TEKTRONIX®

314 STORAGE OSCILLOSCOPE

SERVICE

INSTRUCTION MANUAL

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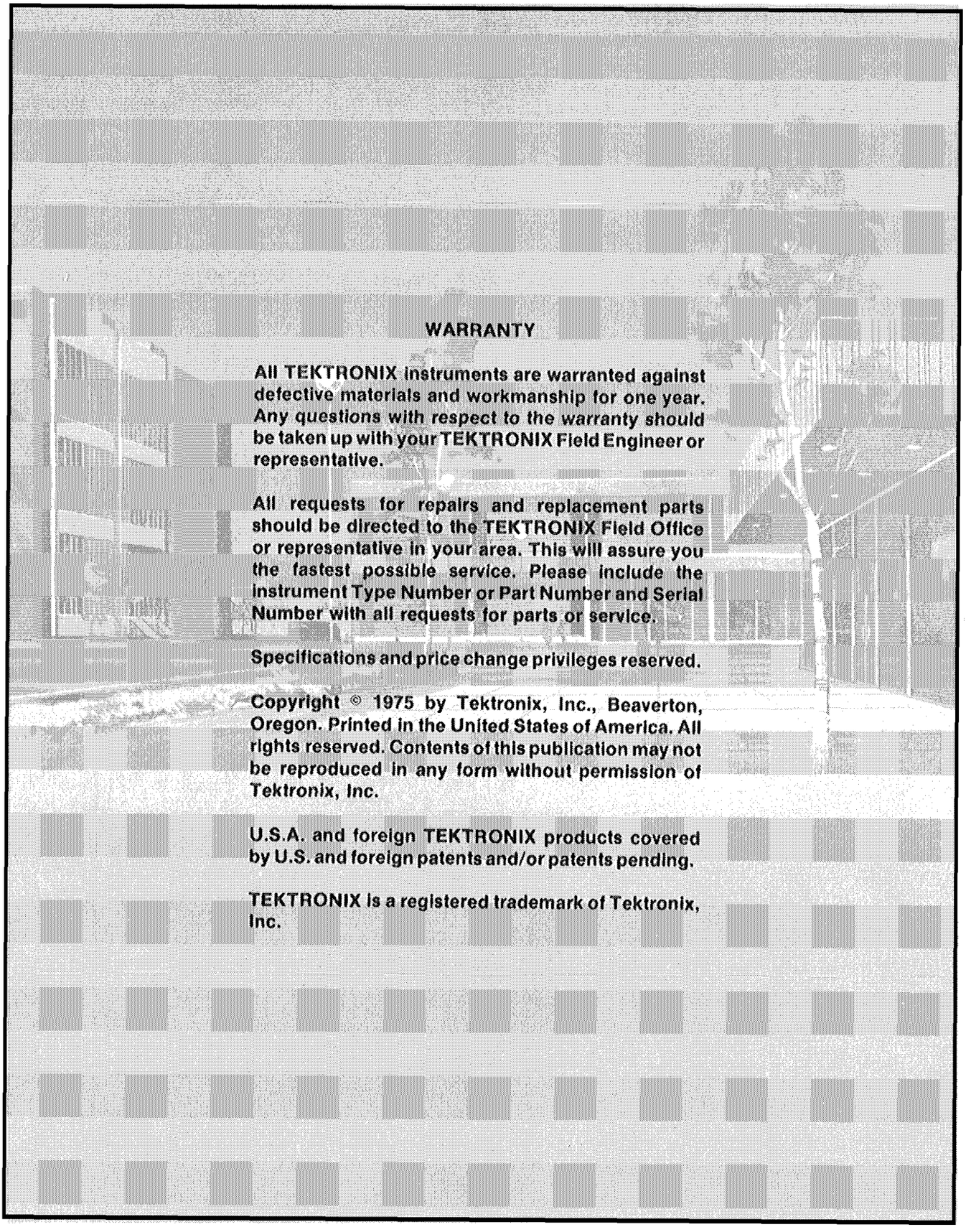

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All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

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.

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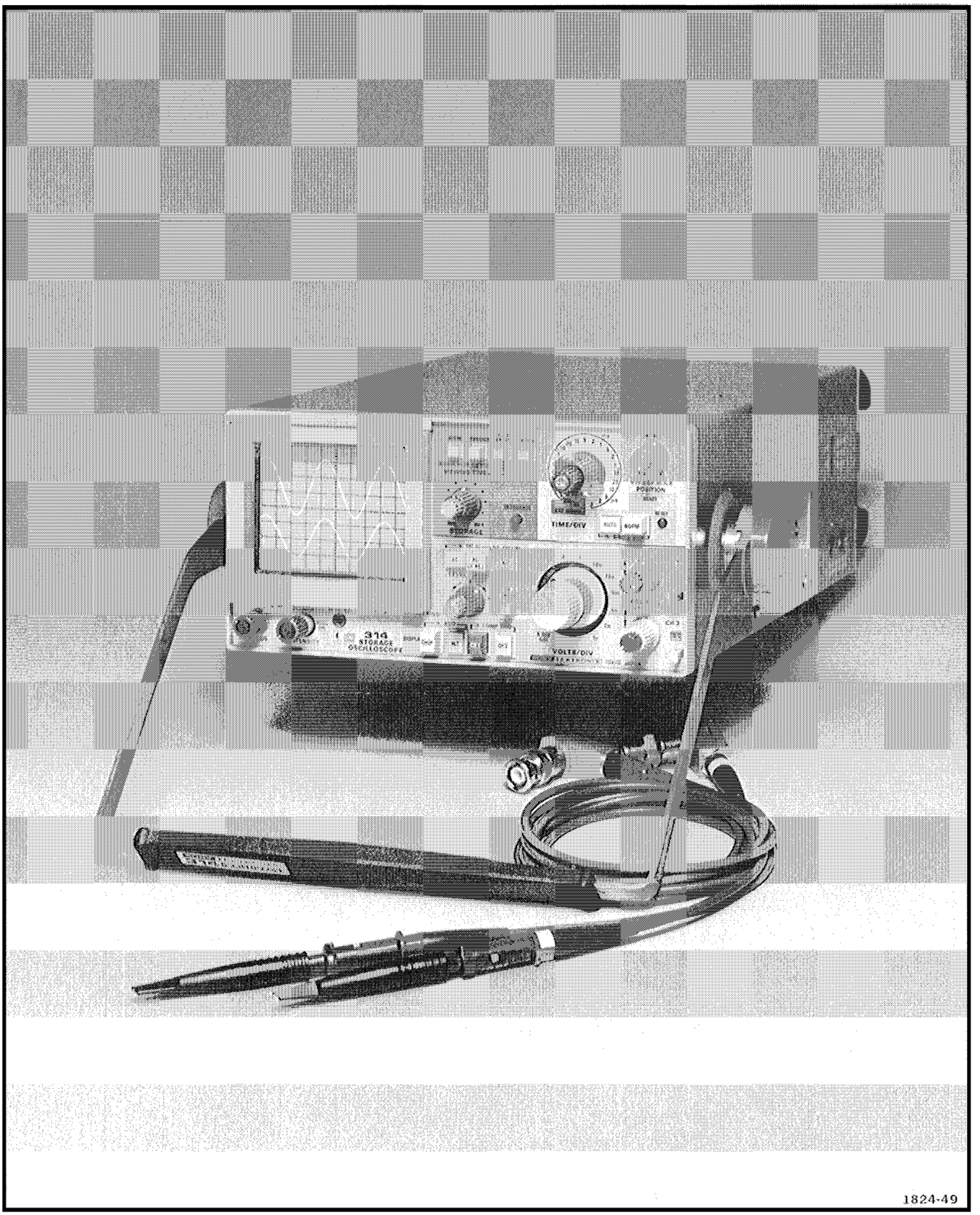

Fig. 1-1. Sony-Tektronix 314 Storage Oscilloscope.

SPECIFICATION

The Sony-Tektronix 314 is a dual-channel, 10 megahertz, portable storage oscilloscope. The instrument is constructed to withstand a wide range of environmental conditions.

Dc to 10 megahertz vertical bandwidth provides calibrated deflection factors from 1 millivolt to 10 volts/division.

The horizontal system provides calibrated sweep rates from 5 seconds to 1 microsecond/division and a X10 sweep magnifier to increase the fastest sweep rate to 0.1 microsecond/division. Three sweep modes are available: AUTO, NORM, and SINGLE SWP. The trigger circuit provides a stable display over the full bandwidth.

External horizontal input provides deflection factors of 20 millivolts to 2 volts/division for external sweep signal.

The crt is a direct-view, bistable storage device having an 8 x 10 division internal graticule. Each graticule division equals 0.25-inch. An enhance mode increases single-sweep writing rate.

The internal 1 kilohertz calibrator is connected internally to the vertical inputs and to a front-panel connector.

The 314 operates from a line voltage of 100, 115, 120, 200, 230, or 240 volts ac, or from a +12- or +24-volt dc source. The following tables contain a detailed listing of the 314 characteristics.

TABLE 1-1

Electrical Characteristics

Characteristic	Performance Requirement		Supplemental Information
VERTICAL			
Deflection Factor			
Calibrated Range	1 mV to 10 V/Div		13 steps in a 1-2-5 sequence
Accuracy	Within 3% over the calibrated range		
Uncalibrated Range (VOLTS/DIV VARIABLE)	Continuously variable between calibrated deflection factor settings. Extends highest deflection factor to at least 25 V/Div.		
Frequency Response			
Bandwidth	Without Probe	With P6149 Probe	
Direct Coupled, 4-div reference	At least 10 MHz	At least 10 MHz	1 mV to 10 V/Div with VARIABLE at CAL
Capacitively Coupled, 4-div reference	10 Hz or less to at least 10 MHz	1 Hz or less to at least 10 MHz	1 mV to 10 V/Div with VARIABLE at CAL
Step Response			
Risetime, 4-division Step Input	36 ns or less		1 mV to 10 V/Div

TABLE 1-1 (cont)

Characteristic	Performance Requirement		Supplemental Information
Maximum Input Voltage	Without Probe	With P6149 Probe	
Direct Coupled (DC)	300 V, dc plus peak ac	500 V, dc plus peak ac	
Capacitively Coupled (AC)	300 V dc		
Input R and C			
Resistance	1 MΩ, within 2%	10 MΩ, within 2%	
Capacitance	47 pF, within 4 pF	13.5 pF or less	
Signal Delay	Permits viewing leading edge of waveform that initiates trigger		
Chopped Repetition Rate	Approximately 100 kHz		
HORIZONTAL SYSTEM			
Sweep Time/Div			
Calibrated Range	5 s to 1 μs/Div. X10 magnifier extends sweep time/div to 0.1 μs		21 steps in a 1-2-5 sequence
Accuracy			
Unmagnified			
5 s to 0.5 s/Div	Within 4% over center 8 graticule divisions. Within 5% over any 2 division interval within center 8 divisions.		
0.2 s to 1 μs/Div	Within 3% over center 8 graticule divisions. Within 4% over any 2 division interval within center 8 divisions.		
Magnified			
0.5 s to 50 ms/Div	Within 5% over center 8 graticule divisions. Within 6% over any 2 division interval within center 8 divisions.		
20 ms to 0.5 μs/Div	Within 4% over center 8 graticule divisions. Within 5% over any 2 division interval within center 8 divisions.		
0.2 μs and 0.1 μs/Div	Within 5% over center 8 graticule divisions. Within 6% over any 2 division interval within center 8 divisions, excluding first and last 2 divisions of magnified sweep.		
TIME/DIV Variable	At least 2.5:1		

TABLE 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
TRIGGERING SYSTEM		
Trigger Sensitivity		
Internal		INT button pressed in
AC	0.3 divisions from ≈50 Hz to 1 MHz, increasing to 1.0 division at 10 MHz	AC button pressed in
AC LF REJ	0.3 divisions from ≈50 kHz to 1 MHz, increasing to 1.0 division at 10 MHz	AC LF REJ button pressed in
External		INT button out and ATTEN-LINE on side panel in 1X or 10X position
DC	150 mV from dc to ≈1 MHz, increasing to 500 mV at ≈10 MHz	AC and AC LF REJ buttons both pressed in
AC	150 mV from ≈50 Hz to ≈1 MHz, increasing to 500 mV at ≈10 MHz	AC button pressed in
AC LF REJ	150 mV from ≈50 kHz to ≈1 MHz, increasing to 500 mV at ≈10 MHz	AC LF REJ button pressed in
LINE	≈150 mV, peak-to-peak, line voltage signal	INT button out and ATTEN-LINE switch on side panel in LINE position
External Trigger		
Level Range		
X1 Attenuator	−0.8 to +0.8 V	
X10 Attenuator	−8 to +8 V	
Maximum Input Voltage	300 V dc plus peak ac	
Input Resistance	1 mΩ, within 2%	
Input Capacitance	62 pF, within 4 pF	
CALIBRATOR		
Output Voltage		
From +20°C (+68°F) to +30°C (+86°F)	0.5 V, peak-to-peak within 1%	
Repetition Rate	1 kHz, within 250 Hz	

TABLE 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
EXTERNAL HORIZONTAL INPUT		
Deflection Factor		
Horiz Gain X10, Atten 1X	≈20 mV/Div	
Horiz Gain X1, Atten 1X	≈200 mV/Div	
Horiz Gain X10, Atten 10X	≈200 mV/Div	
Horiz Gain X1, Atten 10X	≈2 V/Div	
Input Resistance		≈1 MΩ
Input Capacitance		≈62 pF
Bandwidth	DC to at least 200 kHz	
Variable Range	At least 10:1	
EXTERNAL BLANKING		
Sensitivity	+5 V to +20 V (direct coupled)	
Usable Freqency Range	100 kHz or greater	
Maximum Input Voltage		50 V dc plus peak ac
CRT DISPLAY SYSTEM		
CRT		
Graticule Area	8 x 10 divisions (1/4-inch/div)	
Graticule Type	Internal, non-illuminated	
Phosphor	P44	
STORAGE SYSTEM		
Storage Time	≈4 hours, maximum recommended	
Erase Time	≈300 ms	
Stored Writing Speed at 0.2 mA Cathode Current		
Normal	At least 80 div/ms (50 cm/ms)	
Enhanced	At least 400 div/ms (250 cm/ms)	
Auto Erase		
Viewing Time	≤1 sec to ≥5 sec	

TABLE 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
POWER SOURCES		
Line Voltage		
Regulating Ranges		
115 V		
Low (LO)	100 V, ±10%	
Medium (M)	115 V, ±10%	
High (HI)	120 V, ±10%	
230 V		
Low (LO)	200 V, ±10%	
Medium (M)	230 V, ±10%	
High (HI)	240 V, ±10%	
Line Frequency	48 to 440 Hz	
Maximum Power Consumption	29 W at 115 V, 60 Hz (M position)	
External DC Voltage		
Range		
+12 V	+11 to +14 V	
+24 V	+22 to +28 V	
Maximum Input Current		
+12 V	1.6 A	Full Intensity in stored mode
+24 V	0.8 A	

Environmental Characteristics

Characteristic	Performance Requirement	Supplemental Information
Temperature		
Operating	−15°C to +55°C (+5°F to +131°F)	
Non-operating		−40°C to +75°C (−40°F to +167°F)
Altitude		
Operating	To 20,000 feet. Maximum allowable ambient temperature decreased by 1°C/1,000 feet from 5,000 feet to 20,000 feet	
Non-operating		To 50,000 feet

TABLE 1-1 (cont)

Characteristic	Performance Requirement	Supplemental Information
Humidity Non-operating		5 cycles (120 hours) of MIL-I-6181D. Omit freezing and vibration. Post test after drying period at +25° C, ±5° C at 20% to 80% relative humidity
Vibration Operating		15 minutes along each of the 3 major axes at a total displacement of 0.025-inches, peak-to-peak (4 g's at 55 cycles/sec) with frequency varied from 10 to 55 to 10 cycles/sec in 1-minute cycles. Hold for 3 minutes at 55 cycles/sec. All major resonances must be above 55 cycles/sec
Shock Operating and Non-operating		30 g's, 1/2 sine, 11 ms duration, 2 guillotine-type shocks per axis for a total of 12 shocks
Electromagnetic Interference as Tested in MIL-I-6181D Radiated Interference (from the Instrument under Test)		150 kHz to 1000 MHz
Transportation Package Vibration		1 hour slightly in excess of 1 g
Package Drop		30 inches on any corner, edge or flat surface

Physical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Warmup Time		At least 5 minutes
Weight Net, without accessories		10 pounds (4.7 kilograms)
Shipping, Domestic		19.4 pounds (8.8 kilograms)
Dimensions		See Fig. 1-2.

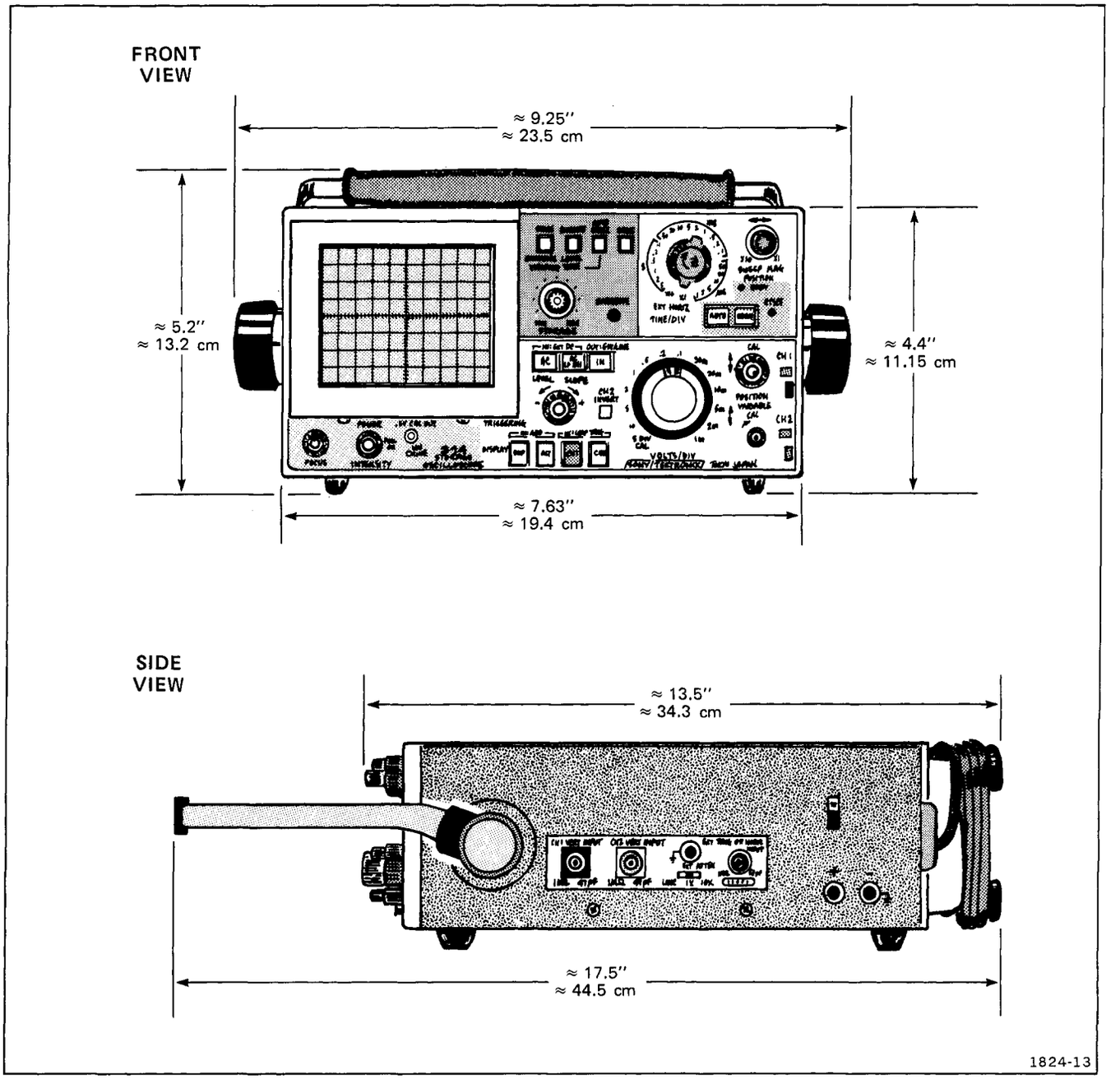

Fig. 1-2. 314 dimensions.

