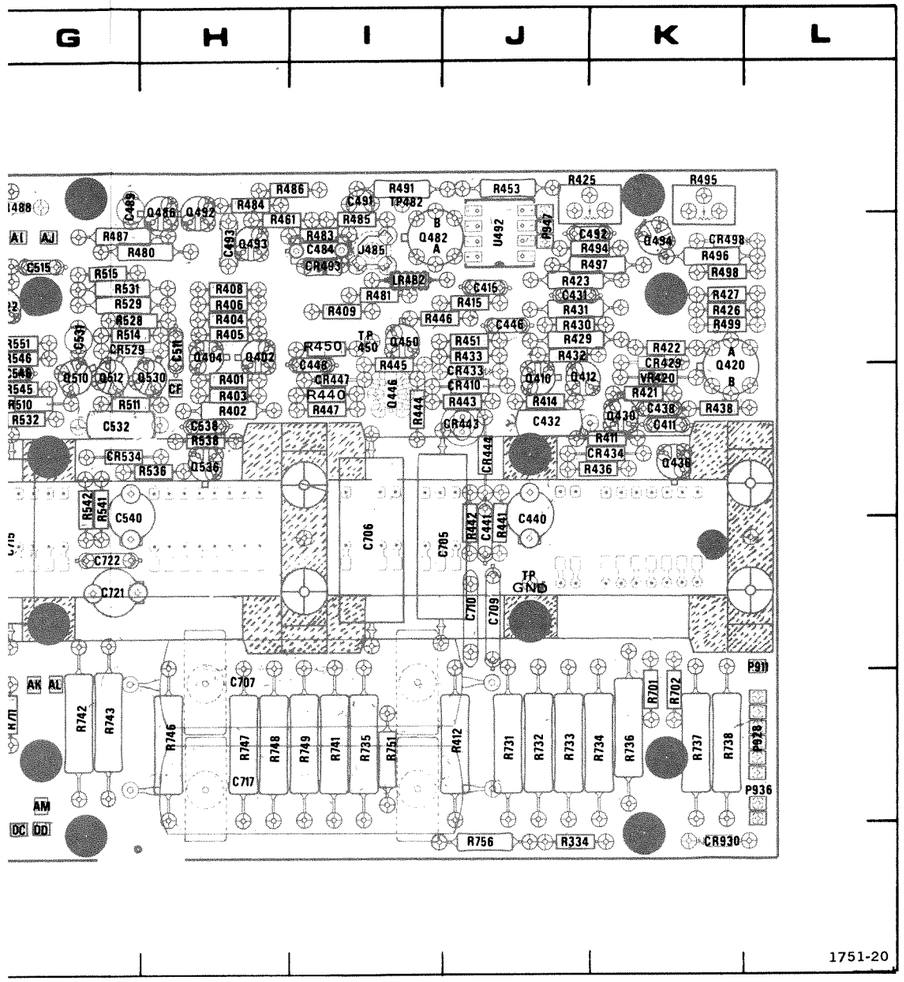


Fig. 7-15. A6—Interface Circuit Board.



MORE

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C411	3K	CR434	3K	Q404	2H
C415	2J	CR443	3J	Q410	3J
C431	2J	CR444	3J	Q412	3J
C432	3J	CR447	3I	Q420	2K
C438	3K	CR493	2I	Q430	3K
C440	3J	CR498	2K	Q436	3K
C441	4J	CR508	2E	Q446	3I
C446	2J	CR510	3G	Q450	2I
C448	2I	CR529	2G	Q462	2E
C484	2I	CR534	3G	Q482	2I
C489	1G	CR543	3F	Q484	2E
C491	1I	CR547	3F	Q486	1H
C492	2K	CR751	5E	Q492	1H
C493	2H	CR752	6E	Q493	2H
C508	2E	CR753	5E	Q494	2K
C511	2H	CR758	3C	Q502	2E
C515	2G	CR781	2B	Q504	2E
C531	2G	CR785	2B	Q510	3G
C532	3G	CR786	3B	Q512	3G
C538	3H	CR488	1G	Q520	2F
C540	3G	CR799	3D	Q522	2G
C546	3G	CR922	3E	Q530	3H
C548	3F	CR930	6K	Q536	3H
C705	4J	CR932	4E	Q546	3F
C706	4I	CR934	3E	Q550	2F
C707	5H	CR938	4E	Q562	2E
C709	4J	CR963	4D	Q564	2E
C710	4J			Q798	2C
C715	4F	J25	3B	Q900	3D
C716	4F	J35	3B	Q902	3D
C717	5H	J485	2I	Q904	4D
C721	4G			Q910	5D
C722	4G	L558	2F	Q912	5D
C750	5E	L938	4D	Q914	5D
C905	3D			Q922	3D
C915	6D	LR482	2I	Q926	3D
C935	4E	LR971	3B	Q928	3D
C938	4D	LR972	4C	Q932	4D
C942	4C	LR973	4C	Q934	3D
C944	4C	LR976		Q938	4D
C952	5D	LR981	2C	Q940	4D
C954	5C	LR982	3C	Q942	5D
C971	3C	LR983	2C	Q952	5D
C972	4C	LR985	5F	Q960	4C
C973	4C	LR986	6F	Q978	2D
C974	5D	LR987	6F		
C975	4C			R334	6J
C976	3C	P911	4L	R401	3H
C978	2D	P928	5L	R402	3H
		P936	5L	R403	3H
CR410	3J	P947	2J	R404	2H
CR429	2K			R405	2H
CR433	3J	Q402	2H	R406	2H



face Circuit Board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C411	3K	CR434	3K	Q404	2H	R408	2H	R501	3E	R737	5K
C415	2J	CR443	3J	Q410	3J	R409	2I	R502	2C	R738	5K
C431	2J	CR444	3J	Q412	3J	R511	3K	R504	3E	R74	5I
C432	3J	CR447	3I	Q420	2K	R412	5J	R505	3E	R742	5G
C438	3K	CR493	2I	Q430	3K	R414	3J	R506	2E	R743	5G
C440	3J	CR498	2K	Q436	3K	R415	2J	R509	2F	R744	5F
C441	4J	CR508	2E	Q446	3I	R421	3K	R511	3G	R745	5F
C446	2J	CR510	3G	Q450	2I	R422	2K	R512	5F	R746	5H
C448	2I	CR529	2G	Q462	2E	R423	2J	R514	2G	R747	5H
C484	2I	CR534	3G	Q482	2I	R425	1J	R515	2G	R748	5H
C489	1G	CR543	3F	Q484	2E	R426	2K	R512	2F	R749	5I
C491	1I	CR547	3F	Q486	1H	R429	2J	R521	2F	R751	5I
C492	2K	CR751	5E	Q492	1H	R430	2J	R525	1E	R752	5F
C493	2H	CR752	6E	Q493	2H	R431	2J	R526	2E	R753	5E
C508	2E	CR753	5E	Q494	2K	R432	2J	R527	2F	R977	2D
C511	2H	CR758	3C	Q502	2E	R433	2J	R528	2G	R978	2D
C515	2G	CR781	2B	Q504	2E	R436	3K	R529	2G		
C531	2G	CR785	2B	Q510	3G	R438	3K	R532	3G	T250	3B
C532	3G	CR786	3B	Q512	3G	R440	2I	R536	3H	T958	5C
C538	3H	CR488	1G	Q520	2F	R441	4J	R538	3H		
C540	3G	CR799	3D	Q522	2G	R442	4J	R541	3G	TP450	2I
C546	3G	CR922	3E	Q530	3H	R443	3J	R542	3G	TP482	1I
C548	3F	CR930	6K	Q536	3H	R444	3I	R544	3F	TP550	2F
C705	4J	CR932	4E	Q546	3F	R444	3I	R545	3G	TPGND	4J
C706	4I	CR934	3E	Q550	2F	R446	2I	R546	2G		
C707	5H	CR938	4E	Q562	2E	R447	3I	R547	3F	U492	2J
C709	4J	CR963	4D	Q564	2E	R450	2I	R548	3F	U752	5E
C710	4J			Q798	2C	R451	2J	R551	2G	U978	2D
C715	4F	J25	3B	Q900	3D	R458	1E	R552	2F		
C716	4F	J35	3B	Q902	3D	R461	1H	R553	2F	VR420	3K
C717	5H	J485	2I	Q904	4D	R462	2E	R554	2E	VR904	3D
C721	4G			Q910	5D	R463	2E	R557	2F	VR914	5D
C722	4G	L558	2F	Q912	5D	R464	2E	R558	2F	VR916	5D
C750	5E	L938	4D	Q914	5D	R465	1E	R559	2F	VR937	5D
C905	3D			Q922	3D	R466	1E	R561	2E		
C915	6D	LR482	2I	Q926	3D	R468	2F	R562	2E		
C935	4E	LR971	3B	Q928	3D	R469	2E	R563	3E		
C938	4D	LR972	4C	Q932	4D	R480	2H	R564	2E		
C942	4C	LR973	4C	Q934	3D	R481	2I	R565	3E		
C944	4C	LR976		Q938	4D	R483	2I	R566	3E		
C952	5D	LR981	2C	Q940	4D	R484	1H	R701	5K		
C954	5C	LR982	3C	Q942	5D	R485	1I	R702	5K		
C971	3C	LR983	2C	Q952	5D	R486	1H	R711	5G		
C972	4C	LR985	5F	Q960	4C	R487	2G	R712	5F		
C973	4C	LR986	6F	Q978	2D	R488	1F	R713	5F		
C974	5D	LR987	6F			R489	1F	R714	5F		
C975	4C			R334	6J	R491	1I	R715	5F		
C976	3C	P911	4L	R401	3H	R494	2K	R731	5J		
C978	2D	P928	5L	R402	3H	R495	1K	R732	5J		
		P936	5L	R403	3H	R496	2K	R733	5J		
CR410	3J	P947	2J	R404	2H	R497	2K	R734	5J		
CR429	2K			R405	2H	R498	2K	R735	5I		
CR433	3J	Q402	2H	R406	2H	R499	2K	R736	5K		