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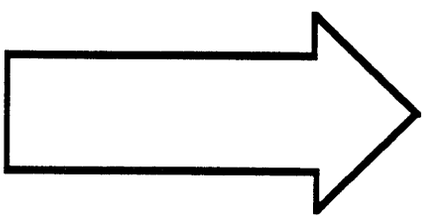


OPERATING INFORMATION

NOTICE

The 314 automatically reduces the display intensity level when sweep speeds of 10 ms and slower are selected. This reduces the possibility of accidentally burning the sensitive storage crt phosphor at slower sweep speeds.

When changing from sweep speed settings faster than 10 ms to 10 ms and slower, readjust the INTENSITY control setting as necessary for a visible display.

PRELIMINARY INFORMATION

To effectively operate this instrument, the user should become familiar with its operation and capabilities. This section describes briefly the front, side, and rear-panel controls and connectors.

Safety Information

This manual contains warning information that the user must follow to ensure safe operation of the instrument. Warning information is provided to protect the user. Caution information is provided to protect the instrument and connected test equipment.

WARNING

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

This instrument has a three-wire power cord with a three-terminal polarized plug for connection to the power source and safety earth. The safety-earth terminal of the plug is directly connected to the instrument frame. For electric-shock protection, insert this plug only into a mating outlet with a safety-earth contact. If an outlet with a safety-earth contact is not available, connect the instrument frame to a safety earth system. The color coding of the cord conductors is in accordance with recognized standards given in Table 2-1.

TABLE 2-1

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

Operating Voltage

The 314 has a voltage selector switch (on rear panel) that permits selection of either a 115- or 230-volt nominal line voltage source. To change the voltage selector switch position, disconnect the power cord and use a small screwdriver to set the selector to the desired range.

CONTROLS AND CONNECTORS

Figures 2-1, 2-2 and 2-3 show front, side, and rear panel controls and connectors. A brief description of each control and connector is given. For detailed operating information, refer to the 314 Operators Manual.

Front Panel (Fig. 2-1)

Display

1. FOCUS, INTENSITY—These are adjusted for a sharp, bright display. Pull INTENSITY to turn instrument power on.

2. .5 V CAL OUT—A source of 0.5-volt square-wave calibration signal.

3. LOW LINE—This indicator flashes when the power supply goes out of regulation due to low power-line voltage or low dc supply voltage. The Indicator is on steady for normal supply voltages (pilot light).

Trigger Source

4. AC—With this button pushed in, dc signal components are rejected and trigger signals below about 30 hertz are attenuated.

5. AC LF REJ—With this button pushed in, dc signal components are rejected and trigger signals below about 50 kilohertz are attenuated.

NOTE

When both the AC and AC LF REJ buttons are pushed in (EXT DC), all trigger signals from dc to 10 megahertz are accepted if their amplitude is within the ranges specified in Table 1-1.

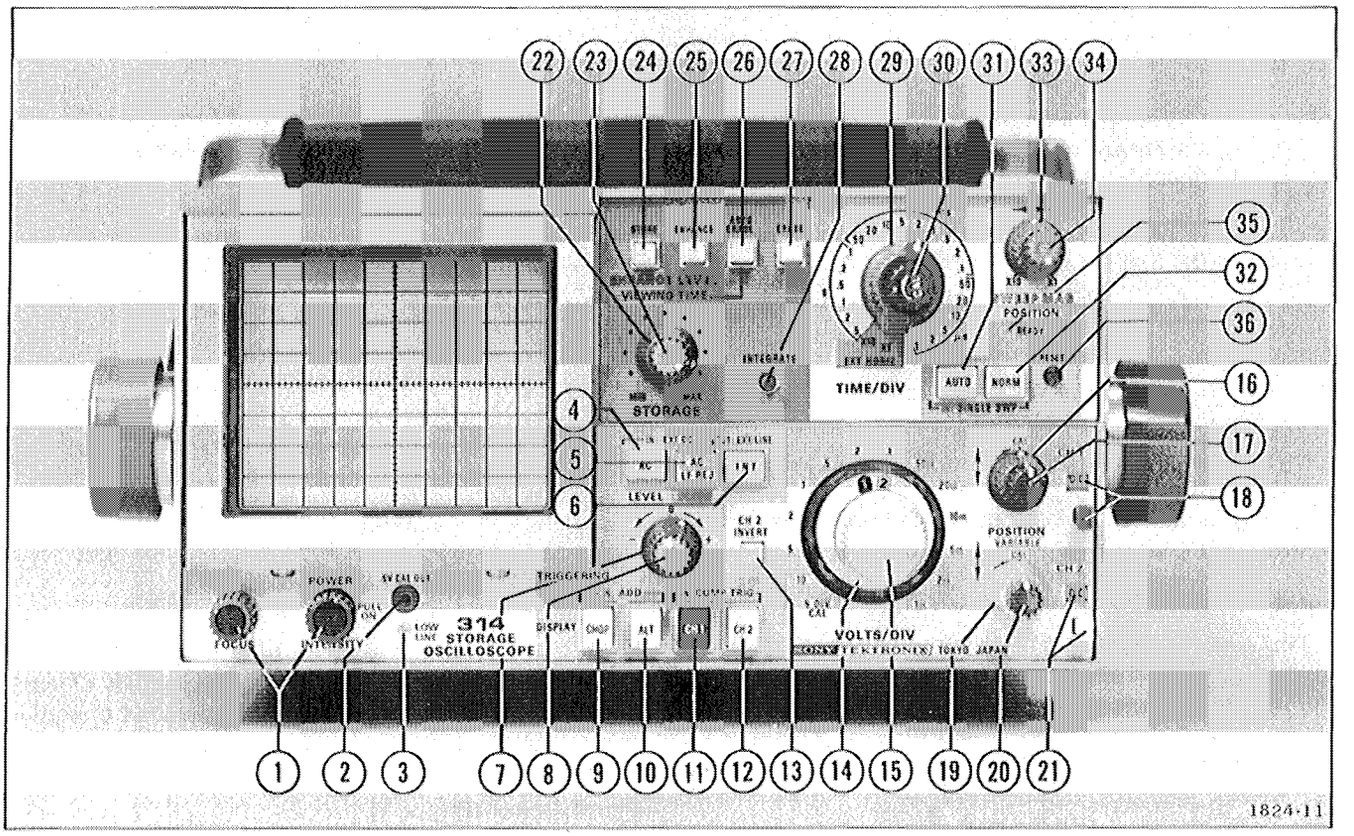


Fig. 2-1. Locations of controls and connectors—front panel.

6. INT—With this button pushed in, the trigger signal is obtained from the vertical deflection system (CH 1 or CH 2, or both). When the button is out, the trigger signal is obtained from the EXT TRIG OR HORIZ INPUT connector if the ATTEN-LINE is in the ATTEN X1-X10 position.

7. LEVEL—This control selects the signal amplitude on which the sweep is triggered.

8. SLOPE—This control selects the slope of the signal on which the triggering occurs: positive-going (+) or negative-going (−).

Vertical Modes

9. CHOP—In Chop Mode, signals from both channels are displayed simultaneously, dual trace. The display is switched between channels at a 100 kilohertz rate.

10. ALT—In Alternate Mode, signals from both vertical channels are displayed alternately, dual trace. The display is switched after each sweep.

NOTE

When both CHOP and ALT buttons are pushed in, the display is the algebraic sum of the vertical channel signals.

11. CH 1—This button selects channel 1 vertical input for display. Channel 1 is the triggering signal.

12. CH 2—This button selects channel 2 vertical input for display. Channel 2 is the triggering signal.

NOTE

With CH 1 and CH 2 buttons pushed in, channel 1 is displayed. Generates an internal composite trigger signal from both channels.

13. CH 2 INVERT—Pushing this button in inverts channel 2 input signal (inverts display).

14. CH 1 VOLTS/DIV—This control selects calibrated deflection factors from 1 mV/DIV to 10 V/DIV in a 1-2-5 sequence.

15. CH 2 VOLTS/DIV—This control selects calibrated deflection factors from 1 mV/DIV to 10 V/DIV in a 1-2-5 sequence.

16. CH 1 POSITION—This control vertically positions the channel 1 display.

17. VARIABLE—When this control is out of the CAL position, it provides uncalibrated deflection factors between calibrated steps. It extends the uncalibrated range to 25 V/DIV.

18. Input Coupling Indicator and switch, channel 1.

AC—out position. Blocks dc component of input signal.

GND—middle position. The channel vertical amplifier input is grounded.

DC—in position. All components of the input signal are presented to the vertical amplifier input.

19. CH 2 POSITION—This control vertically positions the channel 2 display.

20. VARIABLE—When this control is out of the CAL position, it provides uncalibrated deflection factors between calibrated steps. It extends the uncalibrated range to 25 V/DIV.

21. Input Coupling Indicator and switch, channel 2.

AC—out position. Blocks dc component of input signal.

GND—middle position. The channel vertical amplifier input is grounded.

DC—in position. All components of the input signal are presented to the vertical amplifier input.

Storage

22. VIEWING TIME—This control adjusts the viewing time from about 1 second after the end of sweep to about 5 seconds after the end of sweep.

23. ENHANCE LEVEL—This control adjusts the single-sweep stored writing speed.

24. STORE—With this button pushed in, the instrument is in storage mode. When the button is out, the instrument is in non-storage mode.

25. ENHANCE—Pushing this button in increases the single-sweep writing speed.

26. AUTO ERASE—With this button pushed in, an erase occurs after each sweep, when both AUTO and NORM buttons are pushed in.

27. ERASE—Pressing this momentary contact switch erases the stored display.

28. INTEGRATE—This is a momentary contact button. On repetitive signal, parts of which are too fast to store normally, hold the button in to permit a charge to build up on the target before the signal is stored.

Horizontal

29. TIME/DIV—This switch selects calibrated sweep rates from 5 seconds to 1 microsecond/division, in a 1-2-5 sequence.

30. Variable—When this control is out of CAL position, it varies the Time/Div between calibrated steps. The range is at least 2.5X. The Uncalibrated sweep rate is extended to at least 12.5 seconds/div.

31. AUTO—With this button pushed in, the sweep free runs in the absence of a trigger signal.

32. NORM—With this button pushed in, the sweep generator requires a trigger signal to generate a sweep.

NOTE

With AUTO and NORM buttons both in, the sweep runs one time on the first triggering event after pressing RESET button.

33. POSITION—This control positions the display horizontally.

34. SWEEP MAG—When set to X1 the sweep is unmagnified. In the X10 position, the horizontal gain

increases by a factor of 10 (sweep expands from graticule center). X10 magnification extends the fastest displayed sweep rate to 0.1 microsecond/division.

35. READY—This lamp is on when the single sweep has been reset and is waiting for a trigger signal to start the sweep generator.

36. RESET—When pressed, the single sweep function is armed and the READY lamp lights.

Side Panel (Fig. 2-2)

Inputs and Attenuator

1. CH 1 VERT INPUT—This is the signal input connector for Channel 1.

2. CH 2 VERT INPUT—This is the signal input connector for Channel 2.

3. Chassis Ground—This provides a common signal ground return for the signal source. Operating the 314 ungrounded on +12 V or +24 V dc isolates the instrument from ground loop currents and conducted RFI. However, this ungrounded operation permits the instrument case to rise to the signal-source potential.

4. External Attenuator-Line Selector—In the X10 position, an external trigger connected to EXT TRIG OR HORIZ INPUT is attenuated by a factor of 10. In the X1 position, the external trigger is not attenuated. In the LINE position, a sample of the ac power line is used as the trigger signal.

5. EXT TRIG OR HORIZ INPUT—This input is used for either the external trigger signal or for the external horizontal signal for X-Y measurements.

6. Power Source Selector—This switch selects 115 V ac, +12 V dc or +24 V dc as the power input source.

7. External DC Supply—These are the input terminals for a +12 V dc or +24 V dc source.

Rear Panel (Fig. 2-3)

Power Supplies and External Blanking

1. Power Line Voltage Selector—This switch selects 115 V ac or 230 V ac power-line voltage.

2. Power Source Regulating Range Selector—This switch selects the regulating range of the selected power source.

3. EXT BLANK—This is the input connector for an external crt blanking signal.

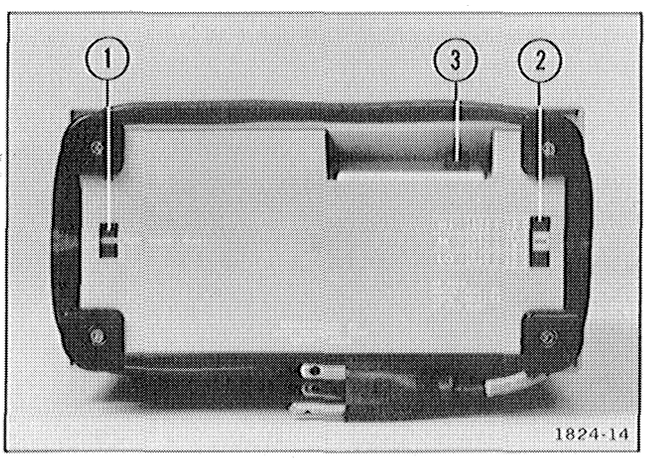


Fig. 2-3. Locations of controls and connectors—rear panel.

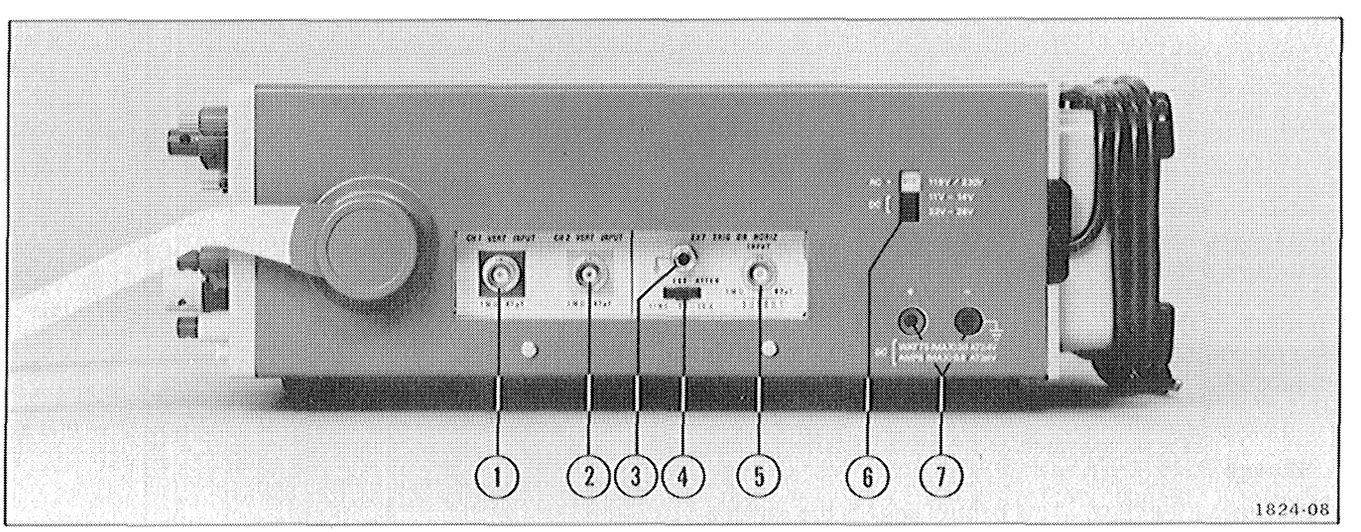


Fig. 2-2. Locations of controls and connectors—side panel.

THEORY OF OPERATION

This section of the manual contains a description of the circuitry used in the 314 Oscilloscope. The description begins with a discussion of the instrument using the basic block diagram shown in Fig. 3-1. Then, each circuit is described in detail, using a detailed block diagram to show the interconnections between the stages in each major circuit and the relationship of the front-panel controls to the individual stages.

A complete block diagram is located in the Diagrams section at the rear of this manual. This block diagram shows the overall relationship of the circuits. A complete schematic of each circuit is also given in the Diagrams section. Refer to these diagrams throughout the following circuit description for electrical values and relationships.

BLOCK DIAGRAM

Description

The following discussion is provided to aid in understanding the overall concept of the 314 before the individual circuits are discussed in detail. A basic block diagram of the 314 is shown in Fig. 3-1. Only the basic interconnections between the individual blocks are shown on this diagram. Each block represents a major circuit within the instrument. The number on each block corresponds to the numbers on the complete circuit diagram, which is located at the rear of this manual.

Vertical Amplifier

Signals to be displayed on the crt are applied to the CH 1 or CH 2 input connectors. The input signals are then amplified by the Channel 1 preamp or the Channel 2 preamp circuit. Each vertical preamp circuit includes separate vertical deflection factor, position, input coupling, gain, variable attenuation, and balance controls. A sample of each channel signal is supplied to the Trigger Pickoff circuit. The Channel 2 Preamp circuit contains an invert feature to invert the channel 2 signal displayed on the crt. The outputs of both Vertical Preamp circuits are connected to the Channel Switching circuit. This switching circuit selects the channel(s) to be displayed. An output signal from this circuit is connected to the Unblanking Amplifier circuit to blank the switching transients when in the chopped mode of operation. A sample of the signal present in the Channel Switching circuit is supplied to the Trigger Pickoff circuit.

The output of the Channel Switching circuit is connected to the Vertical Output amplifier through the delay line. The Vertical Output Amplifier circuit provides the final amplification for the signal before it is connected to the vertical deflection plates of the crt.

Triggering

The Trigger pickoff and Trigger Preamplifier circuits select a trigger signal (determined by the TRIGGERING Source switch) and produces an output signal that initiates the sweep signal produced by the Sweep Generator circuit. The internal trigger signal is selected from each channel circuit or the Channel Switching circuit. A sample of the line voltage applied to the instrument or an external signal applied to the EXT TRIG OR HORIZ input connector can also be used to generate a sweep-starting signal. The Trigger circuit contains level, slope, coupling, and source controls.

Sweep Generator

The Sweep Generator circuit produces a linear sawtooth output signal when inititated by the Sweep Trigger circuit. The slope of the sawtooth produced by the Sweep Generator circuit is controlled by the TIME/DIV switch.

The operating mode of the Sweep Generator circuit is controlled by the Sweep Mode switch. In the Auto mode of operation, the absence of an adequate trigger signal causes the sweep to free run. In the NORM mode, a horizontal sweep is presented only when triggered by an adequate trigger signal. The Single Sweep mode of operation allows one (and only one) sweep to be initiated after the circuit is reset with the RESET button.

The Sweep Generator circuit also produces an unblanking gate signal to unblank the crt. This gate is coincident with the sawtooth produced by the Sweep Generator circuit. Additionally, the Sweep Generator circuit produces an alternate trace sync pulse that is connected to the Channel Switching circuit. This pulse switches the display between channels at the end of each sweep when in the Alt mode of operation.

The output of the Sweep Generator circuit is amplified by the Horizontal Amplifier circuit to produce horizontal deflection for the crt in all positions of the TIME/DIV switch except EXT HORIZ.