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VOLTAGE & WAVEFORM CONDITIONS

DELAYING SHEEP FROM R458 DIAG 4

DELAYED SHEEP FROM Q550 THRU S700 DIAG 5

DELAYING SHEEP INHIBIT FROM U856-5 DIAG 1

DELAYED SHEEP INHIBIT FROM U856-6 DIAG 1

S700 TIME/DIV SEE DIAG 8

POSITION R930 5k

POSITION CENTERING

TIME POSITION

DELAY COMP TO C508 DIAG 5

* MATCHED PAIR

DELAYING SHEEP FROM Q450 DIAG 4

T958 50Ω EC RUN

B11 - A11 + SIGNAL (OUT)

A3 A SWEEP

B3 B SWEEP

PARTIAL A6 INTERFACE BRD

PARTIAL A7 SWEEP LOGIC BRD

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L.I.C.	
B38	P5

OUTPUT AMPLIFIER

7B92A

REV. A, MAR. 1975

OUTPUT AMP 6

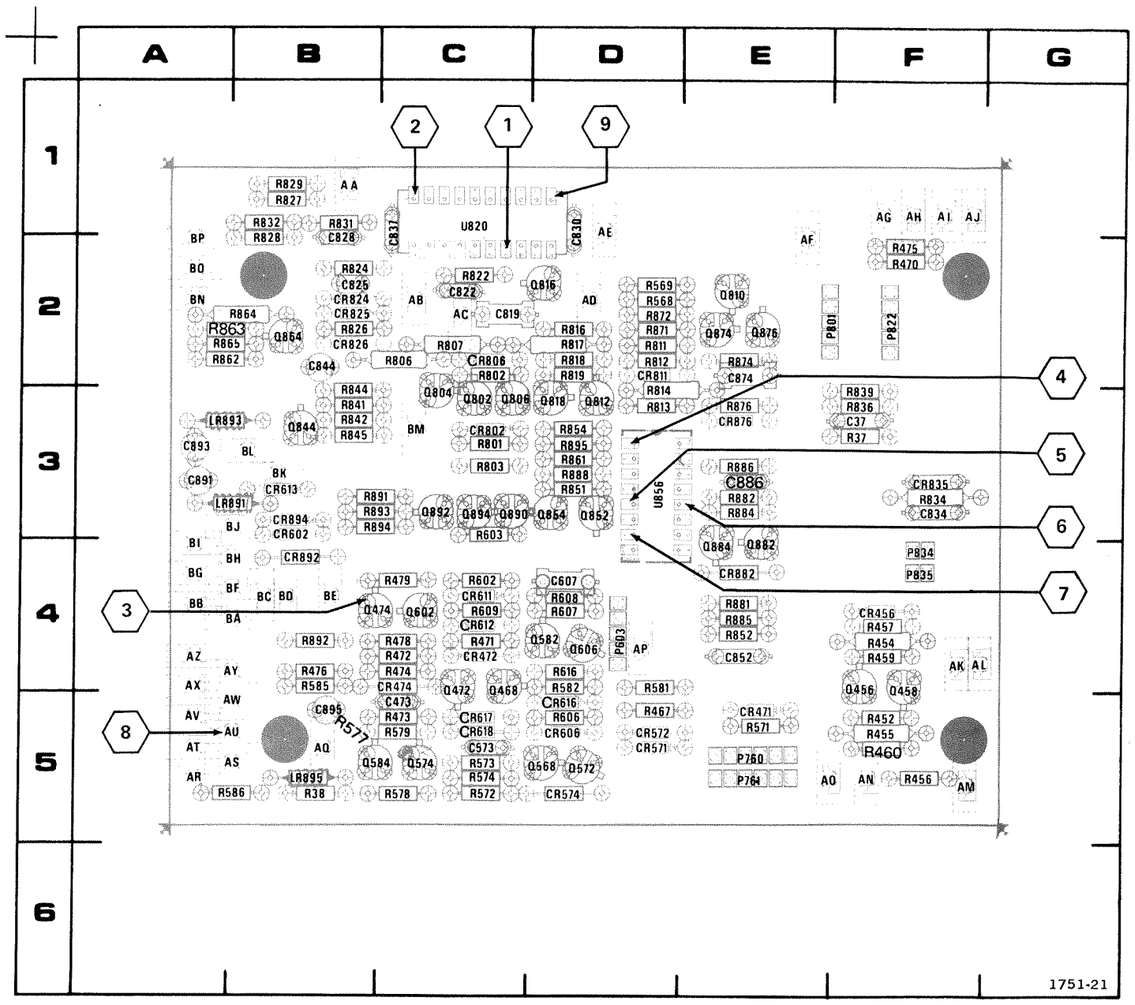
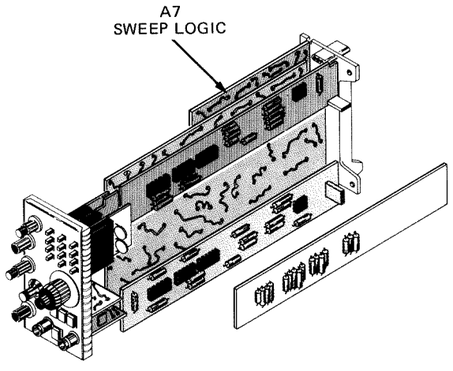


Fig. 7-16. A7—Logic Circuit Board.



MORE

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C37	3F	Q566	4F	R579	5C	R891	3B
C473	5C	Q458	4F	R581	4D	R892	4B
C573	5C	Q468	4C	R582	4D	R893	3B
C607	4D	Q472	4C	R585	4B	R894	3B
C819	2C	Q474	4C	R586	5B	R895	3D
C822	2C	Q568	5D	R602	4C		
C825	2B	Q572	5D	R603	3C	U280	1C
C828	1B	Q574	5C	R606	5D	U856	3D
C830	1D	Q582	4D	R607	4D		
C834	3F	Q584	5B	R608	4D		
C837	1C	Q602	4C	R609	4C		
C844	2B	Q606	4D	R616	4D		
C852	4E	Q802	3C	R801	3C		
C874	2E	Q804	3C	R802	2C		
C886	3E	Q806	3C	R803	3C		
C891	3A	Q810	2E	R806	2C		
C893	3A	Q812	3D	R807	2C		
C895	5B	Q816	2D	R811	2D		
		Q818	3D	R812	2D		
CR456	4F	Q844	3B	R813	3D		
CR471	5E	Q852	3D	R816	2D		
CR472	4C	Q854	3D	R817	2D		
CR474	4C	Q864	2B	R818	2D		
CR571	5D	Q874	2E	R819	2D		
CR572	5D	Q876	2E	R822	2C		
CR574	5D	Q882	4E	R824	2B		
CR602	3B	Q884	4E	R826	2B		
CR606	5D	Q890	3C	R827	1B		
CR611	4C	Q892	3C	R828	2B		
CR612	4C	Q894	3C	R829	1B		
CR613	3B			R831	1B		
CR616	5D	R37	3F	R832	1B		
CR617	5C	R38	5B	R834	3F		
CR618	5C	R452	5F	R836	3F		
CR802	3C	R454	4F	R839	3F		
CR806	2C	R455	5F	R841	3B		
CR811	2D	R456	5F	R842	3B		
CR824	2B	R457	4F	R844	3B		
CR825	2B	R459	4F	R845	3B		
CR826	2B	R460	5F	R851	3D		
CR835	3F	R467	5D	R852	4E		
CR876	3E	R470	2F	R854	3D		
CR882	4E	R471	4C	R861	3D		
CR892	4B	R472	4C	R862	2A		
CR894	3B	R473	5C	R863	2A		
		R474	4C	R864	2B		
LR891	3B	R475	2F	R865	2A		
LR893	3A	R476	4B	R871	2D		
LR895	5B	R478	4C	R872	2D		
		R479	4C	R874	2E		
P603	4D	R568	2D	R876	3E		
P760	5E	R571	5E	R881	4E		
P761	5E	R572	5C	R882	3E		
P801	2E	R573	5C	R884	3E		
P822	2F	R574	5C	R885	4E		
P834	4F	R577	5B	R886	3E		
P835	4F	R578	5C	R888	3D		

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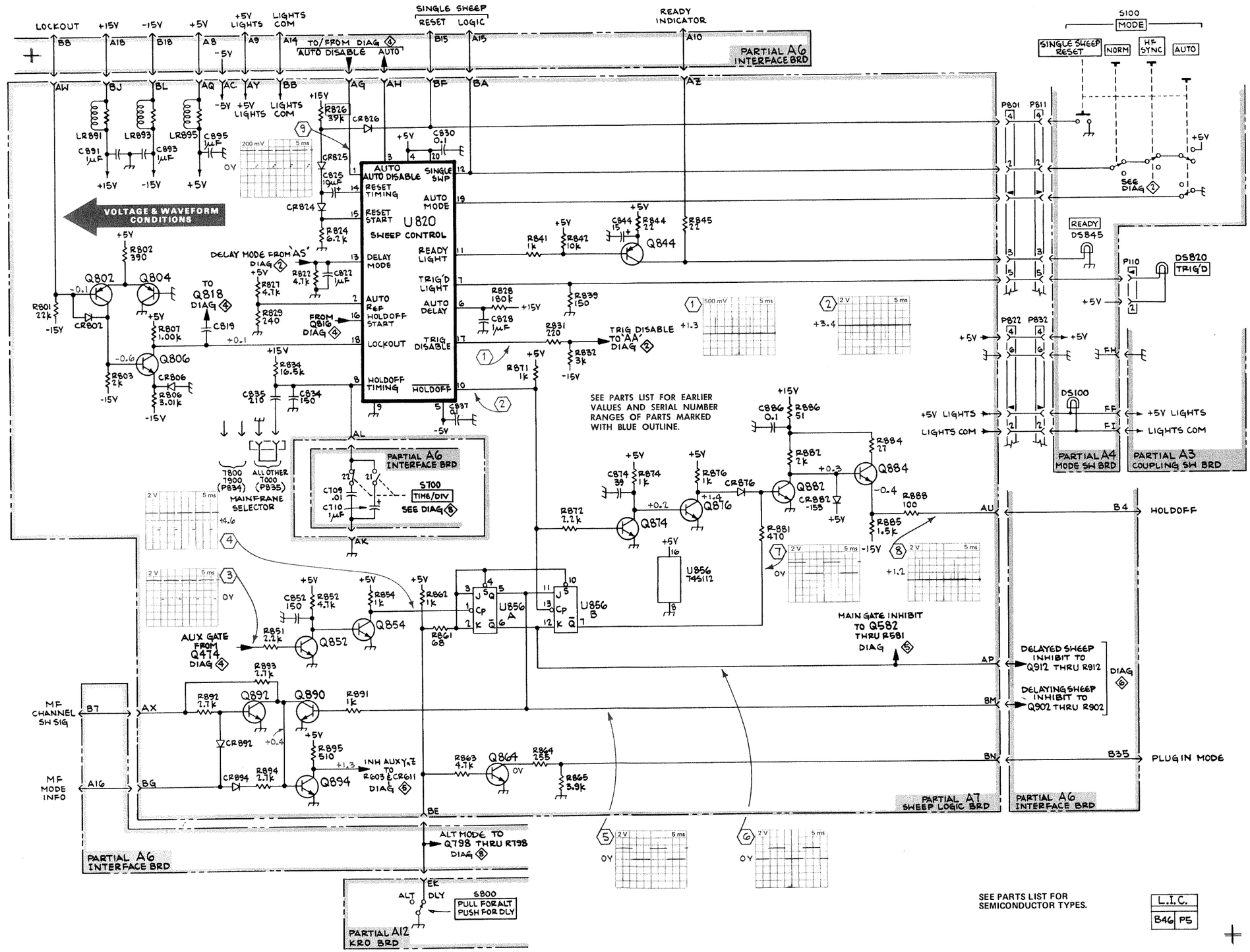

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REV. A, MAR. 1975

LOGIC 7

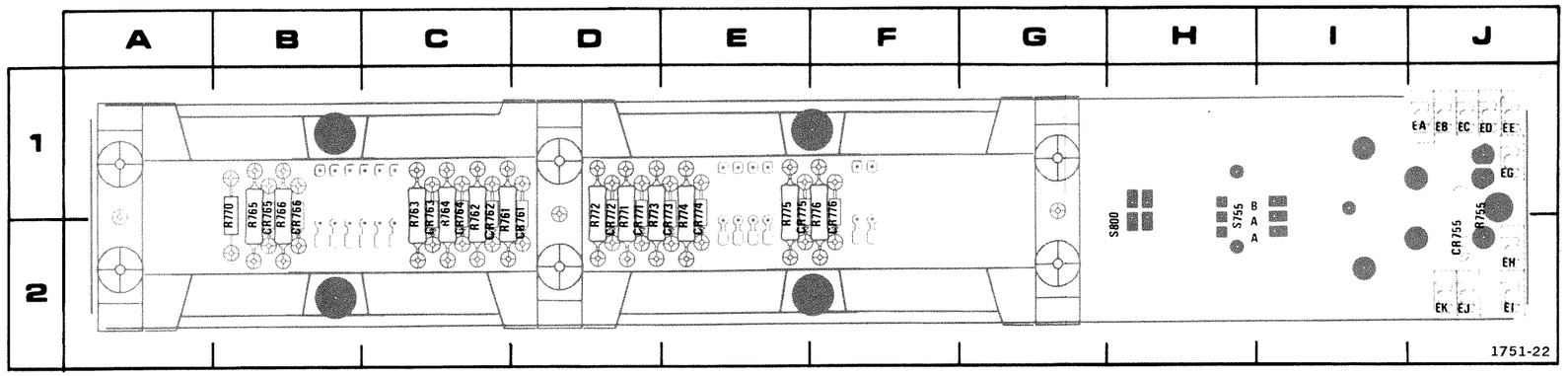
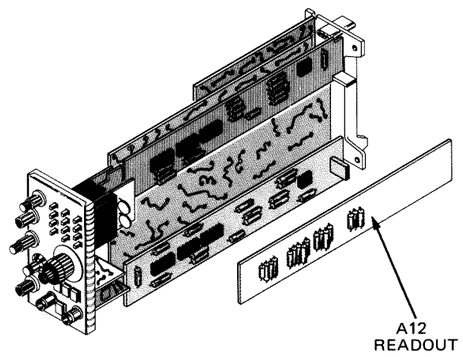


Fig. 7-17. A12—Readout Circuit Board.



CKT NO	GRID LOC	CKT NO	GRID LOC
CR755	2J	R761	1C
CR761	1D	R762	1C
CR762	1C	R763	1C
CR763	2C	R764	1C
CR764	1C	R765	1B
CR765	1B	R766	1B
CR766	1B	R770	1B
CR771	1D	R771	1D
CR772	1D	R772	1D
CR773	1E	R773	1D
CR774	1E	R774	1E
CR775	1E	R775	1E
CR776	1E	R776	1F
R755	1J	S755	2H
R761	1C	S800	2H

MORE

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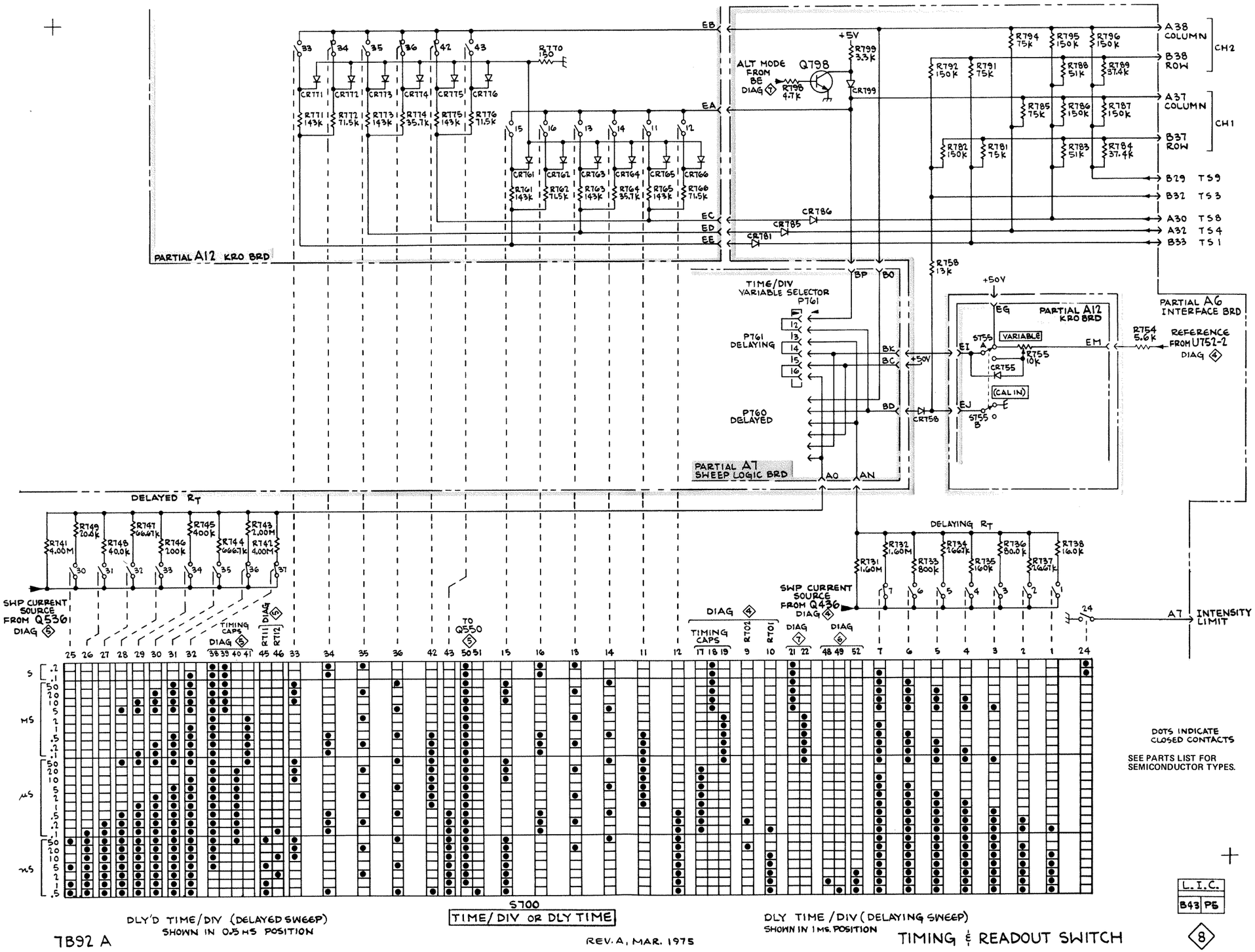