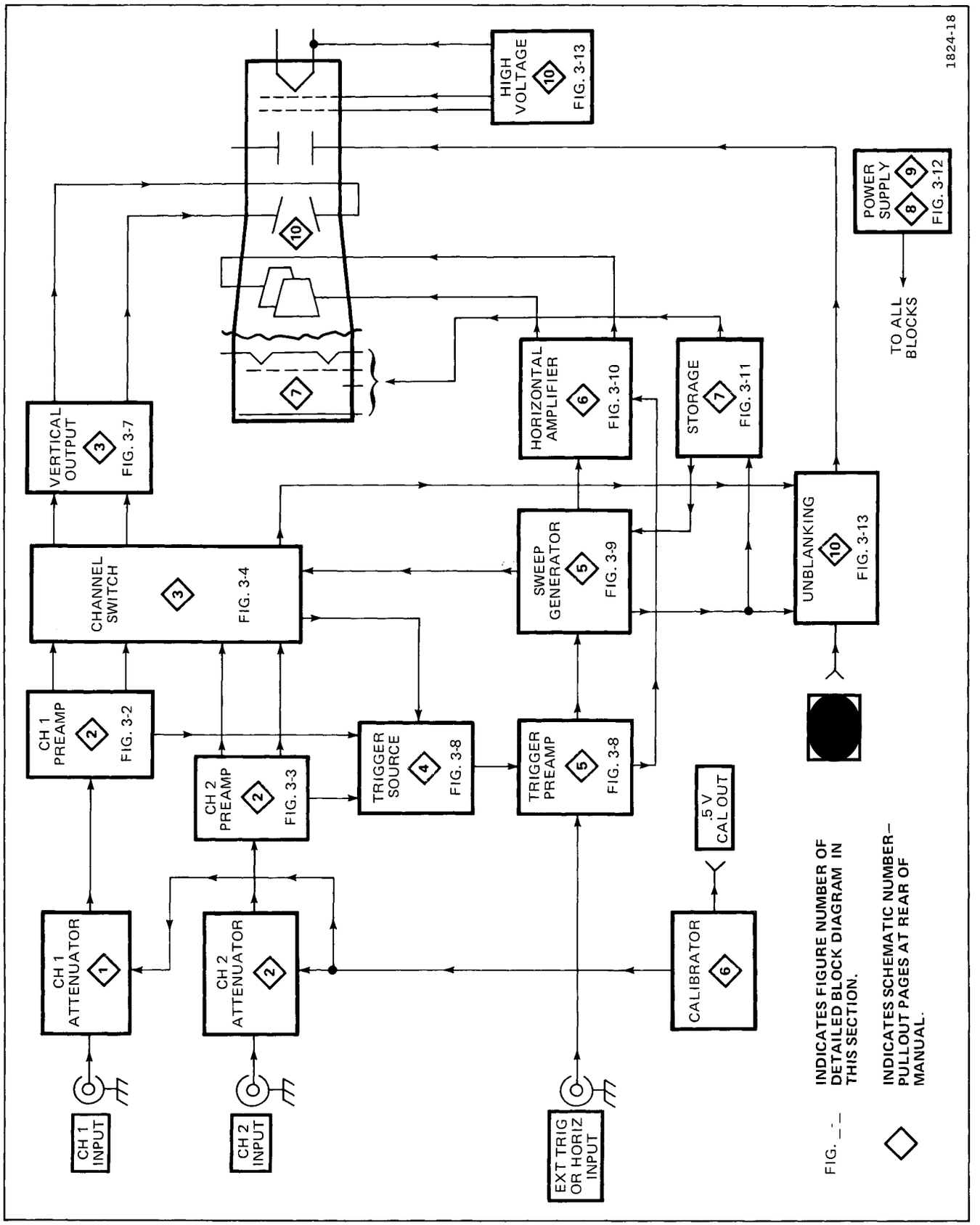


Fig. 3-1. Basic Block Diagram.

Other horizontal deflection signals can be connected to the horizontal amplifier by using the Ext Horizontal mode of operation. For the Ext Horizontal mode, the trigger preamplifier is used as a high-impedance-input amplifier, and when so used, the sweep generator is disabled.

CRT and Power Supply

The crt circuit contains the controls necessary for operation of the cathode-ray tube. Trace storage is accomplished by the Storage circuit. The Power Supply and crt circuits provide all the voltages necessary for operation of the instrument.

Calibrator

The Calibrator circuit provides a square-wave output with accurate amplitude, which can be used to check calibration of the vertical portion of the instrument and for probe compensation.

CIRCUIT OPERATION

This section provides a description of the electrical operation and relationship of the circuits in the 314. The theory of operation for circuits unique to this instrument is described in detail in this discussion. Circuits that are commonly used in the electronics industry are not described in detail.

CHANNEL 1 PREAMP ◇1◇ ◇2◇ AND CALIBRATOR ◇6◇

General

Input signals for vertical deflection on the crt are connected to the CH 1 connector. The Channel 1 Preamp circuit provides control of input coupling, vertical deflection factor, balance, vertical position, and vertical gain. A sample of the Channel 1 input signal is provided to the Trigger Source and Trigger Preamp circuits to provide internal triggering from the Channel 1 signal only. Fig. 3-2 is a detailed block diagram of the Channel 1 Preamp circuit. The signal from the calibrator is connected to the vertical system following the attenuators.

Input Coupling

Input signals applied to the CH 1 input connector can be ac coupled, dc coupled, or internally disconnected. When input coupling switch S2 is in the dc position, the input signal is coupled directly to the Input Attenuator circuit. In the ac position, the input signal passes through C2. This capacitor prevents the dc component of the signal from passing to the amplifier. In the GND position, S2 opens the signal path and connects the input of the amplifier to ground, providing ground reference without the need to disconnect the applied signal from the input connector. R2, connected across the input coupling switch, permits C2 to precharge in the ground position, so that the trace remains on screen when switched to the ac position.

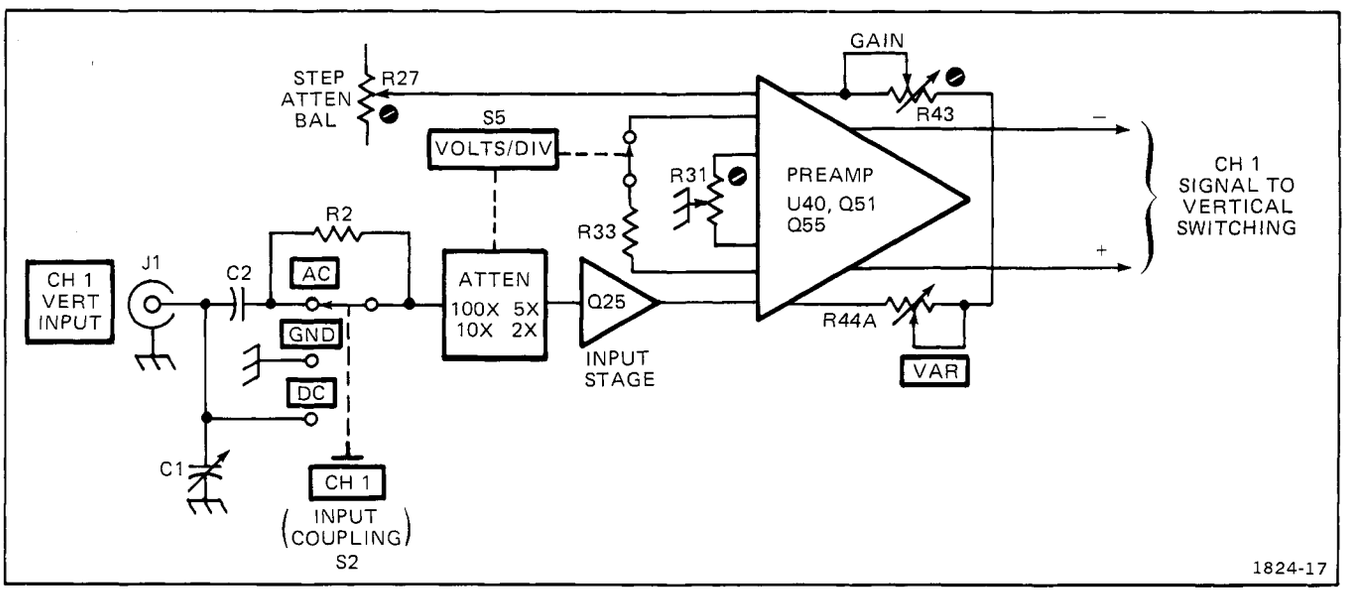


Fig. 3-2. CH 1 Preamp circuit block diagram.

Input Attenuator

The channel 1 deflection factor is determined by the CH 1 VOLTS/DIV switch.

The basic deflection factor of the vertical deflection system is 10 m/Div in the ten positions of the VOLTS/DIV switch above 5 m. In the 1, 2, and 5 m positions of the VOLTS/DIV switch, the basic deflection factor is 1 m/Div. For VOLTS/DIV switch positions other than 1 m/Div and 10 m/Div, attenuators are switched into the circuit to produce the vertical deflection factors indicated on the front panel. These attenuators are frequency-compensated voltage dividers. In addition to providing constant attenuation at all frequencies within the bandwidth of the instrument, the input attenuators are designed to maintain the same input RC characteristics (one megohm and approximately 47 picofarads) for each setting of the VOLTS/DIV switch. Each attenuator contains an adjustable series capacitor to provide correct attenuation at high frequencies and an adjustable shunt capacitor to provide correct input capacitance.

5 Division Calibrator

Switching either VOLTS/DIV switch to 5 DIV CAL provides a five-division (at approximately 1 kilohertz) display on the crt. The calibrator square-wave amplitude is accurate enough to permit vertical gain calibration. This calibrator signal also appears at the .5 V CAL OUT jack (on the front panel) for compensating attenuator probes (see Diagrams 1 and 6).

Input Stage

Channel 1 signal from the input attenuator is connected to the input stage through C22, R22B, and R22A. R23 provides the input resistance for this stage. R22A limits the current drive to the gate of Q25. CR23 and CR24 protect the circuit by clamping the gate of Q25A at about +6 or −6 volts if a high-amplitude signal is applied to the CH 1 input connector. Q25B is a relatively constant-current source and provides temperature compensation for Q25A.

Preamp Stage

The Preamp stage, U40, is a multiple-stage integrated-circuit amplifier. Adjusting the gain (R43) of this stage sets the overall gain for channel 1. R44A permits continuously variable, uncalibrated deflection factors between the calibrated settings of the VOLTS/DIV switch position. Var Balance R31 adjusts for no base-line shift of the crt display when rotating the VAR control.

In the 1 and 10m position of the VOLTS/DIV switch, no attenuation is used in the input attenuator stage. The correct vertical deflection factors are obtained by changing the gain of the Channel 1 Preamp stage. This gain change is accomplished by changing the value of the gain-setting resistance connected between pins 7 and 8 of U40. The Step Atten Bal adjustment, R27, adjusts for no baseline shift of the crt display when switching between the 1, 2, 5, and 10m positions of the VOLTS/DIV switch.

C34 is a compensation adjustment to provide optimum high-frequency response through the channel 1 amplifier. A sample of the signal being amplified in channel 1 is connected between pin 19 of U40 and the Trigger Source and Trigger Preamp circuits to permit "channel 1 only" triggering operation. Q51 and Q55, in the Output Amplifier stage, are connected as common-base amplifiers to provide a low-impedance load for the Preamp stage. Q51 and Q55 also provide isolation between the Preamp circuit and the Channel Switching circuit.

The Limit Centering adjustment, R53, sets the collector currents of Q51 and Q55 to match the center level of the signal in the Current Limiter stage to the center level of the linear operating region in the Vertical Output stage.

CHANNEL 2 PREAMP ◇1 ◇2

General

The Channel 2 Preamp circuit is basically the same as the Channel 1 Preamp circuit. Only the differences between the two circuits are described here. Portions of this circuit not described in the following description operate in the same manner as for the Channel 1 Preamp. Fig. 3-3 is a detailed block diagram of the Channel 2 Preamp.

Preamp Stage

Basically, the Channel 2 Preamp stage operates as described for Channel 1. However, the INVERT switch, S98, in the Channel 2 circuit, inverts the displayed signal.

CHANNEL SWITCH ◇3

General

The Channel Switching circuit determines which output signal (CH 1 or CH 2) is connected to the Vertical Output Amplifier circuit. In the Alt and Chop modes, the channels are displayed alternately on a shared-time basis. Fig. 3-4 is a detailed block diagram of the Channel Switching circuit. A schematic of this circuit is shown on Diagram 3 at the rear of this manual.

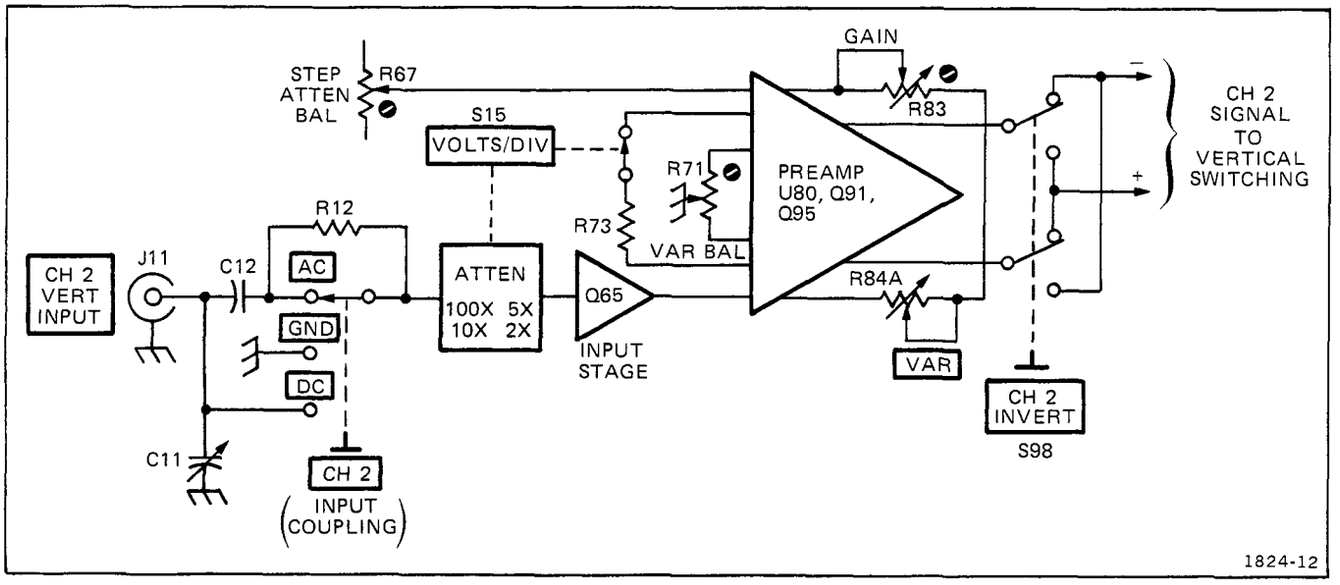


Fig. 3-3. CH 2 Preamp circuit block diagram.

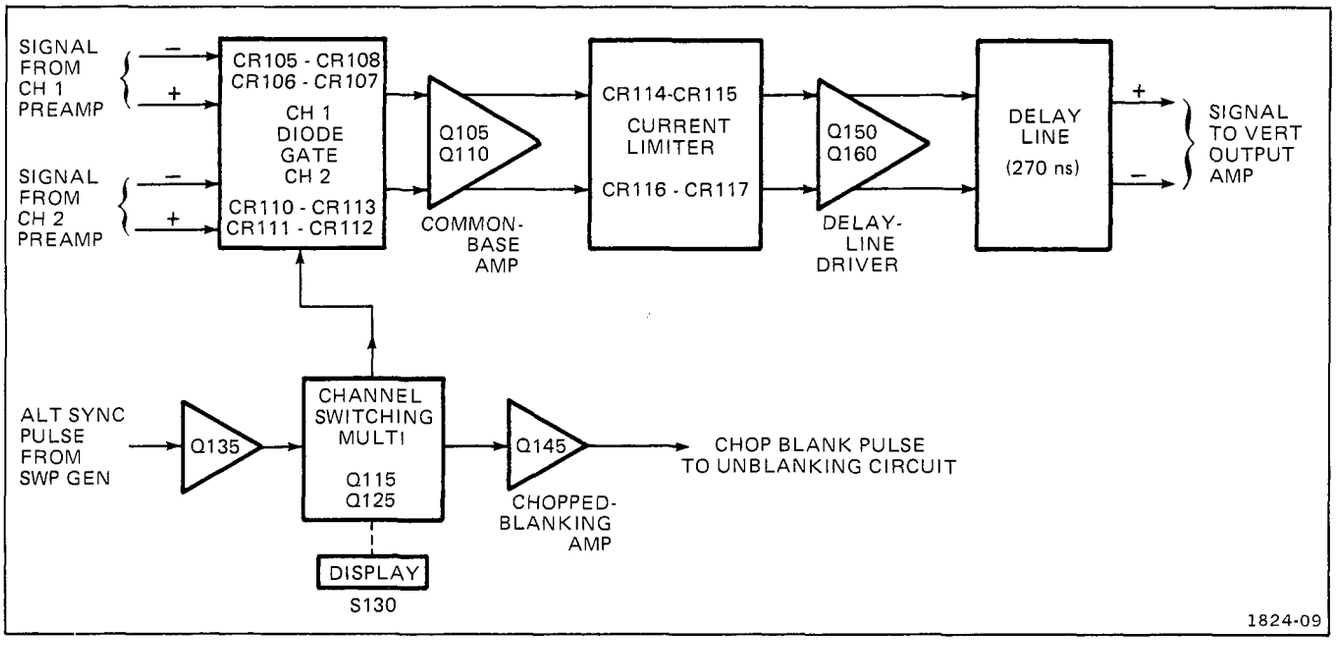


Fig. 3-4. Channel Switching block diagram.

Diode Gates

The diode gates (see Fig. 3-5) consisting of four diodes each, can be thought of as switches that permit either of the vertical preamp output signals to be coupled to the Common-Base Amplifier stage. CR105, CR106, CR107, and CR108 control the channel 1 signal output, and CR110, CR111, CR112, and CR113 control the channel 2 signal output. These diodes are, in turn, controlled by the Switching Multivibrator for dual-trace displays, or by the Vertical Mode switch for single-trace displays.

CH 1. In the CH 1 mode, −6 volts is applied to the junction of CR111-CR112 in the channel 2 diode gate through vertical mode switch S130C, R131, and CR130 (see simplified diagram, Fig. 3-5). This −6 volts forward biases CR111 and CR112 and reverse biases CR110 and CR113 since the input to the common-base amplifier stage is at about +0.6 volts. CR110-CR113 block the Channel 2 signal so it cannot pass to the Common-Base Amplifier. At the same time, in the Channel 1 Diode Gate, CR106 and CR107 are connected to +6 volts through R115. CR106

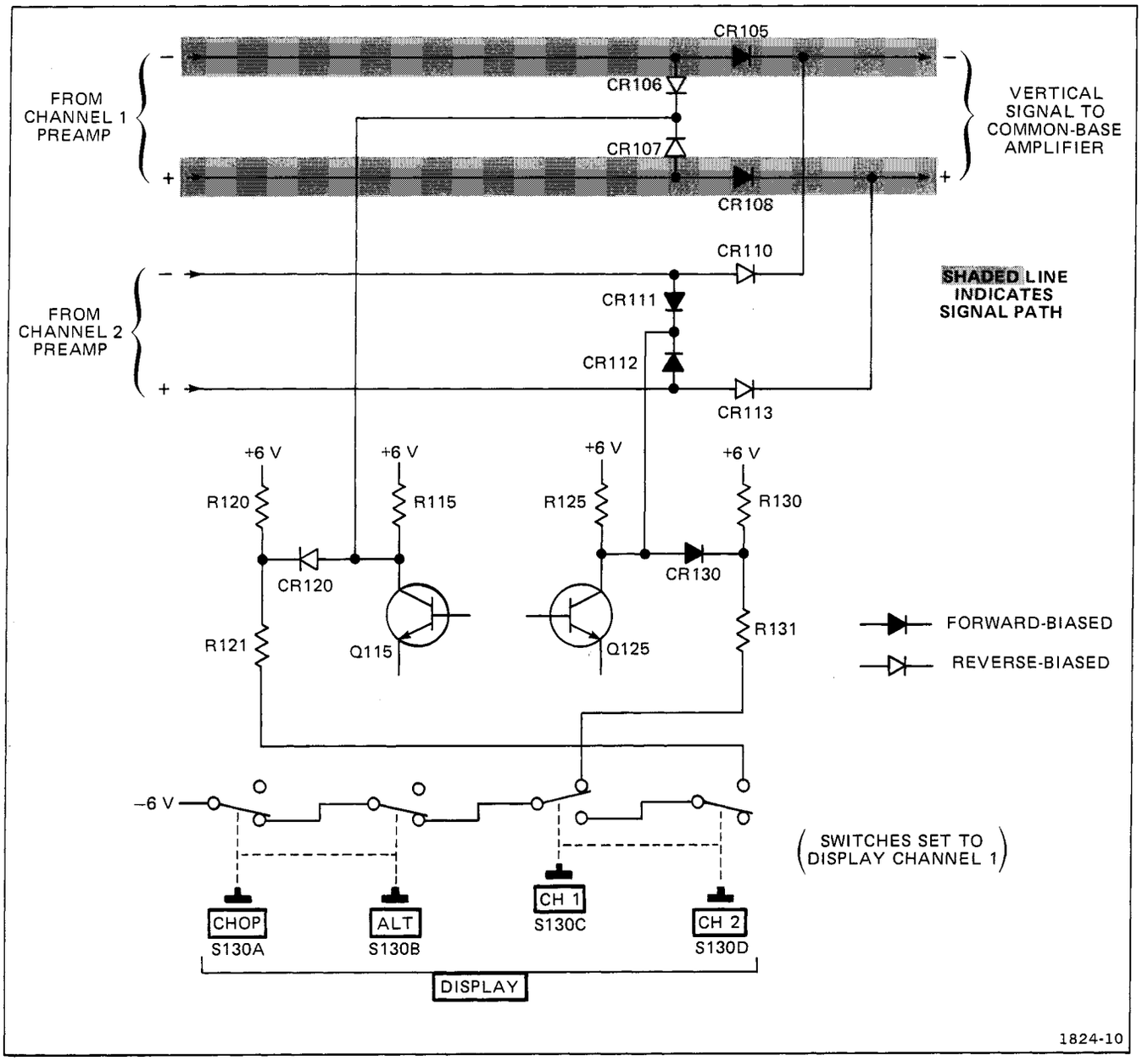


Fig. 3-5. Signal path, CH 1.

and CR107 are held reverse biased, while CR105 and CR108 are forward biased. Therefore, the Channel 1 signal can pass to the Common-Base Amplifier stage.