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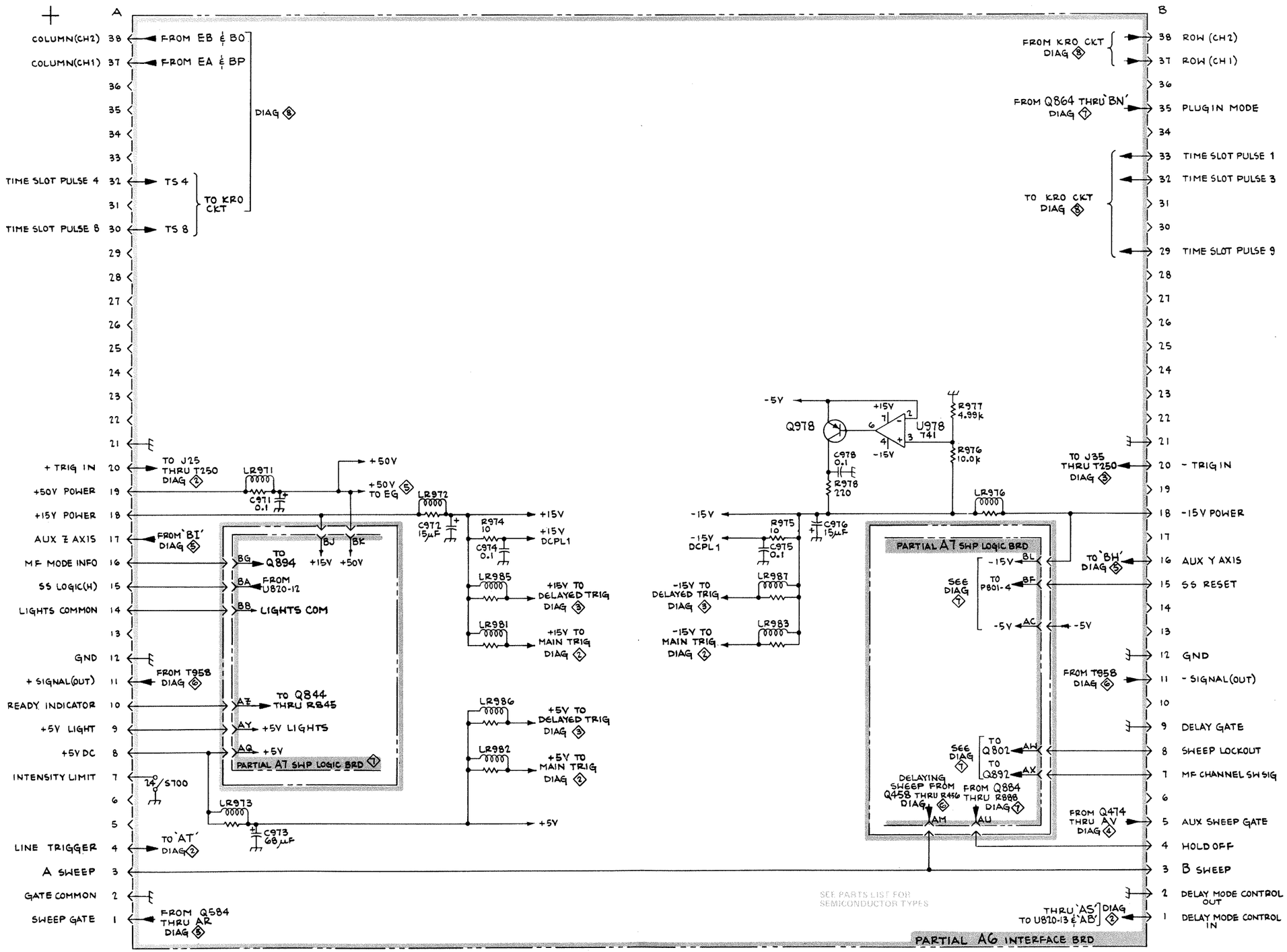
REV. A, MAR. 1975

TIMING & READOUT SWITCH

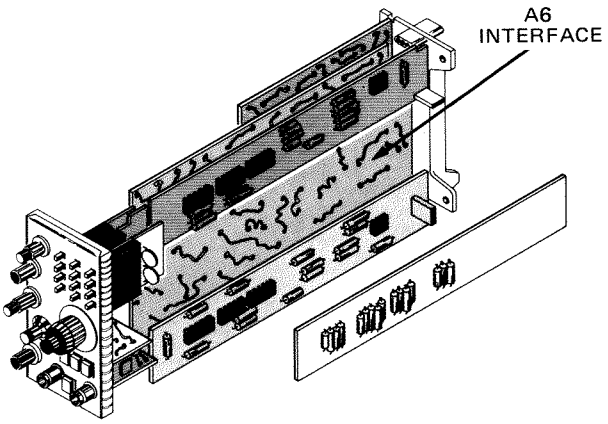
L.I.C.	
B43	P5

8



7B92A @ REAR PLUG SIGNAL LOCATOR (FRONT VIEW) 9

REAR PLUG SIGNAL 9



MORE

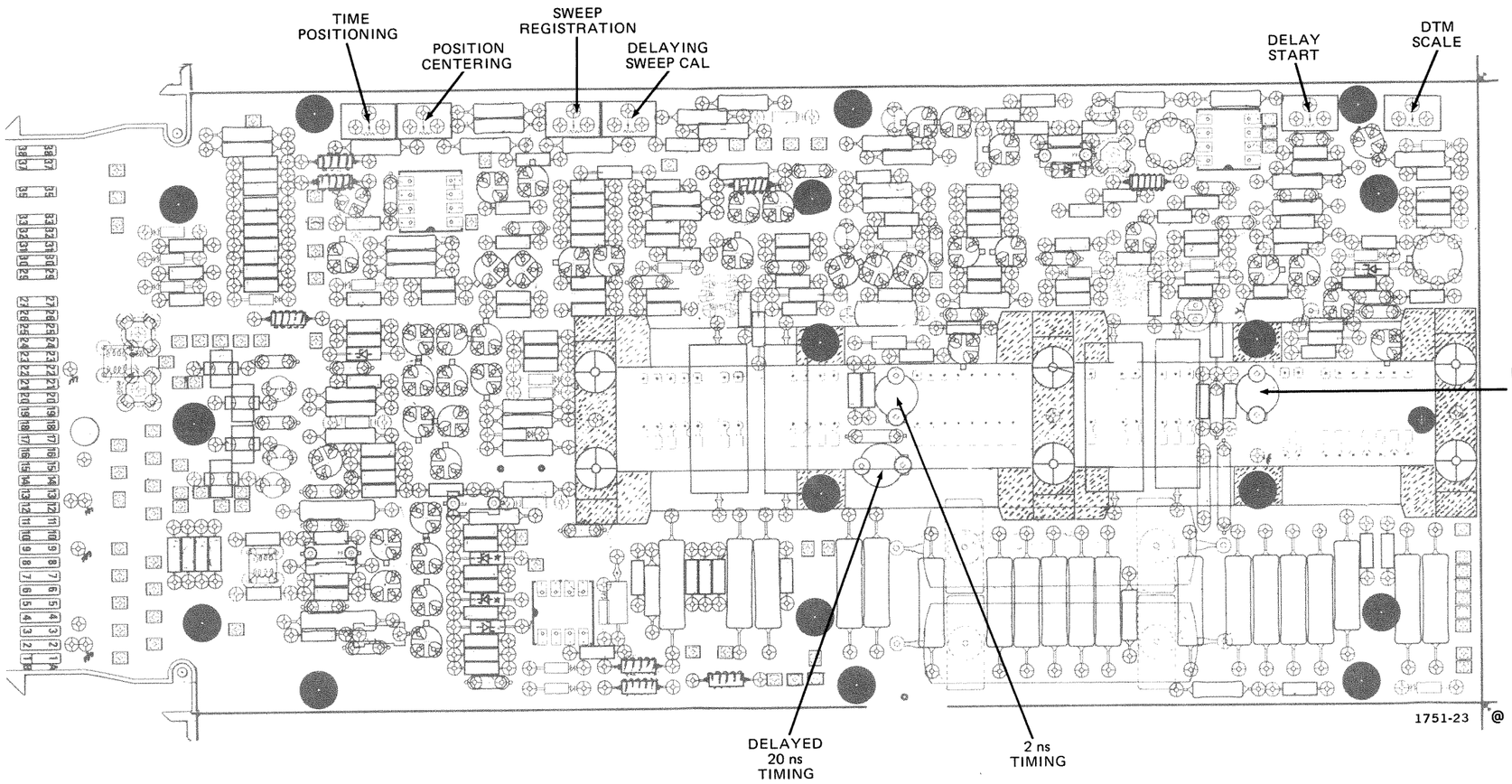


Fig. 7-18. Sweep Adjustment Locations.

PLUG-IN PANEL, BLANK
(Part No. 016-0155-00)

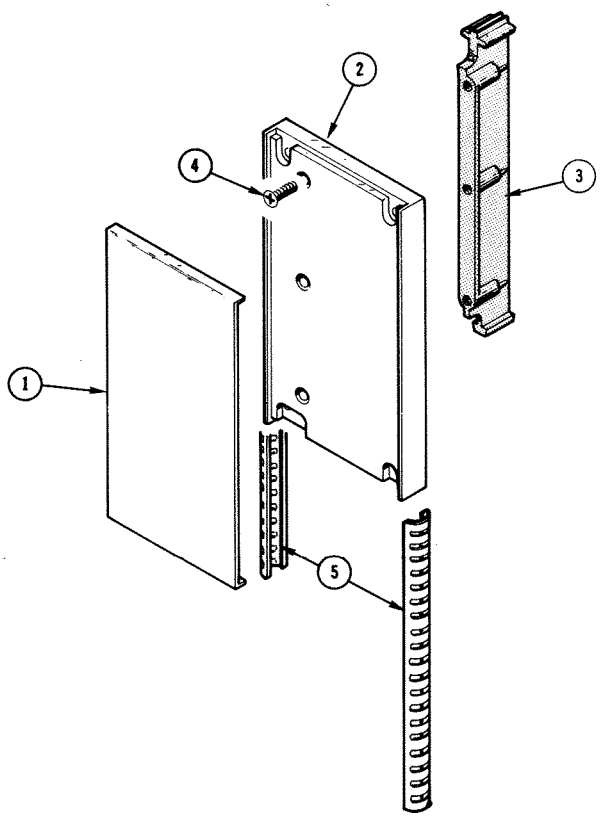
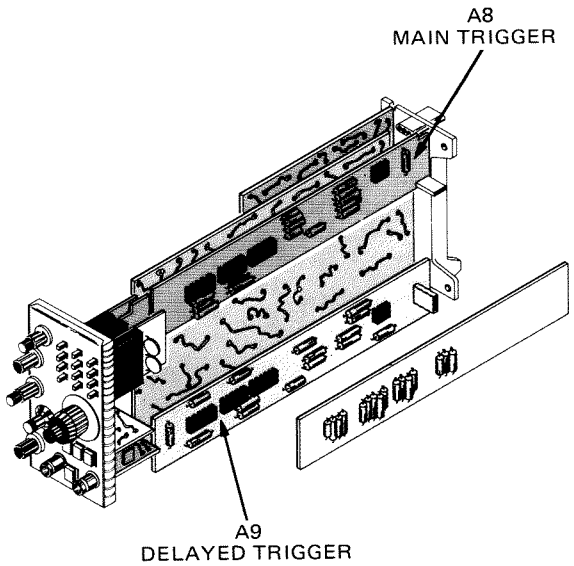
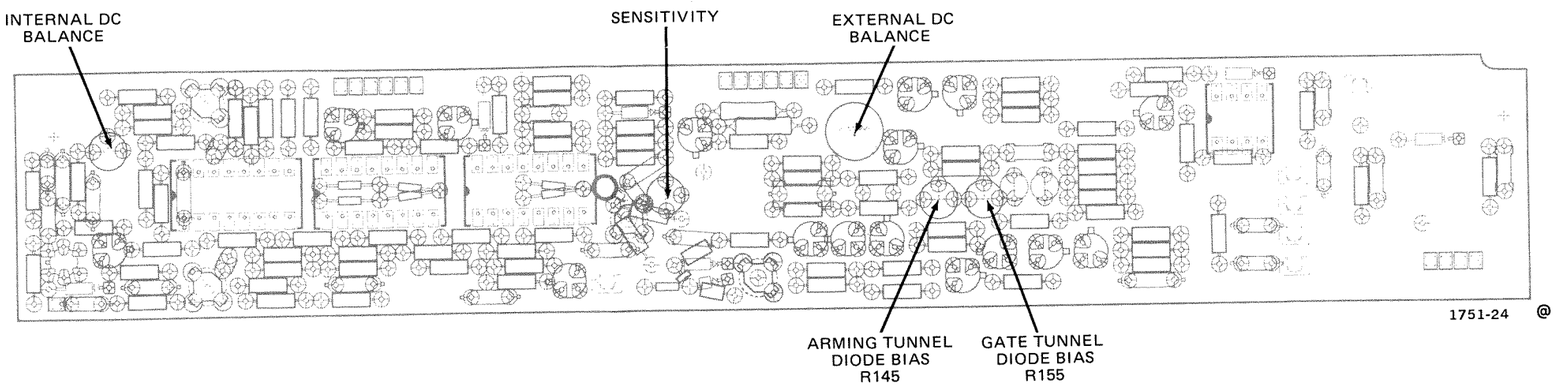


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	Description
					1 2 3 4 5
1	333-1287-00			1	PANEL, front
2	386-1447-28			1	SUBPANEL, front
3	351-0235-00			1	SLIDE, guide
	- - - - - -			-	mounting hardware: (not included w/slide)
4	213-0078-00			3	SCREW, 4-24 x 0.375 inch, 100° csk, FHS
5	348-0235-00			2	SHIELDING GASKET

DATA SHEET
NO. 062-1151-00
DATE MAR. 1973(R)



MORE



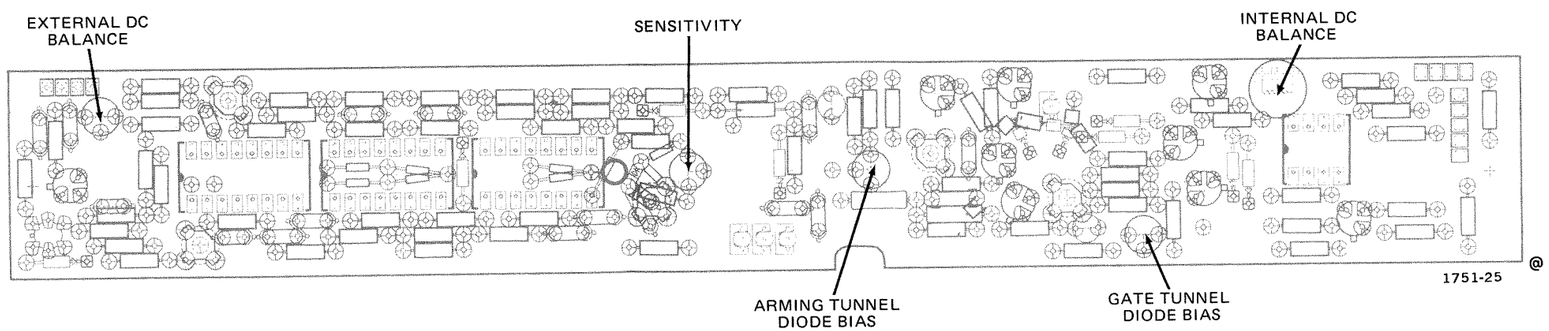
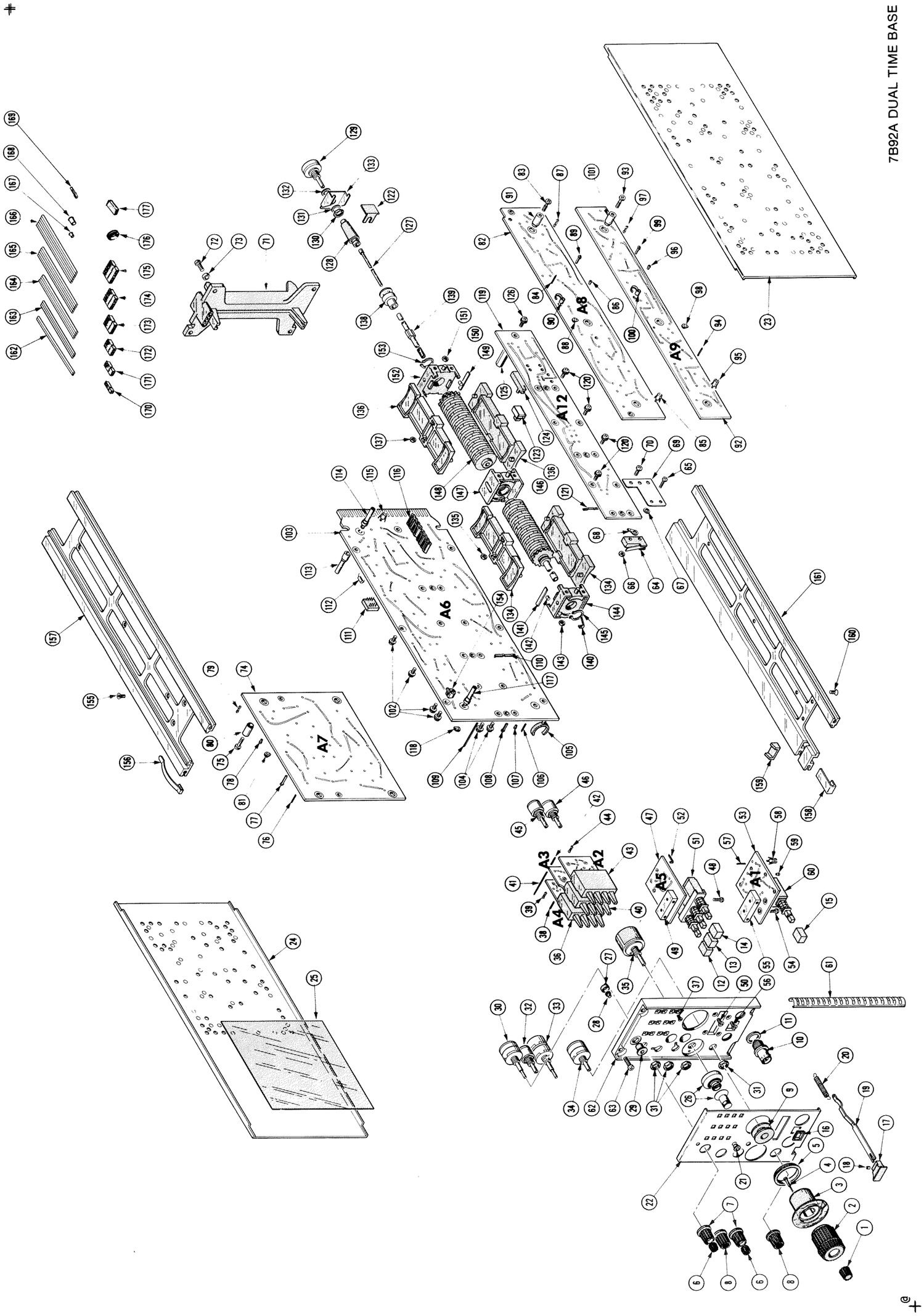