CH 2. In the CH 2 mode, the above conditions are reversed (see Fig. 3-6). CR106 and CR107 are connected to −6 volts through S130D, R121, and CR120, while CR111 and CR112 are connected to +6 volts through R125. The Channel 1 Diode Gate blocks the signal and the Channel 2 Diode Gate permits signal to pass.

Switching Multivibrator

ALT. In this mode, the Switching Multivibrator operates as a bistable multivibrator. −6 volts is connected to Q135 emitter (Alternate Trace Switching Amplifier stage, see Diagram 3), through R136. Q135 is forward biased and supplies current to the "on" transistor in the Switching Multivibrator stage through R135 and CR118 or CR128. For example, if Q115 is conducting, current is supplied to Q115 through CR118. The current through collector resistor R115 drops the CR106-CR107 cathode level negative with respect to the cathode of CR105 and CR108,

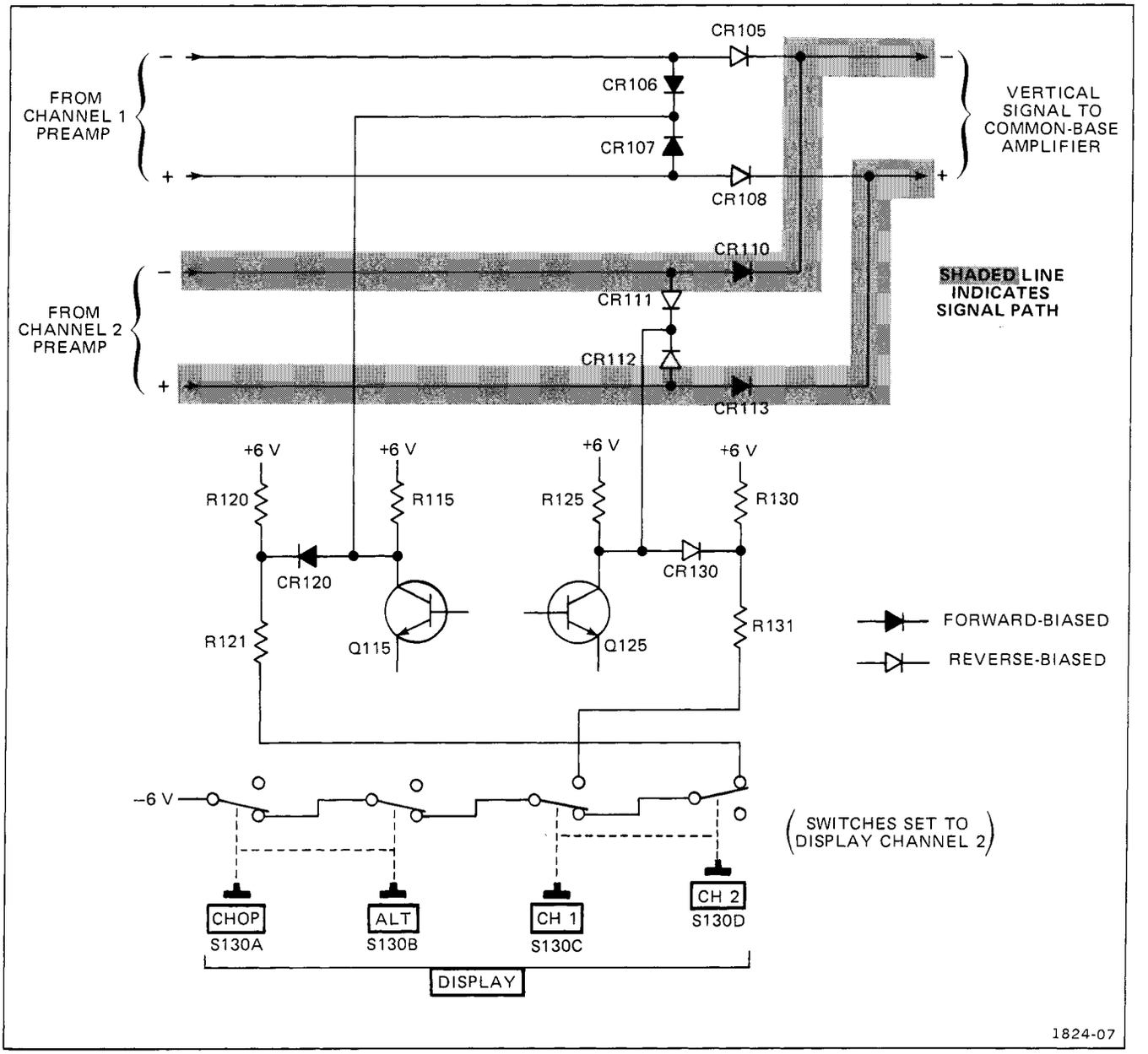


Fig. 3-6. Signal path, CH 2.

blocking the Channel 1 Diode Gate, as for Channel 2 only operation. The signal passes through the Channel 2 Diode Gate to the Common-Base Amplifier.

The alternate-trace sync pulse is applied to Q135 through R139 and C138 at the end of each sweep. This differentiated negative-going sync pulse momentarily interrupts the current through Q135, and both Q115 and Q125 are turned off. When Q135 turns on again after the alternate-trace sync pulse, the charge on C119 determines whether Q115 or Q125 conducts. For example, when Q115 is conducting, C119 is charged more positively on the CR118 side to the emitter level of Q115, and more negatively on the CR128 side. This charge is stored while Q135 is off, and holds the emitter of Q125 more negative than the emitter of Q115. When both Q115 and Q125 are off, the voltages at their bases become approximately equal. When Q135 turns on, the transistor with the most negative emitter starts conducting first, with the resulting negative movement at its collector holding the other transistor off. On the next sync pulse, the conditions described previously are reversed; now the Channel 2 Diode gate is reverse biased, and the Channel 1 signal passes through the Channel 1 Diode Gate.

CHOP. In the Chop mode, the Switching Multivibrator stage free runs as an astable multivibrator at about 100 kilohertz. The emitters of Q115 and Q125 are connected to −6 volts through R118, R128, through R140 and T140 primary. At the time of turn on, one of the transistors begins to conduct; for example, Q115. The negative level at Q115 collector forward biases CR106 and CR107 and back biases CR105 and CR108, preventing the Channel 1 signal from reaching the Common-Base Amplifier. Meanwhile, the Channel 2 Diode Gate passes the Channel 2 signal to the Common-Base Amplifier.

The frequency-determining components in the Chop mode are C119, R119, R118, and R128. Switching action occurs as follows: when Q115 is on, C119 attempts to charge to −6 volts through R128. The emitter of Q125 goes slowly toward −6 volts as C119 charges. The base of Q125 is held at a negative voltage determined by the voltage divider R116-R127, between −6 volts and the collector voltage of Q115. When the emitter voltage of Q125 reaches a level slightly more negative than its base, Q125 conducts. Q125 collector level goes negative and pulls the base of Q115 negative through divider R117-R126 to turn Q115 off, switching the Diode Gate stage to connect the opposite half to the Common-Base Amplifier stage. Again, C119 begins to charge toward −6 volts, this time through R118. As C119 charges, the emitter of Q115 goes slowly negative until Q115 turns on. Q125 is off and the cycle begins again.

The Chopped Blanking Amplifier stage, Q145, provides an output pulse to the Unblanking circuit that blanks the transitions between the Channel 1 and the Channel 2 traces. When the Switching Multivibrator stage changes states, the voltage across T140 momentarily increases. A negative pulse is applied to the base of Q145 to turn Q145 off. The width of the pulse at the base of Q145 is determined by R142 and C142. Q145 is driven quickly into cutoff, and the positive-going output pulse, which coincides with trace switching, is connected to the Unblanking circuit through R147.

ADD. In the Add mode, S130A and B closed, the Diode Gate stage permits both signals to pass to the Common-Base Amplifier stage. The Diode Gates are both held on by −6 volts applied to their cathodes through R108 and R105-R106. Since both signals are applied to the Common-Base Amplifier stage, the output is the algebraic sum of the signals on Channels 1 and 2.

The Common-Mode Adjustment, R108, sets the deflection plate levels of the Vertical Output Amplifier in the Add mode.

Q105 and Q110 are connected as common-base amplifiers to provide a low impedance load, with about +0.6 volt on Q105-Q110 emitters, to ensure the operation of the Diode Gate stage. Q105 and Q110 also provide the current drive for the Current Limiter stage.

Current Limiter

The Current Limiter stage (CR114, CR115, CR116, and CR117, see Fig. 3-4) decouples the Delay-Line Driver stage from the Common-Base Amplifier during overdrive conditions, preventing the Output Amplifier from being driven to a non-linear operating region.

Delay-Line Driver

Output of the Current Limiter stage is applied to the Delay-Line Driver stage, Q150 and Q160. Q150 and Q160 are connected as feedback amplifiers with R150-R156 and R160-R166 providing feedback from the collector to the base of their respective transistor. A sample of the signal in the collector circuit of Q160 is used for triggering in the COMP TRIG mode. C153-C154 and R154 provide high-frequency compensation of the delay line termination. The output of the Delay-Line Driver stage is connected to the Vertical Output amplifier through the Delay Line, DL180.

VERTICAL OUTPUT AMPLIFIER ◇3

General

The Vertical Output Amplifier circuit provides the final amplification for the vertical deflection signal. This circuit includes the delay line. Fig. 3-7 is a detailed block diagram of the Vertical Output Amplifier circuit.

Delay Line

Delay Line DL180 provides approximately 270 nanoseconds delay to the vertical signal to give the Sweep Generator circuit time to initiate a sweep before the vertical signal reaches the vertical deflection plates of the crt. This delay permits display of the leading edge of the signal that initiates the trigger (when using internal triggering).

Output Amplifier

Q188 and Q198 are connected as common-base amplifiers to provide a low input impedance to properly terminate the delay line. Q188 and Q198 also provide isolation between the delay line and the following stages.

Q200, Q202, Q205, Q206, Q210, Q212, Q215, and Q216 are connected as push-pull multi-stage operational

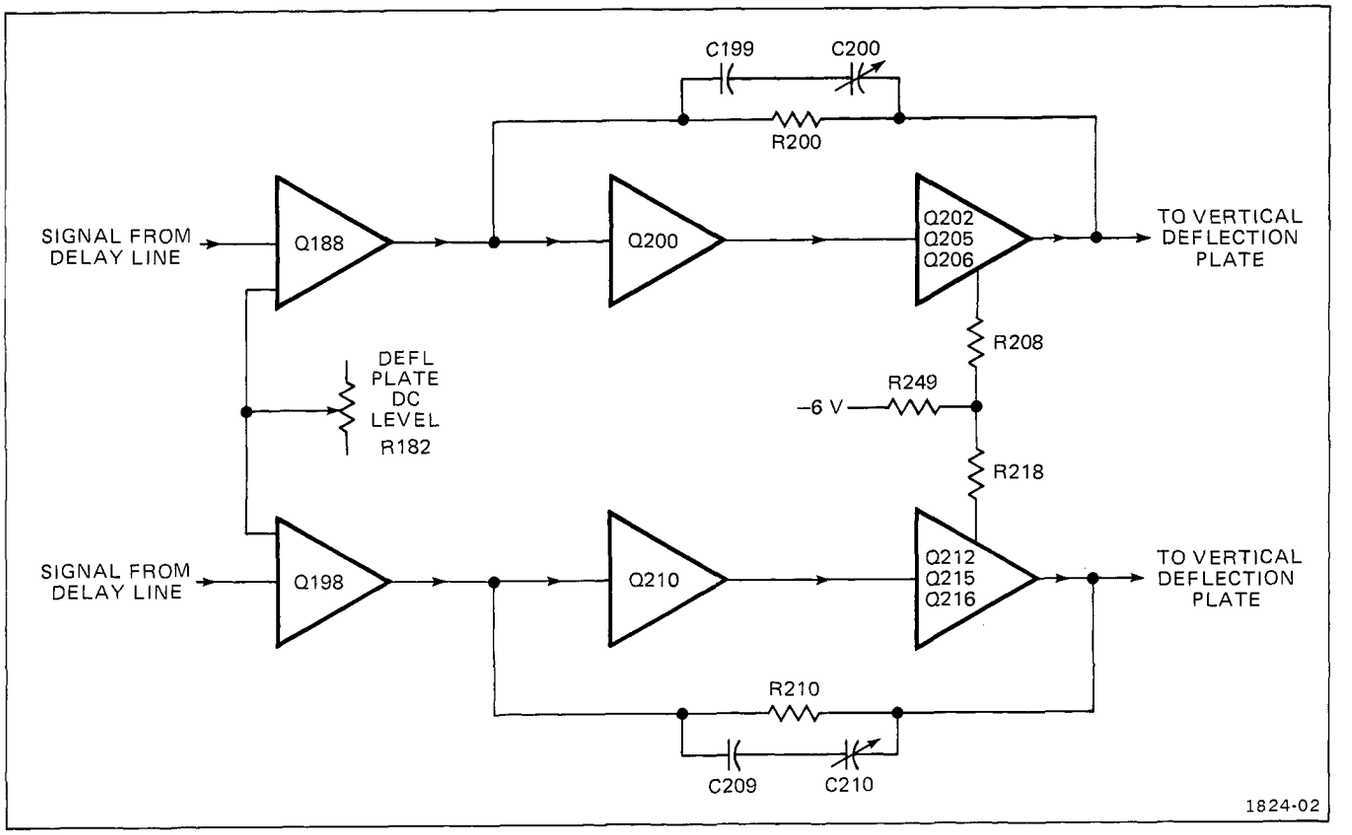


Fig. 3-7. Vertical Output Amplifier block diagram.

amplifiers, quiescently supplying approximately 50 volts dc to each of the crt vertical deflection plates. The deflection plate dc levels are adjusted by R182, Defl Plt DC Level. Q200 and Q210 (emitter follower amplifiers) drive the Output stage. The two halves of the Output amplifier operate in push-pull. Current in one side decreases as current increases in the other. C200 and C210 are compensation adjustments to provide optimum high-frequency response.

TRIGGER SOURCE ◇4

Internal

The Internal Trigger Source circuit (see Fig. 3-8) selects and amplifies the internal trigger signal to the level required at the input of the Trigger Preamplifier stage. Input signal for the Internal Trigger Source circuit is a sample (from pin 19 of U40 or U80) of the signal applied to CH 1 or CH 2, or a sample of the composite vertical signal from the Delay-Line Driver stage.

Diode Gate. The diode gates, consisting of two diodes each, can be thought of as switches that allow one of the three internal trigger signals to be coupled to the Trigger Source Amplifier. CR225 and CR226 control the Channel 1 signal, CR229 and CR230 control the Channel 2 signal, and CR222 and CR223 control the composite signal. These diodes are controlled by the Trigger Source switch, ganged with the DISPLAY switch. Q165 provides high impedence input to prevent loading the Delay-Line Driver stage. The composite signal applied to the base of Q165 causes signal in the collector of Q220. Q232 and Q237 compose an emitter-coupled comparator amplifier. Q235 is a feedback amplifier with R233 providing the feedback. Q236 is an emitter-follower amplifier providing low output impedance.

Source and Coupling

The Trigger Source switches, S130 and S305A (see Fig. 3-5 and Fig. 3-8), select the trigger signal source. Five trigger sources are available: CH 1, CH 2, COMP, EXT, and LINE. When the INT or EXT/LINE switch, S305A, is pressed, one of the internal trigger signals is obtained from the Trigger Source circuit. When the INT or EXT/LINE switch is released, either the external signal or the line trigger signal is available by switching LINE/EXT ATTEN switch S300. S300 also provides ten times attenua-

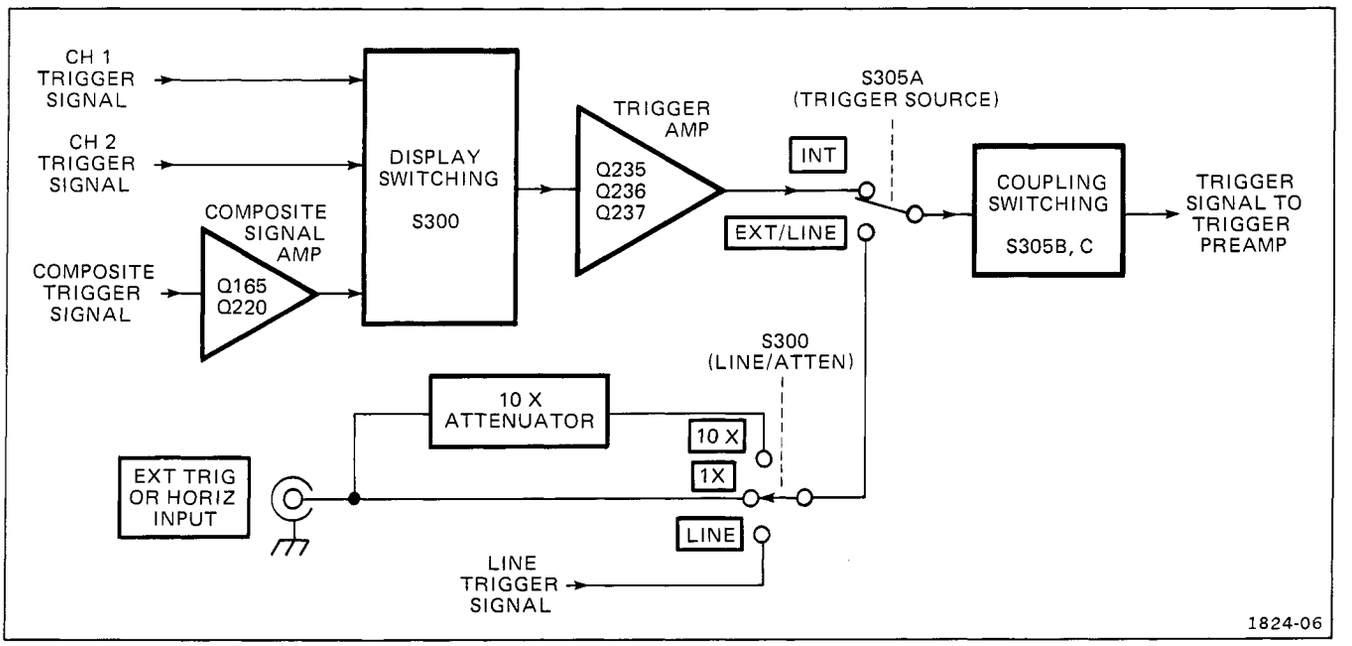


Fig. 3-8. Trigger Source block diagram.

tion for the external trigger signal. Input impedance of the EXT TRIG OR HORIZ input is 1 megohm, paralleled by about 62 picofarads. The line trigger signal is obtained from the secondary of transformer T600 through the voltage divider C601-C602 and switch S300. Fig. 3-8 is a block diagram of the Trigger Source circuit.