Fig. 7-19. Trigger Adjustment Locations.

FIG. 1 EXPLODED



REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
\- - - * - - -
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
\- - - * - - -
Parts of Detail Part
Attaching parts for Parts of Detail Part
\- - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

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

ABBREVIATIONS

"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
XSTR	TRANSISTOR

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
0000C	Gettig Engineering and Manufacturing Co.		Springmill, PA 16875
00779	AMP, Inc.	P. O. Box 3608	Harrisburg, PA 17105
01963	Cherry Electrical Products Corp.	3600 Sunset Ave.	Waukegan, IL 60085
05129	Kilo Engineering Co.	2015 D	La Verne, CA 91750
08261	Spectra-Strip Corp.	7100 Lampson Ave.	Garden Grove, CA 92642
10389	Chicago Switch, Inc.	2035 Wabansia Ave.	Chicago, IL 60647
12327	Freeway Corp.	9301 Allen Dr.	Cleveland, OH 44125
13257	Esna Ltd.	10 Esna Park Dr.	Markham, Ontario, Canada
22526	Berg Electronics, Inc.	Youk Expressway	New Cumberland, PA 17070
23499	Gavitt Wire and Cable, Division of RSC Industries, Inc.	455 N. Quince St.	Escondido, CA 92025
70276	Allen Mfg. Co.	P. O. Drawer 570	Hartford, CT 06101
71590	Centralab Electronics, Div. of Globe-Union, Inc.	5757 N. Green Bay Ave.	Milwaukee, WI 53201
73743	Fischer Special Mfg. Co.	446 Morgan St.	Cincinnati, OH 45206
74445	Holo-Krome Co.	31 Brook St. West	Hartford, CT 06110
77250	Pheoll Manufacturing Co., Division of Allied Products Corp.	5700 W. Roosevelt Rd.	Chicago, IL 60650
78189	Illinois Tool Works, Inc. Shakeproof Division	St. Charles Road	Elgin, IL 60120
78471	Tilley Mfg. Co.	900 Industrial Rd.	San Carlos, CA 94070
78488	Stackpole Carbon Co.		St. Marys, PA 15857
79807	Wrought Washer Mfg. Co.	2100 S. O Bay St.	Milwaukee, WI 53207
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97077
81741	Chicago Lock Co.	4311 W. Belmont Ave.	Chicago, IL 60641
82647	Texas Instruments, Inc., Control Products Div.	34 Forest St.	Attleboro, MA 02703
83385	Central Screw Co.	2530 Crescent Dr.	Broadview, IL 60153
83501	Gavitt Wire and Cable, Division of RSC Industries, Inc.	Central St.	Brookfield, MA 01506
87308	N. L. Industries, Inc., Southern Screw Div.	P. O. Box 1360	Statesville, NC 28677
97464	Industrial Retaining Ring Co.	57 Cordier St.	Irvington, NJ 07111

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-1	366-1168-00			1	KNOB:BLACK CAP AND RED BODY	80009	366-1168-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-2	366-1321-01			1	KNOB:ACT	80009	366-1321-01
	213-0243-00			2	. SETSCREW:5-40 X 0.25 INCH,HEX SOC STL	70276	NOTE
-3	354-0410-00			1	RING,KNOB SKIRT:0.252 ID X 0.850 OD,0.86" L	80009	354-0410-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-4	384-1087-00			1	SHAFT,PUSH,ACTR:	80009	384-1087-00
-5	401-0126-00			1	BRG,KNOB SKIRT:0.861 ID X 0.975 OD	80009	401-0126-00
-6	366-1391-00			2	KNOB:GRAY	80009	366-1391-00
	213-0140-00			2	. SETSCREW:2-56 X 0.094 INCH,HEX SOC STL	70276	OBD
-7	366-1077-00			2	KNOB:GRAY	80009	366-1077-00
	213-0153-00			2	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-8	366-1189-00			2	KNOB:GRAY	80009	366-1189-00
	213-0153-00			1	. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-9	214-1597-00			1	ACTUATOR,SW:SPOOL SHAPE	80009	214-1597-00
-10	131-0106-02			2	CONNECTOR,RCPT,:BNC	80009	131-0106-02
					(ATTACHING PARTS FOR EACH)		
-11	210-0978-00			1	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
					- - - * - - -		
-12	366-1257-90			1	PUSHBUTTON:+,-	80009	336-1257-00
-13	366-1257-91			1	PUSHBUTTON:AC-DC	80009	366-1257-91
-14	366-1257-92			1	PUSHBUTTON:INT,EXT	80009	366-1257-92
-15	366-1489-73			1	PUSHBUTTON:TERM	80009	366-1489-73
-16	426-0681-00			4	FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-17	366-1058-61			1	KNOB:LATCH	80009	366-1058-61
					(ATTACHING PARTS)		
-18	214-1095-00			1	PIN,SPG,SPLIT:0.094 OD X 0.187 INCH LONG	13257	52-022-094-0187
					- - - * - - -		
-19	105-0076-00			1	REL BAR,LATCH:PLUG-IN UNIT	80009	105-0076-00
-20	214-1280-00			1	SPRING,HLCPS:0.14 OD X 1.126"L,0.16"DIA W	80009	214-1280-00
-21	358-0378-00			2	BUSHING,SLEEVE:PRESS MOUNT	80009	358-0378-00
-22	333-1886-00			1	PANEL,FRONT:	80009	333-1886-00
-23	337-1064-04			1	SHIELD,ELEC:SIDE	80009	337-1064-00
-24	337-1163-02			1	SHIELD,ELEC:RIGHT	80009	337-1163-02
-25	337-1167-00			1	SHIELD,ELEC:PLASTIC SHEET,2.75 X 4.25"	80009	337-1167-00
-26	331-0247-00			1	DIAL,CONTROL:10 TURN	05129	77131
-27	200-0935-00			1	BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-28	378-0602-00			1	LENS,LIGHT:GREEN	80009	378-0602-00
-29	352-0157-00			1	LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-30	----- -----			1	RES.,VARIABLE:(SEE R50,S50 EPL)		
					(ATTACHING PARTS)		
-31	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
					- - - * - - -		
-32	----- -----			1	RES.,VARIABLE:(SEE R930 EPL)		
					(ATTACHING PARTS)		
	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
					- - - * - - -		
-33	----- -----			1	RES.,VARIABLE:(SEE R600,R605 EPL)		
					(ATTACHING PARTS)		
	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-34	----- -----			1	RES.,VARIABLE:(SEE R250 EPL)		
					(ATTACHING PARTS)		
	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
					- - - * - - -		
-35	----- -----			1	RES.,VARIABLE:(SEE R490 EPL)		
-36	----- -----			1	CKT BOARD ASSY:TRIG MODE(SEE A4 EPL)		
					(ATTACHING PARTS)		
-37	211-0156-00			2	SCREW,MACHINE:1-72 X 0.25",82 DEG,FLH STL	77250	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-38	131-0608-00			14	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-39	136-0263-04			5	. CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
-40	----- -----			1	CKT BOARD ASSY:COUPLING SW(SEE A3 EPL)		
					(ATTACHING PARTS)		
	211-0156-00			2	SCREW,MACHINE:1-72 X 0.25",82 DEG,FLH STL	77250	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-41	131-0593-00			5	. CONTACT,ELEC:1.15 INCH LONG	22526	47354
	131-0590-00			9	. CONTACT,ELEC:0.71 INCH LONG	22526	47351
-42	131-0608-00			11	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-43	----- -----			1	CKT BOARD ASSY:SOURCE SW(SEE A2 EPL)		
					(ATTACHING PARTS)		
	211-0156-00			2	SCREW,MACHINE:1-72 X 0.25",82 DEG,FLH STL	77250	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-44	136-0263-04			14	. CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-45	----- -----			1	RES.,VARIABLE:(SEE R615 EPL)		
-46	----- -----			1	RES.,VARIABLE:(SEE R750 EPL)		
-47	----- -----			1	CKT BOARD ASSY:DELAYED TRIGGER SW(SEE A5 EPL)		
					(ATTACHING PARTS)		
-48	211-0001-00			2	SCREW,MACHINE:2-56 X 0.25 INCH,PNH STL	83385	OBD
					- - - * - - -		
-49	220-0637-00			1	NUT BLOCK:1.05 X 0.50 X 0.188 INCH OA	80009	220-0637-00
					(ATTACHING PARTS)		
-50	211-0105-00			2	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-51	260-1133-00			1	. SWITCH,PUSH:3 BUTTON DP	71590	2KBB030000-374
-52	131-0589-00			7	. CONTACT,ELEC:0.46 INCH LONG	22526	47350
-53	----- -----			1	CKT BOARD ASSY:EXTERNAL INPUT(SEE A1 EPL)		
					(ATTACHING PARTS)		
-54	211-0001-00			2	SCREW,MACHINE:2-56 X 0.25 INCH,PNH STL	83385	OBD
					- - - * - - -		
-55	220-0616-00			1	NUT BLOCK:1.05 X 0.50 X 0.188 INCH OA	80009	220-0616-00
					(ATTACHING PARTS)		
-56	211-0105-00			2	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-57	131-0608-00			2	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-58	131-1003-00			2	. CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-59	136-0252-04			2	. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-60	260-1132-00			1	. SWITCH,PUSH:1 BUTTON,DOUBLE POLE	80009	260-1132-00
-61	348-0235-00			2	SHLD GSKT,ELEC:4.734 INCH LONG	80009	348-0235-00
-62	386-1447-76			1	SUBPANEL,FRONT:	80009	386-1447-76
					(ATTACHING PARTS)		
-63	213-0192-00			4	SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
					- - - * - - -		
-64	260-1309-00			1	SWITCH,PUSH:LEVEL ACT SPDT	01963	E63-10H
					(ATTACHING PARTS)		
-65	211-0185-00			2	SCREW,MACHINE:4-40 X 0.438 INCH,STL	80009	211-0185-00
-66	210-0405-00			2	NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-67	210-0850-00			3	WASHER,FLAT:0.093 ID X 0.281 INCH OD	12327	OBD
-68	210-0259-00			1	TERMINAL,LUG:0.099"ID INT TOOTH,SE	80009	210-0259-00
					- - - * - - -		
-69	386-2839-00			1	PLATE,SW MTG:MICRO SWITCH	80009	386-2839-00
					(ATTACHING PARTS)		
-70	211-0097-00			2	SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
					- - - * - - -		
-71	386-1402-00			1	PANEL,REAR:	80009	386-1402-00
					(ATTACHING PARTS)		
-72	213-0192-00			4	SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
-73	361-0326-00			1	SPACER,SLEEVE:0.18 ID X 0.25 OD X 0.10"L	80009	361-0326-00
					- - - * - - -		
-74	----- -----			1	CKT BOARD ASSY:SWEEP LOGIC(SEE A7 EPL)		
					(ATTACHING PARTS)		
-75	211-0155-00			4	SCREW,EXT,RLV B:4-40 X 0.375 INCH,SST	80009	211-0155-00
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-76	131-0608-00			32	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-77	214-0579-00			1	. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-78	136-0252-04			44	. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-79	136-0263-04			42	. CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-80	361-0238-00			4	. SPACER,SLEEVE:0.25 OD X 0.34 INCH LONG	80009	361-0238-00
-81	136-0350-00			28	. SOCKET,PLUG-IN:3 PIN,LOW PROFILE	80009	136-0350-00
-82	----- -----			1	CKT BOARD ASSY:MAIN TRIGGER(SEE A8 EPL)		
					(ATTACHING PARTS)		
-83	211-0155-00			3	SCREW,EXT,RLV B:4-40 X 0.375 INCH,SST	80009	211-0155-00
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-84	131-0608-00			17	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-85	131-1003-00			4	. CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-86	136-0252-04			70	. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-87	136-0263-04			6	. CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-88	136-0350-00			16	. SOCKET,PLUG-IN:3 PIN,LOW PROFILE	80009	136-0350-00
-89	214-0579-00			4	. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-90	343-0088-00			2	. CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-91	361-0238-00			3	. SPACER,SLEEVE:0.25 OD X 0.34 INCH LONG	80009	361-0238-00
-92	----- -----			1	CKT BOARD ASSY:DELAYED TRIGGER(SEE A9 EPL)		
					(ATTACHING PARTS)		
-93	211-0155-00			3	SCREW,EXT,RLV B:4-40 X 0.375 INCH,SST	80009	211-0155-00
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-94	131-0608-00			13	. CONTACT,ELEC:0.365 INCH LONG	22526	47357
-95	131-1003-00			5	. CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-96	136-0252-04			71	. CONTACT,ELEC:0.188 INCH LONG	22526	75060
-97	136-0263-04			4	. CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-98	136-0350-00			9	. SOCKET,PLUG-IN:3 PIN,LOW PROFILE	80009	136-0350-00
-99	214-0579-00			5	. TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-100	343-0088-00			1	. CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-101	361-0238-00			3	. SPACER,SLEEVE:0.25 OD X 0.34 INCH LONG	80009	361-0238-00
	672-0446-00			1	CKT BOARD ASSY:TIME/CM		
					(ATTACHING PARTS)		
-102	211-0116-00			6	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
-103	----- -----			1	. CKT BOARD ASSY:MAIN INTERFACE(SEE A6 EPL)		
					(ATTACHING PARTS)		
-104	211-0116-00			11	. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. . CKT BOARD ASSY INCLUDES:		
-105	352-0196-00			4	. . HOLDER,RESISTOR:PNL MT 0.531 ID MOLD PLSTC	80009	352-0196-00
-106	131-0608-00			12	. . CONTACT,ELEC:0.365 INCH LONG	22526	47357
-107	136-0252-04			27	. . CONTACT,ELEC:0.188 INCH LONG	22526	75060
-108	214-0579-00			4	. . TERM.,TEST PT:0.40 INCH LONG	80009	214-0579-00
-109	131-0595-00			2	. . CONTACT,ELEC:1.37 INCH LONG	22526	47355
-110	131-0604-00			38	. . CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
-111	136-0514-00			3	. . SOCKET,PLUG-IN:MICROCIRCUIT,8 CONTACT	82647	C930802
-112	131-0566-00			5	. . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	0000C	L-2007-1
-113	351-0186-00			4	. . GUIDE-POST,LOCK:0.84 INCH LONG	80009	351-0186-00
-114	351-0185-00			4	. . GUIDE-POST,LOCK:0.65 INCH LONG	80009	351-0185-00
-115	131-1003-00			3	. . CONNECTOR BODY,:CKT BD MT,3 PRONG	80009	131-1003-00
-116	352-0274-00			2	. . HOLDER,TERMINAL:FOR 8 SQUARE PINS	80009	352-0274-00
-117	351-0188-00			2	. . GUIDE-POST,LOCK:0.65 INCH LONG	80009	351-0188-00
-118	136-0350-00			42	. . SOCKET,PLUG-IN:3 PIN,LOW PROFILE	80009	136-0350-00
	131-0590-00			8	. . CONTACT,ELEC:0.71 INCH LONG	22526	47351
	131-0592-00			40	. . CONTACT,ELEC:0.885 INCH LONG	22526	47353
	131-0593-00			10	. . CONTACT,ELEC:1.15 INCH LONG	22526	47354
-119	----- -----			1	. CKT BOARD ASSY:READOUT(SEE A12 EPL)		
					(ATTACHING PARTS)		
-120	211-0116-00			8	. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-121	131-0604-00			15	. . CONTACT,ELEC:0.025 SQ X 0.365 INCH LONG	80009	131-0604-00
	136-0263-04			10	. . CONTACT,ELEC:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-122	214-1136-00			1	. . ACTUATOR,SL SW:DUAL DPST	80009	214-1136-00
-123	260-0960-01			1	. . SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
-124	351-0180-00			1	. . SLIDE,GUIDE:SWITCH ACTUATOR	80009	351-0180-00
-125	129-0323-00	B010100	B020199	1	. . POST,ELEC-MECH:HEX,0.25 X 1 INCH LONG	80009	129-0323-00
	129-0570-00	B020200		1	. . POST,ELEC-MECH:HEX,0.25 X 0.976 INCH LONG	80009	129-0570-00
					(ATTACHING PARTS)		
-126	211-0116-00			1	. . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
-127	384-1275-00			1	. EXTENSION SHAFT:10.95 INCHES LONG	80009	384-1275-00
-128	214-1190-02			1	. . EXTENDER-RETRAC:KNOB	80009	214-1190-02
-129	----- -----			1	. RES.,VARIABLE:(SEE R755 EPL)		
					(ATTACHING PARTS)		
-130	210-0583-00			1	. NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20319-402
-131	210-0940-00			1	. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-132	210-0046-00			1	. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
					- - - * - - -		
-133	407-0803-00			1	. BRKT,COMPONENT:	80009	407-0803-00
-134	200-1255-00			2	. COVER,CAM SW:25 CAMS PLASTIC	80009	200-1255-00
-135	210-0406-00			4	. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-136	200-1256-00			2	. COVER,CAM SW:28 CAMS, PLASTIC	80009	200-1256-00
-137	210-0406-00			4	. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-138	376-0129-01			1	. COUPLER ASSY:CAM SWITCH	80009	376-0129-01
	263-1084-00			1	. ACTUATOR ASSY:	80009	263-1085-00
-139	384-0806-00			1	. . SHAFT,CAM SW:	80009	384-0806-00
-140	131-0963-00			1	. . CONTACT,ELEC:GROUNDING	80009	131-0963-00
-141	214-1139-02			1	. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1	. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-142	214-1127-00			2	. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-143	210-0406-00			3	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-144	401-0081-02			1	. . BEARING,CAM SW:FRONT	80009	401-0081-02
					(ATTACHING PARTS)		
-145	354-0391-00			1	. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
					- - - * - - -		
-146	105-0601-00			1	. . DRUM,CAM SW:	80009	105-0601-00
	210-0406-00			4	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-147	401-0083-00			1	. . BEARING,CAM SW:CENTER	80009	401-0083-00
-148	105-0600-00			1	. . DRUM,CAM SW:	80009	105-0600-00
-149	214-1139-02			1	. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1	. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-150	214-1127-00			2	. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-151	210-0406-00			4	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-152	401-0081-02			1	. . BEARING,CAM SW:FRONT	80009	401-0081-02
					(ATTACHING PARTS)		
-153	354-0391-00			1	. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
					- - - * - - -		
-154	220-0547-01			3	NUT,BLOCK:0.38 X 0.25 X 0.282"OA	80009	220-0547-01
					(ATTACHING PARTS)		
-155	211-0105-00			3	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
-156	214-1061-00			1	SPRING,GROUND:FLAT	80009	214-1061-00
-157	426-0505-11			1	FR SECT,PLUG-IN:TOP	80009	426-0505-11
-158	214-1054-00			1	SPRING,DETENT:LATCH	80009	214-1054-00
-159	105-0175-00			1	LOCK,FLUSH:SW ACT,B WAY KEY PULL	81741	OBD
	220-0547-01			3	NUT,BLOCK:0.38 X 0.25 X 0.282"OA	80009	220-0547-01
					(ATTACHING PARTS)		
-160	211-0105-00			3	SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
-161	426-0499-11			1	FR SECT,PLUG IN:BOTTOM	80009	426-0499-11
-162	175-0825-00			FT	WIRE,ELECTRICAL:2 WIRE RIBBON	23499	TEK-175-0825-00 .
-163	175-0826-00			FT	WIRE,ELECTRICAL:3 WIRE RIBBON	08261	TEK-175-0826-00 .
-164	175-0827-00			FT	WIRE,ELECTRICAL:4 WIRE RIBBON	08261	TEK-175-0827-00 .
-165	175-0828-00			FT	WIRE,ELECTRICAL:5 WIRE RIBBON	23499	TEK-175-0828-00 .
-166	175-0829-00			FT	WIRE,ELECTRICAL:6 WIRE RIBBON	83501	TEK-175-0829-00 .