Trigger Coupling switch S305 offers a means of accepting or rejecting certain components of the trigger signal. In the AC and AC LF REJ modes of trigger coupling, the dc component of the trigger signal is blocked by coupling capacitor C305 or C306. Frequency components below about 50 hertz are attenuated when using AC coupling and below about 50 kilohertz when using AC LF REJ. The higher-frequency components of the trigger signal are passed without attenuation. In the INT trigger mode, AC and AC LF REJ trigger coupling are available. In the EXT or LINE mode, AC, AC LF REJ and DC are available.

The line trigger signal is obtained from the secondary of T600 in the Power Supply circuit. This sample of the line frequency is coupled to the Trigger Preamp circuit in the LINE mode. The Trigger Coupling switches should not be in the AC LF REJ mode when using this trigger source, as the trigger signal is blocked by the AC LF REJ circuit.

TRIGGER PREAMP AND SWEEP GENERATOR ◇5

Trigger Preamplifier

Q313A, Q313B, Q318, and Q320 (see Fig. 3-9) form a voltage comparator system to select the amplitude of a triggering signal on which a sweep can be initiated. The triggering signal is applied to the gate of Q313A and a dc level established by R331, (TRIGGERING LEVEL) is applied to the gate of Q313B. When the two halves of the comparator are balanced, the voltage at Q318 collector is about zero and the current through R323 is zero. When the triggering signal passes through the selected dc level, the conduction of the two halves of the comparator is shifted; and when the collector of Q318 moves away (positive or negative) from about zero volts, far enough to produce the drive current through R323, a trigger is initiated in U340.

Sweep Generator

The Sweep Generator circuit produces a linear sawtooth voltage that is used to provide sweep deflection in the oscilloscope. The Sweep Generator also provides positive-going and negative-going gates to perform sweep-related functions such as time-shared switching and crt unblanking.

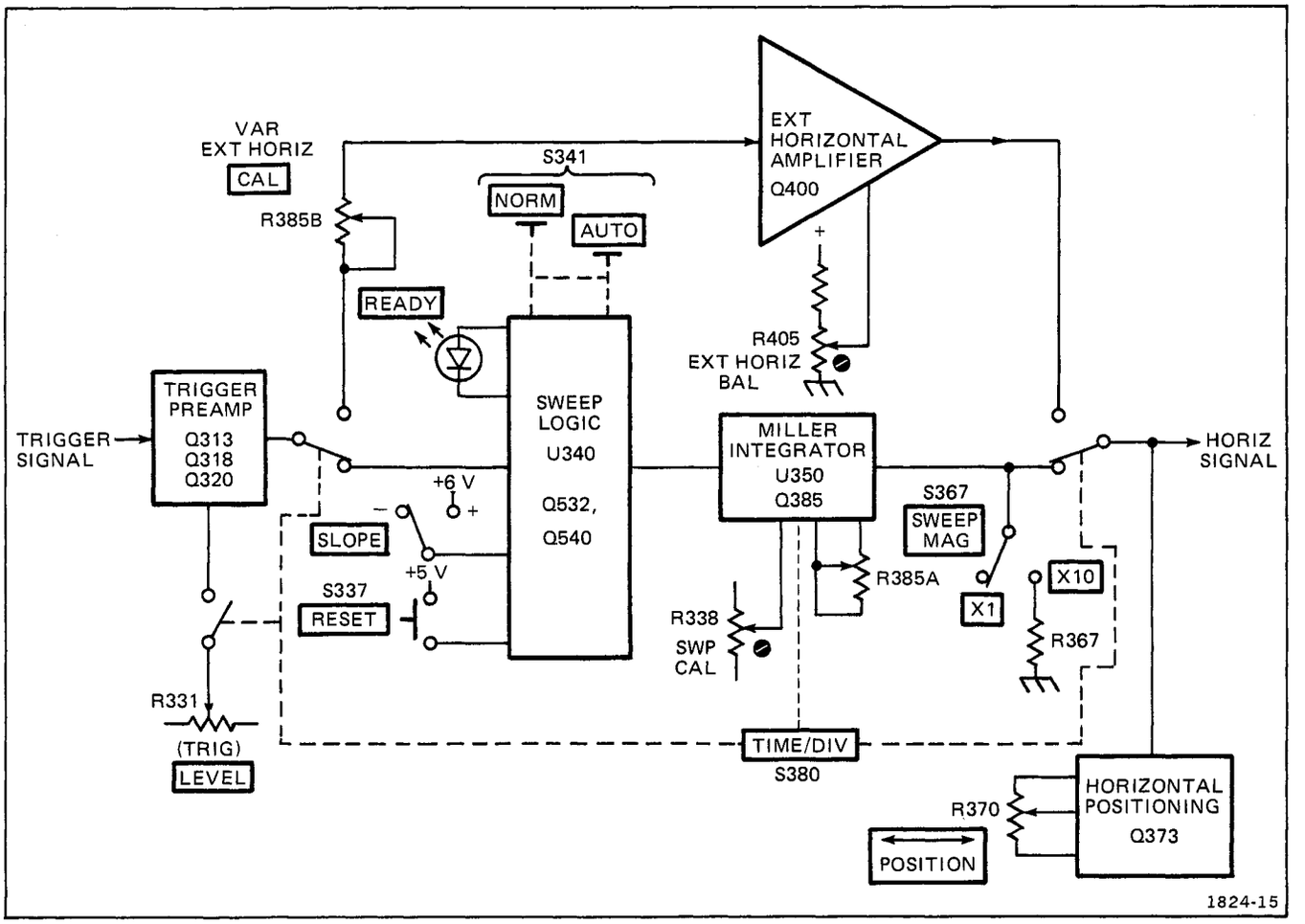


Fig. 3-9. Sweep Generator and External Horizontal block diagram.

The Sweep Generator circuit is composed of two integrated circuits, Sweep Logic (U340) and Miller integrator (U350) and associated discrete circuit components. The primary functions of these components are trigger slope selection and pulse forming; sawtooth start and stop; holdoff and single-sweep lockout; and bright-baseline generation. Table 3-1 lists each IC pin and its function. All pins are digital unless otherwise noted and positive logic is employed. Pins not used are grounded.

The Triggering and Sweep Mode switch, S341, permits three modes of operation: Normal, Auto, and Single Sweep.

Fig. 3-9 is a block diagram of the Sweep Generator and External Horizontal Amplifier circuits.

TABLE 3-1

SWEEP GENERATOR IC INPUT-OUTPUT

Sweep Logic, U340

Pin		Function
1	End Sweep	Current (logic 1) for at least 20 nanoseconds ends sweep. Continuous current locks out sweep. No input (logic 0) permits U340 to operate.
2	Not used	Grounded to chassis
3	Not used	Grounded to chassis
4	Trigger Input	Low impedance analog input. Accepts analog current triggering signal.

TABLE 3-1 (cont)

Pin		Function
5	Slope Select	Logic 1 permits trigger to be initiated on the positive slope of a triggering signal; logic 0 permits trigger to be initiated on the negative slope.
6	Single Sweep Control	Logic 1 permits repetitive sweep. Logic 0 permits only a single sweep to be produced unless reset (see pin 7).
7	Single Sweep Reset	Current into pin 7 (logic 1) for at least 20 nanoseconds resets single sweep system and allows sweep to be retriggered. After reset occurs, C335 and R336 permit this input to return to ground (logic 0).
8	GND (Substrate)	Provides ground reference for the device.
9	READY Indicator	Provides power to READY indicator when sweep is ready for triggering (Single Sweep Mode). Removes power, extinguishes indicator upon receipt of sweep trigger. Open at other times.
10	Lockout	Logic 1, sweep is locked out. Logic 0, lockout off.
11	Holdoff Timing	Connects timing components that set trigger lockout period after end of sweep. Capacitor discharges as soon as sweep is started, and timing starts at end of sweep as capacitor charges. When capacitor charges to upper threshold, new sweep can be produced either upon receipt of next trigger or if pin 12 is above its upper threshold (see pin 12).
12	Bright Baseline Timing/Off	Used in Auto Trigger Mode to connect timing components that set bright baseline off period after trigger recognition. If triggering signal is absent or occurring at a rate less than 15 hertz, capacitor charges toward the +3.5-volt threshold. Above the +3.5-volt level, U340 is conditioned to provide a free-running sweep at a rate determined by the holdoff RC and sweep timing. As soon as a trigger arrives at pin 4 of U340, pin 12 is driven to ground and C345 is discharged.
13	Bright Baseline Control	Current into pin 13 (logic 1) for ⩾20 nanoseconds keeps pin 12 at ground, holding Bright Baseline off. Baseline remains off for one timing period after current level is removed. No input (logic 0) allows Bright Baseline to function (see pin 12).
14	+Gate Output	Provides a +5-volt source through 2 kilohms (logic 1) during sweep, driving current into pin 1 of U350. Logic 0, sweep is not being produced. Maximum delay after fast-rise trigger initiation is 30 nanoseconds.
15	−Gate Output	Logic 0 during sweep. Provides +5-volt source through 2 kilohms (logic 1) when sweep is not being produced. Maximum delay after fast-rise trigger initiation is 25 nanoseconds.
16	Power Supply	+5-volt supply terminal.

TABLE 3-1 (cont)

Miller Integrator, U350

Pin		Function
1	Sweep Gate In	Current into pin 1 results in sawtooth voltage at pin 8.
2	Oscillation Suppressor	Connects discrete components to prevent oscillation of the Miller integrator.
3	Ground	Provides ground reference to the device.
4	End Sweep-Pulse Gate Out	Drives current into pin 1 of U340 to terminate sweep.
5	Not used	Function blocked.
6	End Sweep Level	Connects voltage divider to a reference comparator inside the device, establishing the level at which the sweep sawtooth is terminated.

TABLE 3-1 (cont)

Pin		Function
7	Power Supply	+12-volt supply terminal.
8	Sawtooth Output (Integrator Output)	Produces sweep sawtooth voltage when current is gated into pin 1. Sawtooth is positive going, with amplitude from 0 to about +6 volts.
9	Timing Current Input	Connects timing components which determine sweep rate.
10	Substrate	Supply of about 11 milliamperes applied.

Normal Triggered Mode

The Trigger Preamplifier circuit provides current drive to pin 4 of U340 at selected levels on both the positive- and negative-going slopes of the triggering signal. Slope switch S338 controls the level at pin 5 to determine the slope at which the sweep is initiated.

When the trigger is initiated in U340, a positive transition occurs at pin 14. This output remains high until the sweep terminates. At the same time, a negative-going gate is produced at pin 15, which is used to unblank the crt.

U350 is a Miller integrator, a type of operational amplifier in which the feedback element is the timing capacitor. Before a positive gate is received from U340, timing capacitor C360, C361, or C363 has essentially no charge, as it is clamped by a network inside U350. Current through the timing resistor network (R360, R382, and R385A) is input to pin 9 of U350. When the positive gate arrives from U340, the current is switched into the timing capacitor and the timing capacitor begins to charge. The current is nearly constant, and since pin 9 is the operational null point, a linearly increasing voltage (sawtooth) is produced at pin 8. The rate of the sawtooth rise is a function of the constant current through the timing resistors and the capacitance of C360, C361, or C363.

The voltage at pin 8 of U350 continues to go positive until it reaches the level set at pin 6 by voltage divider R352 and R353. At this point, a reference comparator inside U350 produces a current output at pin 4, which is conducted through CR333 to pin 1 of U340, causing the outputs at points 14 and 15 to revert to their original states. With the positive voltage removed at pin 1 of U350, the timing capacitors discharge into pin 9 and the sweep terminates.

A short-duration trigger-lockout period (to allow the sweep circuits to stabilize when the sweep terminates) is provided by the holdoff network at pin 11 of U340. For U340 to function, the voltage at pin 11 must be at least +3.5 volts. When the sweep starts, the voltage at pin 11 is driven to ground, discharging the holdoff capacitors (C347, C348, or C349). The capacitors begin to charge as the sweep progresses, and continue to charge as the sweep terminates. The time between sweep termination and the point at which pin 11 reaches the +3.5-volt threshold is the holdoff period.

The timing and holdoff RC components are selected by the TIME/DIV switch, S380. Sweep Cal Adjustment R388 permits calibration of this circuit for accurate timing when Variable control R385A is in the CAL detent position. The Variable control provides uncalibrated, continuously variable timing.

Auto-Triggered Mode

Operation of the Sweep Generator in the Auto Triggered mode is the same as that described for the Normal Triggered mode when a trigger is present and occurring at a rate greater than 15 hertz. However, when a trigger is not present within a specified time, a free-running referenece trace, or bright baseline is produced. This is accomplished as follows: when the AUTO button is pushed in, R340 is disconnected from +6 volts, removing the bright baseline lockout current from pin 13 of U340, permitting the Bright Baseline Timing circuit, R345-C345 to function. Each time a trigger is initiated in U340, pin 12 is driven to ground and C345 is discharged. C345 immediately begins to recharge. If the capacitor is allowed to charge above the +3.5-volt threshold level, U340 is conditioned to provide a positive gate at pin 14 and a negative gate at pin 15 as soon as the holdoff period is completed (when pin 11 rises above its threshold). The sweep free runs at a rate determined by the timing and holdoff networks.

Single Sweep Mode

Operation of the Sweep Generator in the Single Sweep mode is similar to operation in the Normal Triggered mode. However, after one sweep has been produced, further triggers are locked out in U340 until the RESET button is pressed.

When both NORM and AUTO buttons are pushed in (Single-Sweep) the following conditions are established in U340. +5 volts is applied to R340 to drive current into pin 13, keeping pin 12 at ground and holding the bright baseline feature off. Pin 6 is grounded, requiring U340 to be manually reset. Ready indicator CR340 is connected to pin 9 through R342 to indicate that the system is reset and triggerable. As soon as the system is triggered, the Ready indicator is extinguished.

The system is reset when RESET button S337 is pushed. +5 volts is applied to differentiating network C335, R336, C332, and R332. The positive spike appearing at pin 1 terminates any sweep that is in progress and the spike appearing at pin 7 resets the system.

Sweep Magnification and Positioning

X10 magnification of the sweep is achieved by changing the attenuation ratio of the output sawtooth. For an unmagnified sweep, R366, R367, and R368 provide about 20X attenuation of the sawtooth, reducing the sweep amplitude from about +6 volts to about +0.3 volts. The deflection sensitivity of the crt is such that this amplitude gives one screen width of deflection, provided that the output sawtooth is centered about ground, which corresponds with screen center.

When the Sweep Mag Switch, S367, is switched to the X10 position, R367 is disconnected, changing the attenuation to about 2X, increasing the sawtooth amplitude to about +3 volts. Since only one-tenth of this amplitude is accepted by the oscilloscope, the displayed segment appears as an X10 magnification. In X10 position of X10 Mag switch, all sweep rates indicated on the panel are magnified by a factor of ten.

POSITION Control R370 provides an adjustable change in the conduciton of Q373 to alter the dc level of the output signal. Positioning range is sufficient to move any portion of a magnified sweep into the on-screen window.

EXT HORIZ ◇5

General

To operate the horizontal in the amplifier mode, the TIME/DIV switch is rotated counterclockwise into one of the two EXT HORIZ positions. In this condition, the Sweep Generator circuit is disabled (including the crt blanking gate), and the output of the Trigger Preamplifier is connected to the Horizontal Amplifier circuit through the common-base amplifier.

Input Stage

A signal applied to input connector J300 is passed to the gate of Q313A, through switches S300 and S305. Q313A, Q313B, Q318, and Q320 form a non-inverting operational amplifier, which is operated as an X2 gain amplifier to isolate the next amplifier stage from the high impedance input circuitry.

LEVEL control R331 is disconnected from the gate of Q313B.

Output Stage

The output from the collector of Q318 is connected to the emitter circuit of Q400, which is a common-base amplifier. The signal produced at Q400 collector is in phase with the applied signal. Two steps of gain selection are available. In X1 gain position of the TIME/DIV switch, the deflection factor is about 200 mV/Div. In X10 gain position, the deflection factor decreases to about 20 mV/Div. As R385B is varied, more resistance is added to the emitter circuit, decreasing the gain. R405 adjusts for no beam position shift of the crt display when rotating the VAR control. The output signal of this stage is applied to the horizontal amplifier.

HORIZONTAL AMPLIFIER ◇6

General

The horizontal amplifier accepts a horizontal sweep voltage from the sweep generator, amplifies it, and applies the resulting push-pull signal to the horizontal deflection plates of the crt. During EXT HORIZ operation, the input from the sweep generator is disconnected, allowing EXT HORIZ input signals to be amplified and applied to the horizontal deflection plates. Fig. 3-10 is a block diagram of the Horizontal Amplifier stage.

Emitter-Follower Amplifier

The signal from either sweep generator or EXT HORIZ amplifier is applied to the emitter-follower stage, Q430. This stage provides a high input impedance to prevent loading the preceding stage.

Common-Base Amplifier

The signal output of Q430 is passed to the output amplifier through the common-base amplifier, Q435. Q435 isolates the input circuit from the output amplifier. When the crt display mode is in Store, R429 is short circuited by the Store switch, S500A, to increase the gain of the horizontal amplifier, correcting for the crt deflection sensitivity change that occurs when the display is shifted to the stored state.

Output Amplifier and Output Inverter Amplifier

Assume that a positive-going sweep signal is arriving at the input of the amplifier. The positive-going voltage is applied to Q440 base. Q440 and Q442 form a non-inverting amplifier circuit, and a positive signal is developed at Q442 collector. This signal is amplified and inverted by Q450, providing a negative-going signal for the left deflection plate. The collector of Q450 is also applied to feedback circuit R443A-R443B-C443. The changing voltage of Q450 causes most of the signal current required by the input signal to flow through the R443A-R443B-C443 network. Therefore, only a very small part of the input signal is seen at the base of Q440.

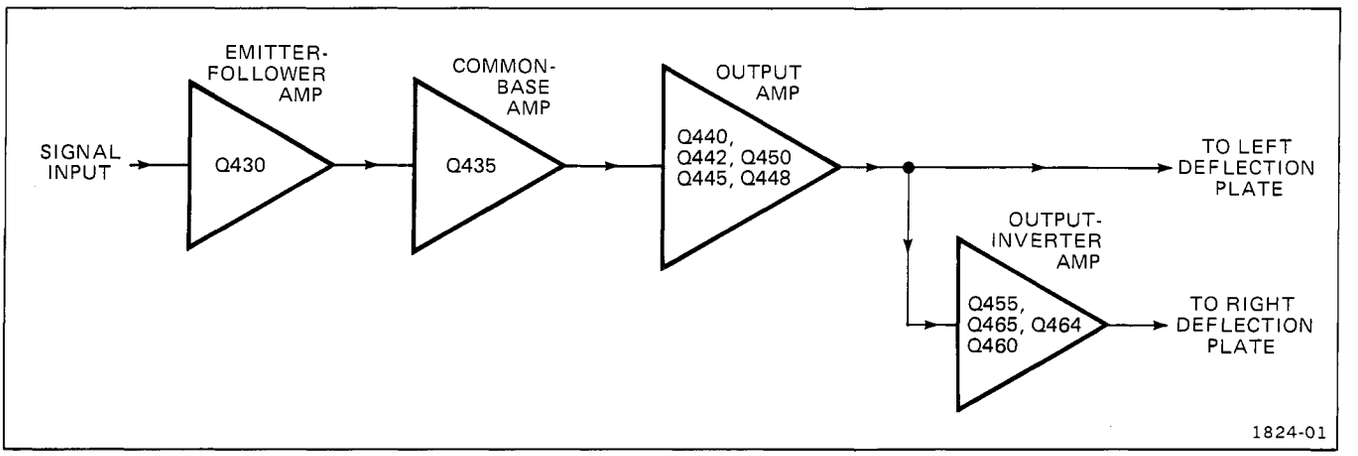


Fig. 3-10. Horizontal Amplifier block diagram.

The gain of the output amplifier is determined by the ratio of feedback resistor R443A-R443B to the resistance of R429-R432. This ratio is approximately 450.

The voltage at Q450 collector is also applied through R455 to the Q455-Q465 output inverter circuit. This circuit is also an operational amplifier, with the feedback resistor, R458, equal to the input resistor, R455. Gain of the circuit is therefore equal to one, providing a signal (equal and opposite that of the left deflection plate) to the right deflection plate.

Standing current for Q450 is provided by Q448 and its associated emitter circuit, which consists of Q445 and resistors R445, R446, R447, and R448. The base voltage of Q448 is established by VR451. This voltage sets the voltage at the Q448 emitter and therefore at the base of Q445. Q445 and Q448 provide the principal current paths for Q448. When slow sweep rates are selected, this current is relatively unchanged by the sweep signal. The Q465 standing current is achieved in a similar manner.

When fast sweep rates are selected, the positive-going signal at Q442 collector is applied through C445 to the base of Q445. This decreases the drive to Q445 and therefore to Q448, aiding in the generation of the negative-going signal for the left deflection plate. During this time, the negative-going signal at Q455 emitter is coupled through C459 to Q460 base. This increases Q460 drive and therefore increases Q460 current, aiding in the generation of the positive-going signal for the right deflection plate. During retrace, the signal changes in a direction opposite to that just described, and the Q445 and Q460 circuits reverse their functions.

STORAGE ⑦

General

The Storage circuit (see Fig. 3-11) provides the voltage levels necessary to operate the crt flood guns, collimation electrodes, and target backplate.

The circuitry includes an erase multivibrator, a target-control amplifier, an enhance generator, and an integrate circuit. Fig. 3-11 is a block diagram of the Storage circuitry.

The Enhance Generator circuit permits very fast single-sweep signals to be stored. The integrate feature permits storage of a number of repetitive sweeps, each of which would be too fast to store as a single-sweep event.

The Auto Erase Generator circuit automatically produces an erase trigger pulse that initiates an erase pulse following the end of the sweep.

The Sweep Reset Delay Multivibrator circuit produces a sweep reset pulse after written information has been erased in the Auto Erase mode.

Storage Tube

The crt used in the 314 is a direct-view, bistable storage cathode ray tube. Storage, which is the retention on the crt of a displayed event, is based on a secondary emission principle. A stream of primary electrons strikes an insulated target surface with sufficient energy to dislodge electrons. As the potential increases, each primary electron dislodges more than one secondary electron, resulting in the target material charging positive. The

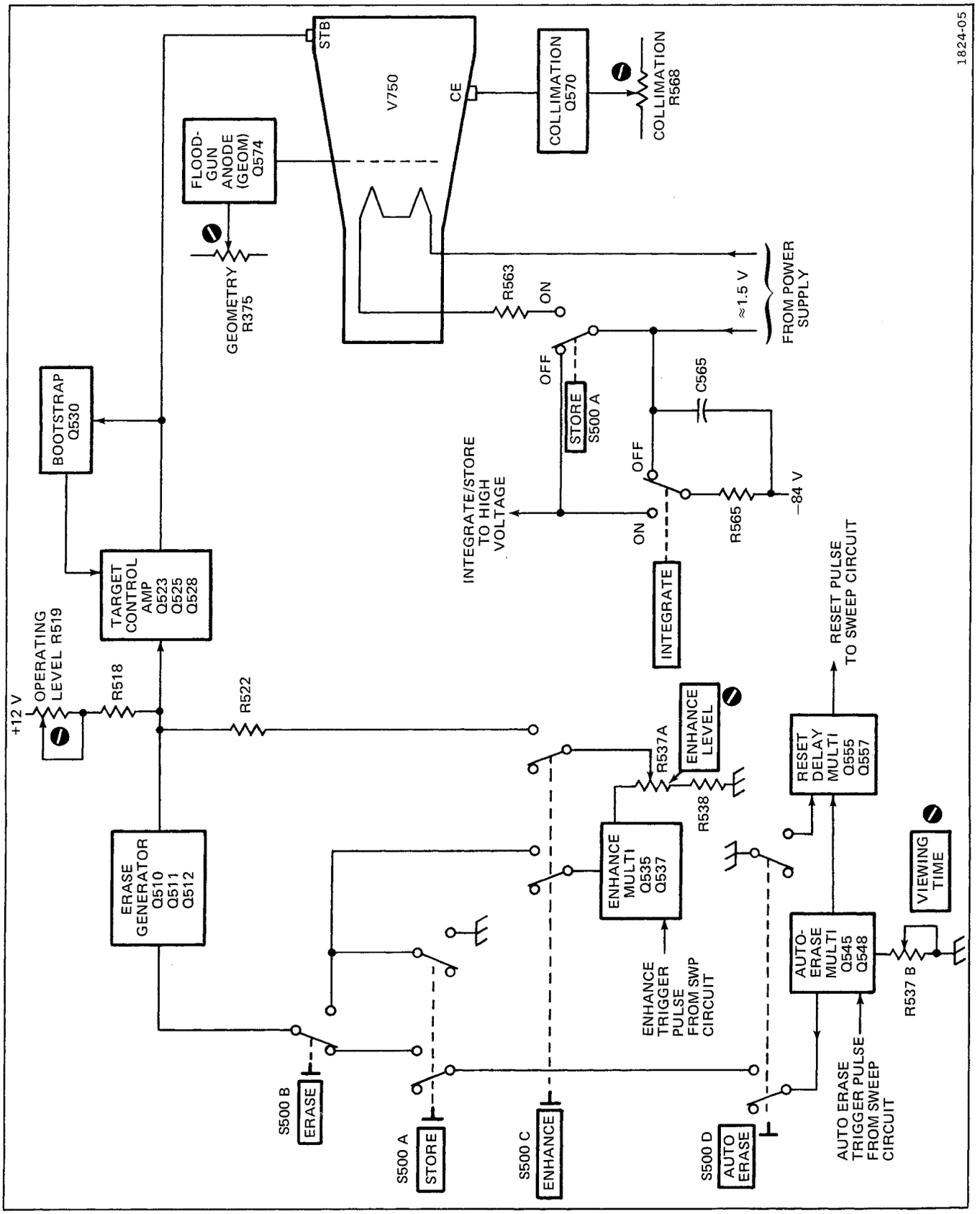


Fig. 3-11. Storage block diagram.

target approaches the backplate potential, yielding higher-energy flood electrons, resulting in light output.

The storage cathode-ray tube contains special storage elements in addition to the conventional writing-gun elements. The operating mode of the tube depends primarily on the voltage applied to these storage electrodes. With one condition of applied potential, the storage screen or target backplate operates in the ready-to-write state; then, when it is bombarded with high-energy writing-beam current, the bombarded portion shifts to the stored mode to store a written display. With a different set of applied voltages, the screen (target) operates in the conventional mode, similar to a conventional crt.

Flood Guns and Collimation Electrodes

Two low-energy electron guns (flood guns) are used in the 314 crt. The cathodes are connected to −120 volts through the Integrate switch, S565, and R565, VR564, and VR565. The voltage drop across VR564-VR565 sets the voltage level of the cathode at about −90 volts. The flood gun anode and the geometry electrode are connected together, and the voltage levels of these electrodes are set by adjustment R575, through Q574.

The collimation electrodes serve as an electrostatic lens to distribute the flood gun electrons uniformly over the storage target, and have no effect on the landing energy of the electrons. R568 determines the voltage level of CE, through Q570 and R573.

Target-Control Amplifier

The Target Control Amplifier is used to maintain a high degree of control of storage backplate voltage. These amplifiers are emitter-follower feedback amplifiers consisting of Q523, Q525, and Q528. A bootstrapping circuit is provided for each target control amplifier to maintain transistor operating voltage during the positive-going portion of the erase waveform (fade positive). The bootstrapping circuits are described in full detail in the Erase Generator description. Operating level of the storage backplate is set by R519, Operating Level.

Erase Generator

To erase the stored display, a fade-positive pulse is first applied to the storage target backplate. This pulse increases the potential difference between the flood-gun cathodes and target backplate, raising the operating level above the upper writing limit, writing the entire target areas with flood-gun electrons. Next, the backplate voltage is pulled negative, well below the retention threshold. Then, as the backplate is gradually returned, the target is charged to the rest potential and returned to the ready-to-write state. The following paragraphs describe how the erase waveform is generated.

The Erase Multivibrator is composed of Q510, Q511, and Q512, and associated circuitry. This is a monostable multivibrator with Q510 quiescently saturated and Q511 biased off. The collector of Q512 is clamped slightly above ground by the conduction of CR513. C509 is charged to the voltage difference between the junction of R508-R509 and the collector level of Q512.

When the ERASE button is pushed, the contacts of S500B are closed, grounding the junction of R501-R502. This produces a negative-going step which turns Q510 off and Q511-Q512 on. The collector of Q512 moves down very close to −12 volts as Q512 saturates and conducts through R512 and Q523. The output of the feedback amplifier steps positive, pulling the target backplate with it. This positive step increases the operating level of the crt and the entire target area is written.

When Q512 turns on, the negative step produced at its collector is also coupled through C509, which turns CR508 off, ensuring cutoff of Q510. C509 begins to discharge through R509, and after an RC-controlled period, the current through R509 has diminished sufficiently to permit the voltage at the anode of CR508 to rise above the turn-on level. The base of Q510 is also raised to the turn-on level and the multivibrator is switched back to its quiescent state.

While Q512 is conducting, the charge on C513 is removed. When Q512 turns off, its collector rises rapidly and is clamped slightly above ground by CR513. This positive-going step is coupled through C513, reverse-biasing CR516. This positive-going step is applied to the input of the feedback amplifier, causing the output to step quickly negative, well below the rest potential. As C513 charges, the voltage at the junction of R515-R516 decays at an RC rate until CR516 turns on and clamps the junction of R515-R516 at about −12.5 volts. This negative-going sawtooth voltage is applied to the feedback amplifier, which produces a positive-going sawtooth at its output to raise the backplate to the ready-to-write state.

Bootstrapping maintains operating voltage for Q525 and Q528 during the fade-positive portion of the erase waveform when the emitter of Q528 is pulled positive. The voltage drop across VR527 sets the base of Q530 approximately 51 volts below the emitter of Q528. This voltage drop is kept constant under dynamic conditions by the essentially constant current established by Q530 forward-bias voltage. When Q528 emitter is suddenly stepped positive by the erase waveform, the base of Q530 is stepped positive by the same amplitude. Q530 emitter follows the base, and the positive-going step is coupled

through C530 to raise the collector of Q528 positive by essentially the same amplitude as that at its emitter, thus maintaining a fairly constant collector-to-emitter voltage. This action reverse biases CR528, temporarily disconnecting the +100-volt supply. When the fade-positive pulse is terminated and the emitter of Q528 is pulled negative, CR529 turns off, disconnecting the bootstrap circuit, allowing the collector of Q528 to return to its +100-volt level.

Enhance Generator

Writing speed is primarily a function of the writing-gun beam current density and physical properties of the storage tube. At very fast sweep speeds, the writing beam does not charge the scanned portion of the target sufficiently to shift the target to the stored state, and the flood-gun electrons discharge the small deposited charge back down to the rest potential before the next sweep occurs.

Writing beyond the normal writing speed of the crt is attained through the process of enhancement or integration.

The Enhance Generator produces an approximate 10-millisecond, negative-going pulse, which is applied to the feedback amplifier summing point, resulting in a positive-going pulse to the target backplate. This conditions the target so that less writing-gun current is required to shift the scanned section to the stored state.

Q535, Q537, and associated circutry form a monstable multivibrator. Operation of this circuit is similar to that described for the Erase multivibrator. When the ENHANCE button is pushed in, Q535 has a conduction path to ground through R535. Q535 saturates and the low voltage level at Q535 collector keeps Q537 turned off. The negative-going portion of the enhance trigger pulse from the sweep circuit is coupled through C532 to switch the Enhance multivibrator. Q535 turns off and Q537 turns on. The collector of Q537 steps down to about −12 volts, producing a negative-going step that is coupled through C535, turning CR533 off. The time that the multivibrator remains in this state, and thus the pulse width, is determined by the values of R534 and C535. The setting of ENHANCE LEVEL control R537A determines the amplitude of the pulse that is applied to the feedback amplifier summing point.

Auto Erase

The Auto Erase circuit provides a repetitive trigger pulse to the Erase multivibrator. When the AUTO ERASE button is pushed in, a trigger is generated after each sweep. A Reset Delay multivibrator is also triggered, which resets the Time Base Single Sweep circuit.

The viewing time can be varied from approximately 1 second to approximately 5 seconds.

Auto-Erase Generator

Q545-Q548 and associated circuitry form a monostable multivibrator. Q545 is an N-channel FET that permits conduction when its gate is grounded through R542 and R537B, VIEWING TIME. Q545 is quiescently conducting and the low-voltage level at Q545 drain keeps Q548 turned off.

When the sweep ends, the negative-going pulse from the Sweep Generator is applied to Q545 gate through C540, R540, and C541. Q545 turns off and Q548 turns on. Q548 collector steps to near ground level. This negative step at Q548 collector is coupled through C548, ensuring Q545 cutoff. C548 then begins to discharge through R542 and R537B. After the time determined by the RC value of C548 and R537B, Q545 gate level recovers sufficiently to permit Q545 to turn on. At Q545 turn on, the negative-going step at Q545 drain turns Q548 off, and the multivibrator switches back to its quiescent state.

The negative-going step produced at Q545 drain is also coupled through C546 and CR550, initiating an erase cycle in the Erase Generator circuit. The stored information is therefore erased after the time period determined by the VIEWING TIME control.

The negative-going pulse at Q545 drain is also applied to the Sweep Reset Delay Multivibrator circuit.

Sweep Reset Delay Multivibrator

When the instrument is operating in the Auto Erase mode, the Sweep Reset Delay acts as a monostable multivibrator. This delay multivibrator generates a sweep reset after each erasure.

Q555, Q557, and associated circuitry form a monostable multivibrator. When the AUTO ERASE button is pushed in (in Single Sweep mode), Q577 is turned on and Q555 is turned off in the quiescent state. C555 is charged to the voltage difference between Q555 collector and R558-R559 junction. The negative-going pulse from the Auto Erase Generator is coupled through R551, C551, and CR560 to switch the Sweep Reset Multivibrator, turning Q557 off and Q555 on.

Q555 collector steps down to about −12 volts. This negative-going step is coupled through C555, turning CR557 off. After a time determined by R559 and C555 (C555 charges through R559), CR557 anode rises above its cathode, turning Q557 on and Q555 off. When Q555

turns off, the positive step at Q555 collector is coupled through C554 to reset the Sweep Generator.

The Q555 "on" time is the sweep reset delay time.

Integrate

In the Integrate mode the flood-gun beam is interrupted by pressing the INTEGRATE button (S565) momentarily, permitting the writing-gun beam to sum small amounts of charge for successive sweeps. These areas of accumulated charge shift to the stored state when the flood electrons are turned on again (INTEGRATE button released).

Pressing the INTEGRATE button also connects about −90 volts to the high-voltage regulator HV Compensation input. This −90 volts, through R722B, shifts the high-voltage level slightly, correcting for the deflection-sensitivity changes that occur when the flood guns are turned off.

POWER SUPPLY ⑧

General

Fig. 3-12 is a block diagram of the power supply circuitry. The Power Supply provides input voltage source selection, dc-to-dc converter, series regulator, current protection, automatic turn off, and the low line indicator.

AC Power Input

Power is applied to the primary of transformer T600 through Line Fuse F600; POWER switch S600; Line-Voltage selector switch S601; and the Regulating Range

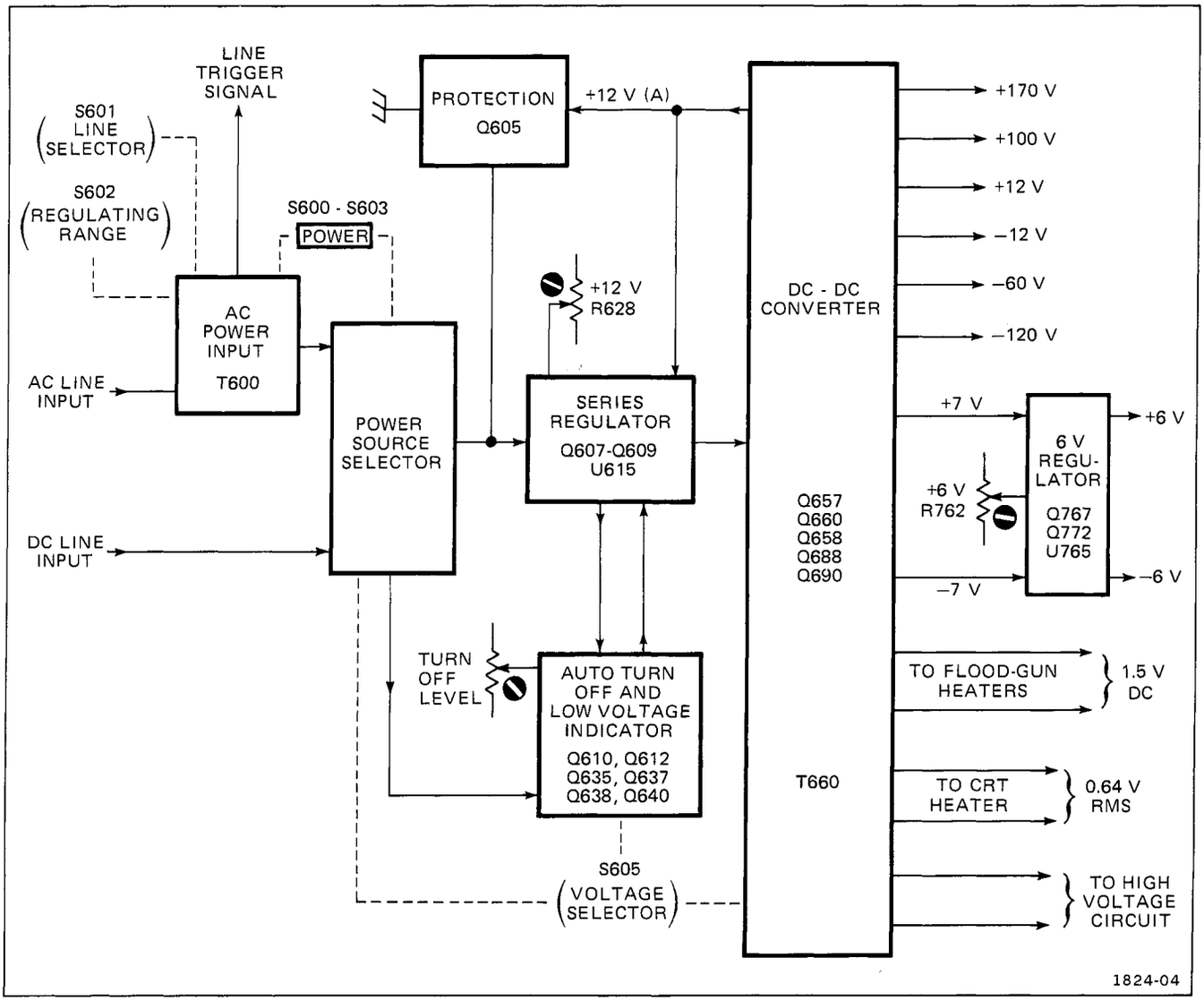


Fig. 3-12. Power Supply block diagram.

selector switch, S602. The Line-Voltage selector, S601, connects the split primaries of T600 in parallel for 115-volt operation and in series for 230-volt operation.

The Line Fuse, F600, should be of the proper value for each nominal line voltage to protect the instrument. Fuses are internally accessible. Procedures for fuse replacement and cabinet removal may be found in the Maintenance section of this manual. Refer fuse replacement to qualified service personnel only. See Electrical Parts List for correct fuse values.

Power Source Selector

The Power Source selector switch, S605, selects one of three sources: 115/230-V ac, +12-V dc, or +24-V dc. The regulating ranges (HI-LO-MED) of these voltages are listed on the rear cover of the instrument.