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-167	210-0774-00			18	EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS	80009	210-0774-00
-168	210-0775-00			18	EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS	80009	210-0775-00
-169	131-0707-00			93	CONTACT,ELEC:0.48"L,22-26 AWG WIRE	22526	47439
-170	352-0171-02			1	HOLDER,TERM.CON:1 WIRE RED	80009	352-0171-02
	352-0171-05			1	HOLDER,TERM.CON:1 WIRE GREEN	80009	352-0171-05
-171	352-0169-00			1	HOLDER,TERM.CON:2 WIRE BLACK	80009	352-0169-00
	352-0169-02			1	HOLDER,TERM.CON:2 WIRE RED	80009	352-0169-00
	352-0169-04			1	HOLDER,TERM.CON:2 WIRE YELLOW	80009	352-0169-04
	352-0169-06			1	HOLDER,TERM.CON:2 WIRE BLUE	80009	352-0169-06
	352-0169-07			2	HOLDER,TERM.CON:2 WIRE PURPLE	80009	352-0169-07
-172	352-0161-07			1	HOLDER,TERM.CON:2 WIRE PURPLE	80009	352-0161-07
-173	352-0162-01			2	HOLDER,TERM.CON:4 WIRE BROWN	80009	352-0162-01
	352-0162-02			2	HOLDER,TERM.CON:4 WIRE RED	80009	352-0162-02
-174	352-0163-01			2	HOLDER,TERM.CON:5 WIRE BROWN	80009	352-0163-01
	352-0163-02			2	HOLDER,TERM.CON:5 WIRE RED	80009	352-0163-02
	352-0163-03			1	HOLDER,TERM.CON:5 WIRE ORANGE	80009	352-0163-03
	352-0163-04			1	HOLDER,TERM.CON:5 WIRE YELLOW	80009	352-0163-04
-175	352-0164-01			1	HOLDER,TERM.CON:6 WIRE BROWN	80009	352-0164-01
	352-0164-03			2	HOLDER,TERM.CON:6 WIRE ORANGE	80009	352-0164-03
	352-0164-05			1	HOLDER,TERM.CON:6 WIRE GREEN	80009	352-0164-05
	352-0164-08			1	HOLDER,TERM.CON:6 WIRE GRAY	80009	352-0164-08
-176	276-0614-00			5	CORE,FERRITE:0.125 ID X 0.375" OD CERAMAG	78488	#57-1656
	276-0635-00			1	CORE,FERRITE:0.281 ID X 0.50" OD,FERROXCUBE	78488	#J41405-TC
-177	131-0993-00			1	LINK,TERM.CONNE:JUMPER	00779	530153-2
					ACCESSORIES		
	070-1752-00			1	MANUAL,TECH:OPERATORS(NOT SHOWN)	80009	070-1752-00
	070-1751-00			1	MANUAL,TECH:INSTRUCTION(NOT SHOWN)	80009	070-1751-00
					REPACKAGING		
	065-0125-00			1	CARTON ASSEMBLY	80009	065-0125-00

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Sections of the manual are often printed at different times, so some of the information on the change pages may already be in your manual. Since the change information sheets are carried in the manual until ALL changes are permanently entered, some duplication may occur. If no such change pages appear in this section, your manual is correct as printed.

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MANUAL CHANGE INFORMATION

PRODUCT 7B92A
EFF SN B010100-up

CHANGE REFERENCE M23,374
DATE 2-5-75

CHANGE:	DESCRIPTION

070-1751-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGE

CHANGE TO:

R826	315-0393-00	RES.,FXD,COMP:39K OHM,5%,0.25W

(R826 is located on diagram 7, HORIZONTAL LOGIC)

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MANUAL CHANGE INFORMATION

PRODUCT 7B92A
EFF SN B030000-up

CHANGE REFERENCE M23,334
DATE 6-10-75

CHANGE:	DESCRIPTION

070-1751-00

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

A6	670-3274-01	CKT BD ASSY:MAIN INTERFACE
A9	670-3278-01	CKT BD ASSY:DELAYED TRIGGER
R496	321-0342-00	RES.,FXD,FILM:35.7K OHM,1%,0.125W
R756	321-0442-00	RES.,FXD,FILM:392K OHM,1%,0.125W
R871	315-0272-00	RES.,FXD,COMP:2.7K OHM,5%,0.25W
R929	321-0256-00	RES.,FXD,FILM:4.53K OHM,1%,0.125W
R951	321-0954-03	RES.,FXD,FILM:162.5 OHM,0.25%,0.125W

REMOVE:

C387	281-0550-00	CAP.,FXD,CER DI:120PF,10%,500V
Q387	151-0190-00	TRANSISTOR:SILICON,NPN 2N3904
R378	317-0102-00	RES.,FXD,COMP:1K OHM,5%,0.125W

ADD:

C56	283-0156-00	CAP.,FXD,CER DI:0.001UF,100%,200V
L382	108-0474-00	COIL,RF:2UH
L462	276-0507-00	SHIELDING BEAD:0.6UH
L493	276-0507-00	SHIELDING BEAD:0.6UH

DIAGRAM ◇2◇ MAIN TRIGGER

C56 is added from the collector to the emitter of Q56.

DIAGRAM ◇3◇ DELAYED TRIGGER

L382 is added from the collector of Q382 to the anode of CR372.

DIAGRAM ◇4◇ DELAYING SWEEP

L462 is added to the emitter of Q462.

L493 is added to the leg of C493 at the junction of C493 and the collector of Q493.