Series Regulator

The Series Regulator circuit regulates the output of the dc-to-dc Converter circuit.

U615, Q607, and Q609 and associated circuitry make up the series regulator circuit. U615 includes a comparator amplifier and a reference voltage output. Q609 serves as a regulating device. R627, R628, and R629 form the output voltage monitoring system.

The voltage from R628 (voltage-monitor output) is applied to one input (pin 2) of U615. The other comparator input (pin 3) receives a reference voltage from pin 4 of U615 through R626. The monitoring voltage is compared to the reference voltage, and any error voltage is amplified in U615. The amplified error voltage (at pin 7 of U615) drives Q607 and Q609. This drive from pin 7 of U615 controls Q607 impedance, holding the dc-to-dc converter output voltage constant. R628, +12 V Adjust, sets the converter output level.

DC-to-DC Converter

The converter multivibrator (Q657, Q660, Q658 and T665) converts the dc supply voltage (from Q607) to ac. This ac is applied to T600 primary. T600 secondary voltages are rectified to provide dc operating voltages for the instrument.

The voltage at +12(A) provides the dc voltage to the comparison divider R627, R628, and R629.

Regulator Protection

If the input voltage to the Series Regulator circuit rises above about +40 volts, Q605 (SCR) turns on and is held in the on state. When Q605 conducts, the input to the Series Regulator is short circuited to ground through R602. The large current drawn by R602 opens the line fuse.

Auto Turn Off

When the input level of the Series Regulator falls below the specified levels (about +20.5 volts in the 115/230-volt ac and the +24 V dc positions of Power Source selector switch S605 or about +10.75 volts in the +12 V dc position), Q612 and Q610 turn on. Q607, through Q609 and U615, turns off, preventing the operation of the dc-to-dc converter.

Low-Line Indicator

When the input level of the Series Regulator falls below the specified levels (about +22 volts in the 115/230 V ac and +24 V dc position of Power Source selector switch S605, or about +11 volts in the +12 V dc position), Q635 turns on. The reference for Q635 and Q637 bases is pin 4 of U615. When Q635 turns on, astable multivibrator Q638-Q640 runs at about two hertz, causing low-line indicator to blink.

+6 V and −6 V Regulators ◈9

The +12-volt supply and VR760 provide the reference voltage for the +6-volt regulator. R762 adjusts the output to 6 volts. U765 is the regulator and Q767 the pass transistor.

U765B is the regulator for the −6-volt supply, with the +6-volt supply providing the reference voltage. Q772 is the −6-volt pass transistor.

HV AND UNBLANKING ◈10

General

This circuit provides the high voltage and control circuitry for crt operation. Fig. 3-13 is a block diagram of the circuit.

High Voltage and CRT

Multiples of T660 secondary voltage are obtained between CR692A cathode and CR692F anode. CR692E (cathode) is connected to one end of the voltage divider network, R697 through R707. The R707 end of the divider connects to CR692F anode, providing operating voltage for Q700. This divider network also provides voltages for the Intensity and Focus controls and the crt writing-gun cathode. Any change in the writing-gun cathode level is fed back to a series regulator circuit (Q710, Q712, and Q717) through feedback resistor R712. This series regulator circuit amplifies and inverts the error signal. The

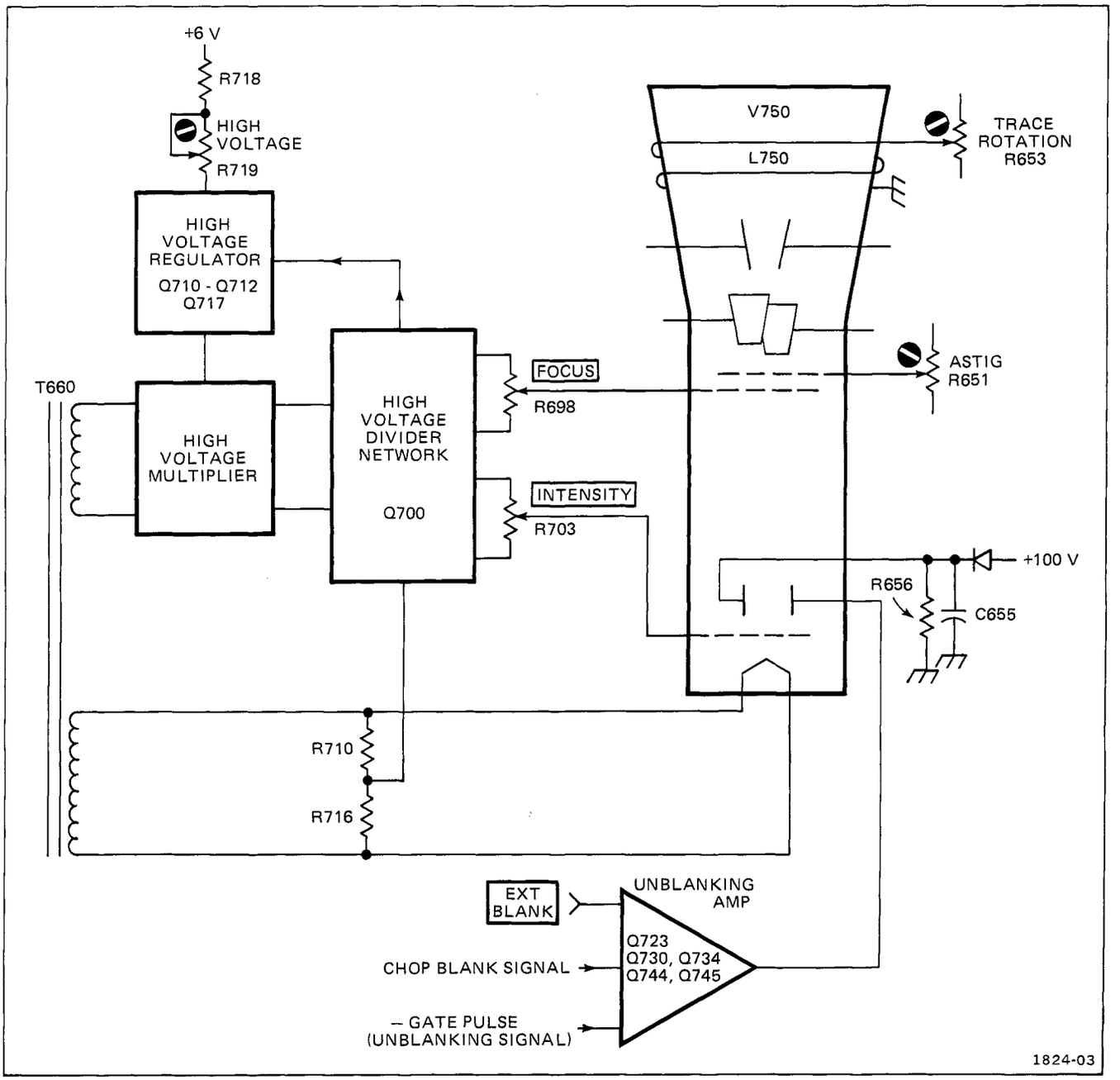


Fig. 3-13. CRT and H V block diagram.

amplified and inverted signal is applied to CR692F anode (via transformer winding and high-voltage multiplier) thus holding the writing-gun cathode level constant.

R719 sets the writing-gun cathode level at −1900 volts in the non-store mode.

Difference in crt sensitivity between store and non-store modes are compensated by R721, High Voltage Compensation.

The Intensity Limit control, R702, sets the minimum difference voltage that can exist between the crt control grid and cathode, thus preventing excessive crt cathode current. For SN 300200 and up, an additional control, R706, provides a second Intensity Limit adjustment to prevent excessive crt cathode current at sweep speeds of 10 ms and slower.

Focus Control R698 in combination with R651 (Astig) determines trace sharpness. Only the Focus control is used during routine operation, and provides a sharp trace

at any intensity setting, once the Astig control has been set.

Geometry Control R575 adjusts for minimum bowing of horizontal and vertical traces within the graticule area.

Trace Rotation control R563 sets the current in the Trace Rotation coil, creating a magnetic field through which the crt electron beam passes. This current permits the horizontal trace to follow a path parallel to the horizontal graticule lines.

Blanking and Unblanking

Signals for unblanking come from one of three sources: Sweep output (U430, pin 15, −Gate), the vertical switching circuit (chopped mode), or the EXT BLANK connector on the rear panel.

The Unblanking amplifier (consisting of Q723, Q730, Q734, Q744, Q745, and associated circuitry) provides crt beam blanking during sweep retrace and during switching interval in chopped mode.

C655-R656 hold the undriven blanking plate at a higher potential than that of the driven plate for a brief period after oscilloscope turn off. This voltage blanks the crt beam until the high voltage power supply discharges and the crt heater cools.

MAINTENANCE

This section contains information for performing preventive maintenance, troubleshooting and corrective maintenance.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning and visual inspection. Preventive maintenance, performed on a regular basis, may prevent instrument breakdown and will ensure the reliability of the instrument. The severity of the environment in which the instrument is used determines the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration.

Cleaning

The 314 should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. Dirt also provides an electrical conduction path that may result in instrument failure. The cabinet reduces the amount of dust reaching the interior. Operating the instrument without the cabinet in place necessitates more frequent cleaning.

CAUTION

Avoid the use of chemical cleaning agents that might damage the plastics used in the instrument. In particular, avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Exterior. Loose dust accumulated on the outside of the 314 can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt on and around the front panel controls. Dirt that remains can be removed with a soft cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

Interior. Dust in the interior 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-pressure air. Remove any remaining dirt with a soft brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Visual Inspection

The 314 should be inspected occasionally for such defects as broken connections, improperly seated semiconductors, damaged circuit boards, and heat-damaged parts.

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

Semiconductor Checks

Periodic checks of the semiconductors in the 314 are not recommended. The best check of semiconductor performance is actual operation in the instrument. More details on checking semiconductor operation are given under troubleshooting.

Recalibration

To ensure accurate measurments, check the calibration of the instrument after each 1000 hours of operation, or every 6 months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. The Adjustment Procedure can also be helpful in localizing some troubles in the instrument. In some cases, minor troubles may be revealed or corrected by readjustment.

TROUBLESHOOTING

The following information is provided to facilitate troubleshooting of the 314. Information contained in other sections of the manual should be used with the following information to aid in locating defective components. An understanding of circuit operation (see the Theory of Operation section) is very helpful in locating troubles.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 314:

1. A dynamic semiconductor tester such as the Tektronix 577-177-178 Curve Tracer System, a Tektronix 576 Curve Tracer, a 7CT1N Curve Tracer plug-in unit and a 7000-Series Oscilloscope system, or a 5CT1N Curve Tracer plug-in unit and a 5000-Series Oscilloscope.

2. A multimeter having at least 10 megohm input resistance; dc voltage range, 0 to 2000 volts; and an ohmmeter. Accuracy on the dc voltage scale should be within 2% of full scale.

3. A test oscilloscope with a frequency response of dc to 10 megahertz; deflection factors from 1 mV/Div to 10 V/Div. A 10X, 10 megohm voltage probe should be used to reduce circuit loading in high-impedance circuits.

Troubleshooting Chart

Fig. 4-1 is a guide for locating a defective circuit. Start at the top of the chart and perform the checks given on the left side of the page until a step is found that does not produce the desired results. Further checks, or the circuit in which the trouble is probably located, are listed to the right of each step. This chart does not include checks for all possible defects.

After the trouble area has been located, locate the defective component, using one or more of the procedures following this chart.

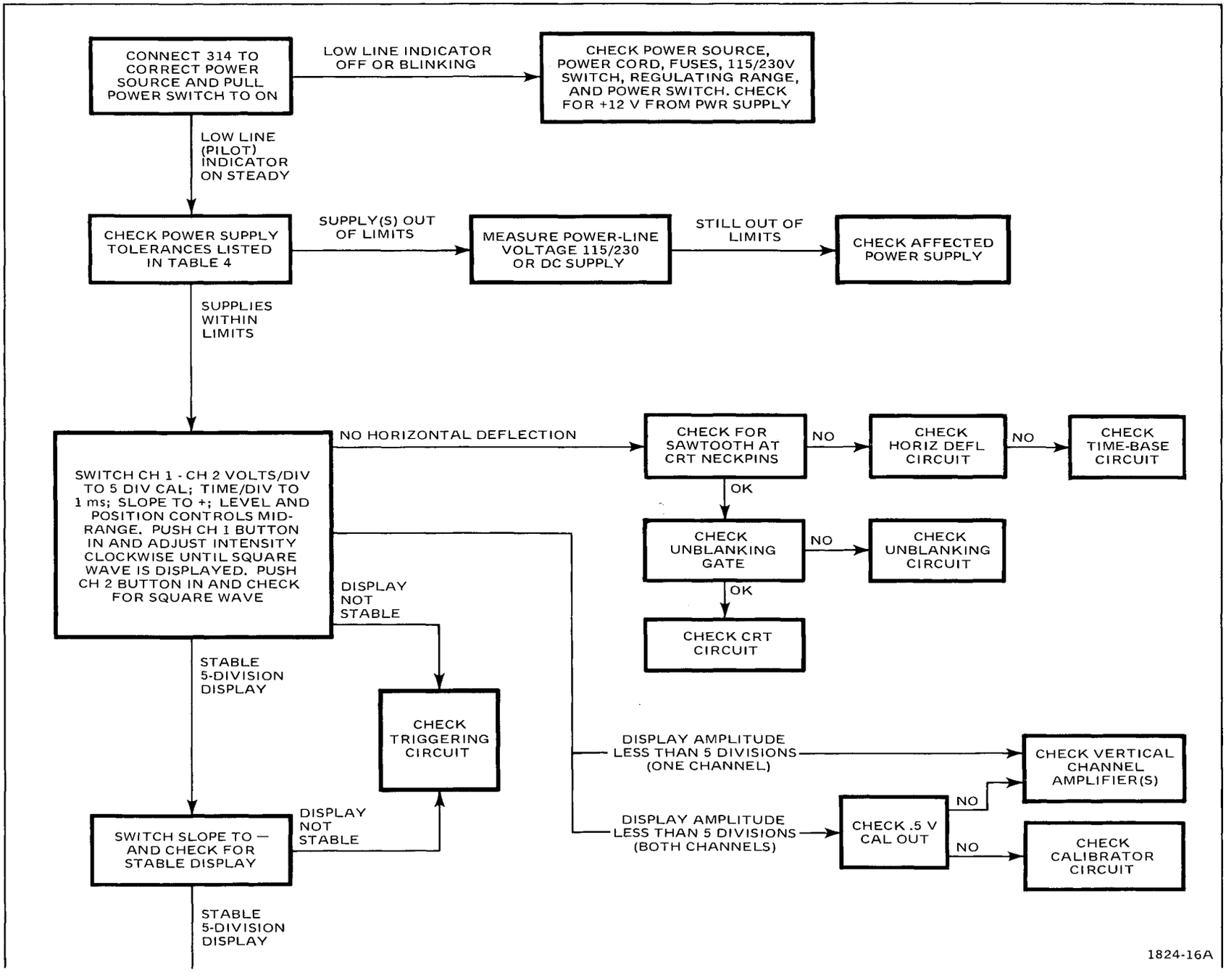


Fig. 4-1. Troubleshooting chart.

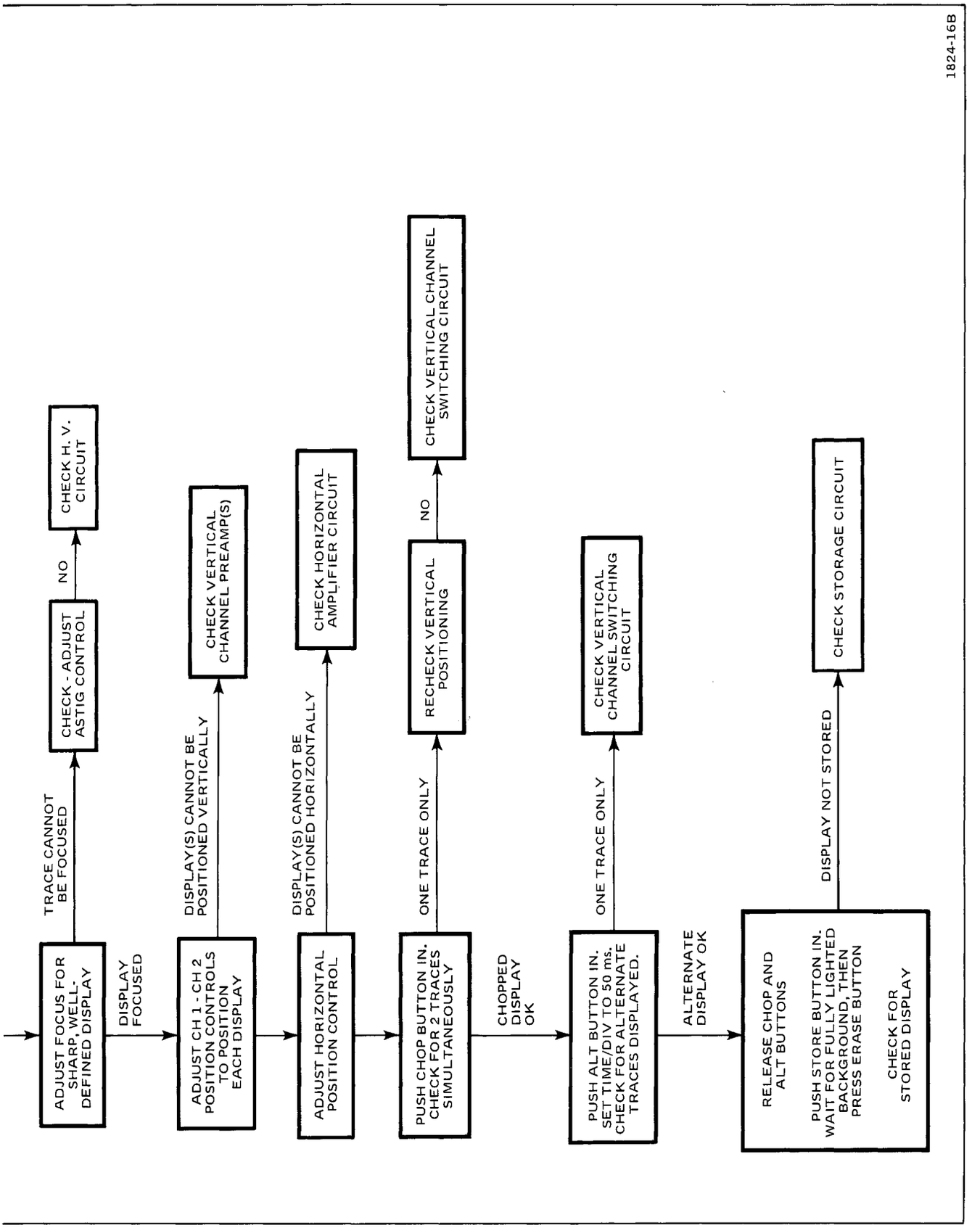


Fig. 4-1. Troubleshooting chart (cont).

Troubleshooting Techniques

This troubleshooting procedure is arranged to check the simple trouble possibilities before proceeding with extensive procedures. The first few checks ensure proper connections, operation, and calibration. If the trouble is not located by these checks, the remaining steps aid in locating defective components.

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 Operators Manual.

2. Check Associated Equipment. Before proceeding with troubleshooting, be certain that the equipment used with the 314 is operating and connected correctly. Check for a defective power supply and interconnecting cables.

3. Visual Check. Many troubles (such as unsoldered connections, broken wires, damaged circuit boards, damaged components, etc.) can be located by visual inspection.

4. Check Instrument Calibration. Check the calibration of the instrument, or the affected circuit if the trouble appears to be in one circuit. The apparent trouble may be a result of misadjustment and may be corrected by readjustment. Complete adjustment instructions are given in the Adjustment Procedure.

5. Isolate Trouble to a Circuit. To isolate trouble to a circuit, note the trouble symptom. The symptom often identifies the circuit in which the trouble is located. For example, poor focus indicates that the crt circuit is probably at fault. When trouble symptoms appear in more than one circuit, check the affected circuits by checking voltages.

Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltages of the individual supplies and determine if one or more supplies is out of regulation. However, a defective component elsewhere in the instrument can appear as a power-supply trouble and may affect operation of other circuits.

If incorrect operation of the power supplies is suspected, check each supply for correct voltage (use a digital voltmeter, preferably one that is accurate to within 0.1%) and check ripple with a test oscilloscope. See Table 4-1 for voltage and ripple tolerances. The voltages shown in Table 4-1 are measured between the power-supply test points and chassis ground. Power-supply test points are shown in Fig. 4-2.

TABLE 4-1

Voltage and Ripple Tolerances

Supply	Accuracy (initial)[1] within	Accuracy (after 200 hrs)[2] within	Ripple max
−6 V	4%	5%	10 mV
+6 V	3%	4%	10 mV
−12 V	3%	4%	200 mV
+12 V	3%	4%	200 mV
−60 V	10%	11%	600 mV
−100 V	5%	6%	300 mV
−120 V	(−4%, +6%)[3]	(−4%, +7%)[3]	200 mV
+170 V	5%	6%	8 V
−1900 V	2%	3%	------

[1]Initial setting, +20° C to +30° C (68° F to 86° F).
[2]Any 500 hour period after the first 200 hours.
[3]In Store mode.

6. Check Voltages and Waveforms. Often the defective component can be located by checking for the correct voltage or waveform in the circuit. Refer to the diagrams section for voltages and waveforms.

7. Check Individual Components. The following procedure describes methods of checking individual components in the 314. Two-lead components that are soldered in place are best checked by first disconnecting one end of the component. This isolates the measurement from the effects of surrounding circuits.

CAUTION

Disconnect the power source before removing or replacing semiconductors to avoid damage to the device and for protection from device cases operated at elevated potentials.

A good check of transistor operation is actual performance under operating conditions. A transistor can be most effectively 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.

A good understanding of circuit operation is desirable when troubleshooting circuits using integrated circuits. Use care when checking voltages and waveforms around the IC's so that adjacent leads are not short circuited. A convenient means of clipping a test probe to dual-in-line IC packages in with an IC test clip. This test clip also serves as an extraction tool. The lead configuration for the semiconductors used in this insturment are shown in Fig. 7-2 on a pullout page preceding the diagrams.

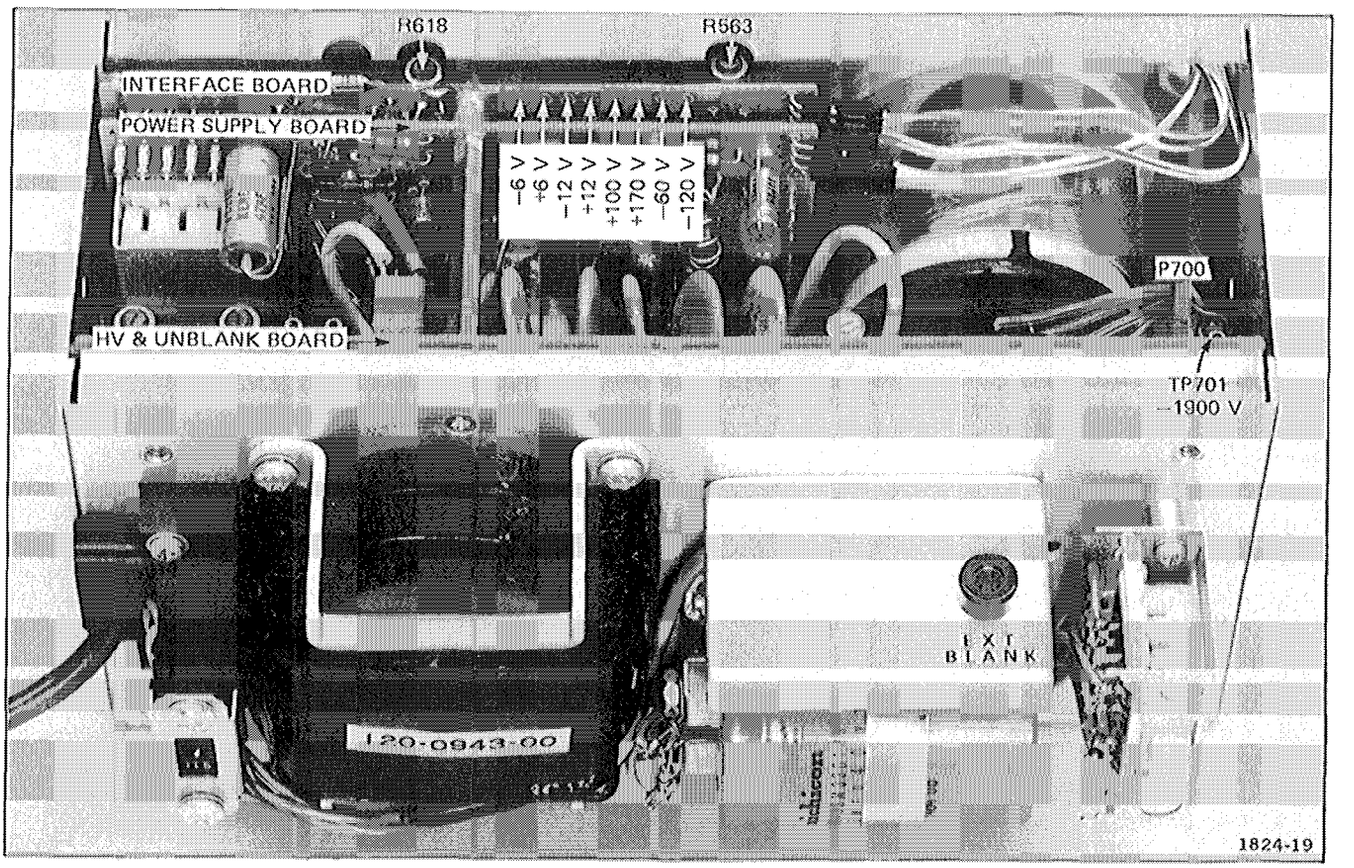


Fig. 4-2. Location of power supply test points.

A diode can be checked for an open or a short circuit by measuring the resistance between terminals using an ohmmeter on the R x 1 k scale. The diode resistance should be very high in one direction and very low with the meter leads reversed.

CAUTION

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

Check resistors with an ohmmeter. See the Electrical Parts List for resistance tolerances. Resistors normally need not be replaced unless the measured value varies widely from the specified value.

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

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

CORRECTIVE MAINTENANCE

Special techniques required to replace components in the instrument are given here.

Obtaining Replacement Parts

All electrical and mechanical parts replacement for the 314 can be obtained through your Tektronix Field Office or representative. However, many of the standard electrical components can be obtained locally in less time than is required to order from Tektronix, Inc. Before purchasing an ordinary part, 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 its performance in the instrument. All replaceable parts should be direct replacements unless it is known that a different component will not adversely affect instrument performance.

Some parts are manufactured or selected by Tekt Inc., to satisfy particular requirements, or are manufactured for Tektronix, Inc., to our specifications. Most of the mechanical parts have been manufactured by Tektronix, Inc. To determine the manufacturer a part, refer to the Parts List cross index of code-number to manufacturer.

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

1. Instrument type.

2. Instrument serial number.

3. A description of the part (if electrical, include circuit number).

4. Tektronix part number.

Component Removal and Replacement

WARNING

Disconnect the instrument from the power source before removing or replacing any components. Dangerous potentials exist at several points throughout this instrument. Only qualified service personnel should attempt component replacement or other internal maintenance procedures.

The exploded view drawings associated with the Mechanical Parts List (Section 8) may be helpful in the removal and replacement of individual components or sub-assemblies. Fig. 7-2 in the Diagrams section shows the locations of circuit boards within the instrument.

Fuse Replacement

Fuses are located inside the instrument. See Fig. 7-4 on Adjustment Locations pullout for fuse locations. Refer to the Electrical Parts List for correct fuse values.

Instrument Cabinet

a. Loosen the 4 screws holding the cabinet feet (cord wrap) and remove the cord-wrap feet.

b. Remove the gray-plastic rear cover.

c. Loosen (do not remove) the 2 screws holding the power cord strain relief (115/230 V ac selector switch mounting) and slide the strain relief toward instrument center.

d. Remove 2 screws below the connector panel on the right side of the cabinet.

e. Remove 2 screws from the cabinet bottom.

f. Position the handle to clear the instrument and slide the cabinet off the rear of the instrument.

g. To replace the cabinet, reverse the foregoing procedure. Be sure the power cord does not become looped through the side-panel cutout.

Storage-Time/Div Module

a. Loosen 2 screws at the bottom of the plastic crt bezel. The screws are captive; do not remove.

b. Lift the bezel away from the crt face.

c. Remove horizontal deflection plate leads from the crt neck pins.

d. Pull the connector (orange-blue-on-gray shielded cable) away from the pins near the right-side-front of the horizontal circuit board.

e. Remove the screw from the rear-center of the Storage circuit board.

f. Pull the module away from the instrument chassis, carefully removing the shielded cable as the module is pulled out.

g. To replace, reverse the foregoing procedure.

CRT (with power supply section of instrument in place)

a. Loosen 2 screws at the bottom of the plastic crt bezel. The screws are captive; do not remove.

b. Lift the bezel away from the crt face.

c. Remove horizontal and vertical deflection-plate leads from the crt neck pins.

d. Remove the connector (brown-on-white, red-on-white leads) from P768. Pull the cable through the hole in the chassis.

e. Carefully remove the crt base socket while pushing the crt forward. When the socket has been removed, push the crt forward. Pull the crt from the shield. The 2-conductor cable mentioned in part d comes out with the crt.

Power Supply-High Voltage Section

a. Remove 3-pin connector (white-brown, white-red, white-orange) and two 2-pin connectors (white-blue, white-green and white-brown, white-red) from corner of the Interface circuit board (see Fig. 4-3A). Note wire colors relative to the positions of board pins.

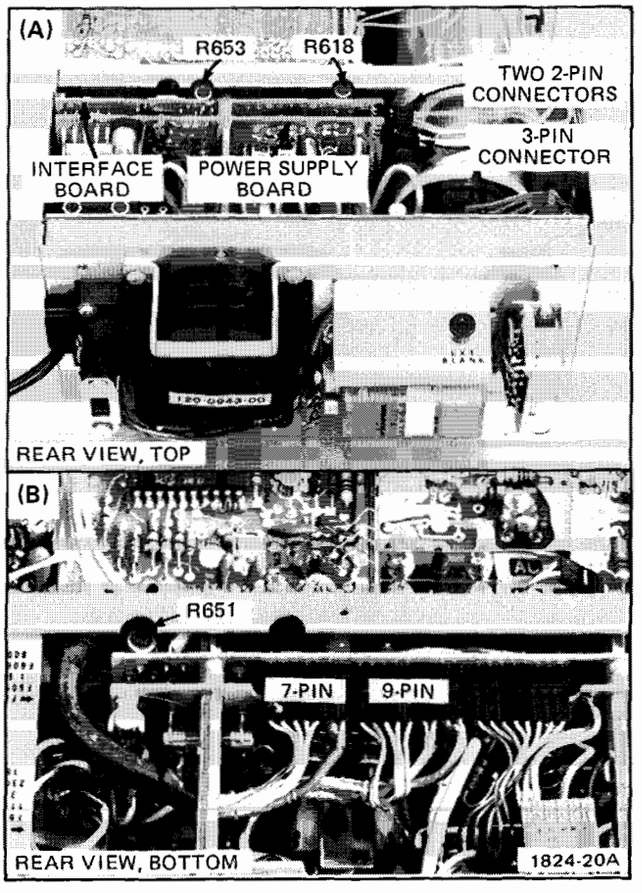


Fig. 4-3. Location of connectors.

b. Remove 2 screws holding the 30-pin connector to chassis. See Fig. 4-4A.

c. Loosen socket-head screws on Focus and Intensity control shafts at the insulated flexible connectors near the controls. Loosen socket-head screw from the collar on the Intensity control shaft.

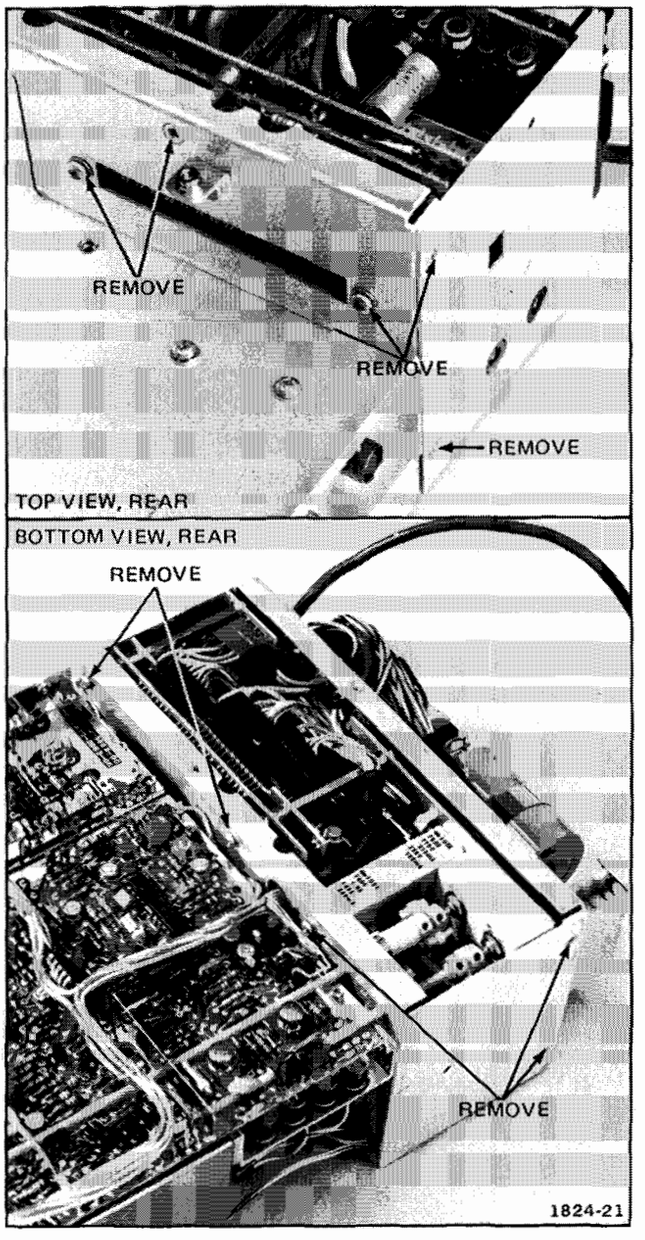


Fig. 4-4. Locations of screws holding power supply section to main chassis.

d. Remove Focus and Intensity shafts through the front of the instrument.

e. Disconnect 7- and 9-pin connectors (see Fig. 4-3B) from the Interface circuit board.

f. Remove 8 screws (shown in Fig. 4-4).

g. Pull power supply section away from the chassis far enough to gain access to additional connectors.

h. Disconnect the red, 6-pin connector from P700 on H V & Unblank circuit board.

i. Disconnect the black, single-pin connector from P740 on H V & Unblank circuit board.

j. Disconnect the black 5-pin connector from P650 on Interface circuit board.

k. The power supply is now free of the body of the instrument. To replace, reverse the foregoing procedure.

Interface Board (Assembly A8)

a. Remove 8-pin connector from Interface board (see Fig. 4-5).

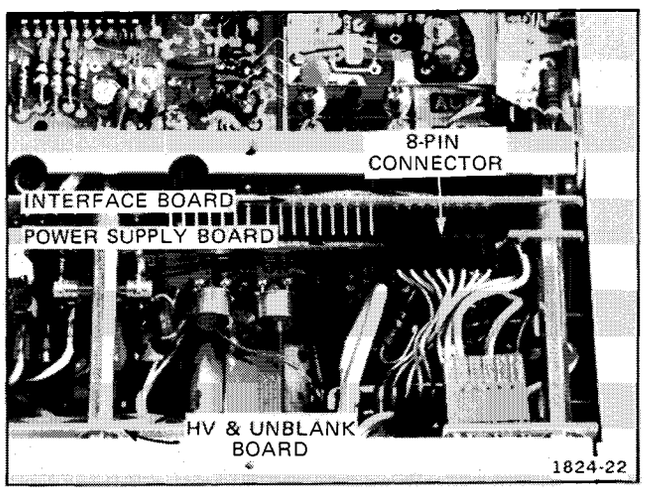


Fig. 4-5. Location of 8-pin connector in power supply.

b. Remove 3 hexagonal spacers (see Fig. 4-6).

c. Hold the Power Supply circuit board with one hand while pulling Interface circuit board away from the Power Supply circuit board. Pull the Interface board evenly to prevent damage to the inter-board connecting pins.

d. Remove 3 short cylindrical spacers remaining when the Interface board is removed.

e. To replace, reverse the foregoing procedure.

Power Supply Circuit Board (Assembly A7)

a. Disconnect (note position of) red and black connectors from the power on-off switches (P606 connector, black, and P605 connector, red).

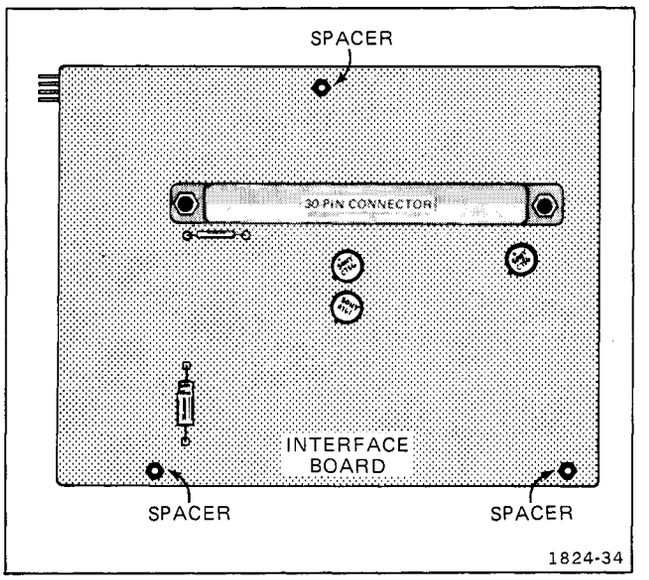


Fig. 4-6. Location of hexagonal spacers on Interface circuit board.

b. Remove the red connector (6-pin) that connects to the H V & Unblank circuit board.

c. Remove 3-pin connector (red) from P692.

d. Remove 2-pin connector (red) from P710.

e. Remove 2 screws holding the heat sink bracket. See Fig. 4-7.

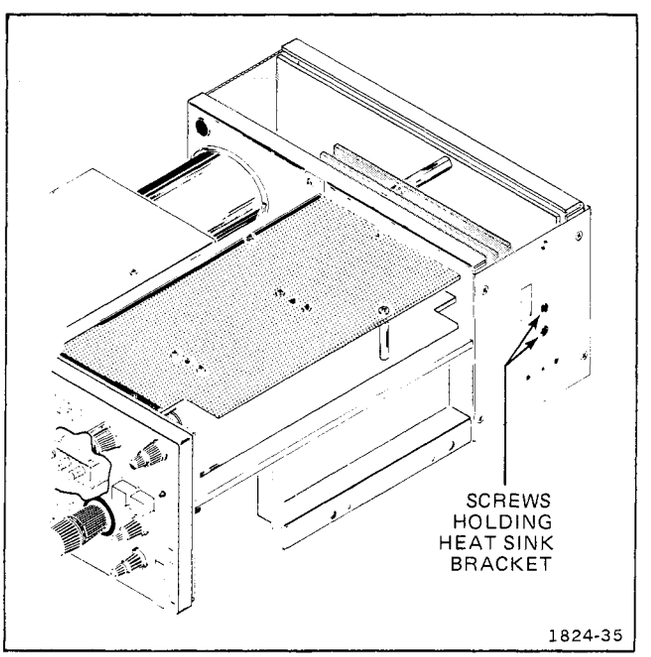


Fig. 4-7. Location of screws holding heat-sink bracket.

f. Remove the Power Supply circuit board very carefully to prevent damage to the power transistors mounted on the heat-sink bracket.

g. To replace, reverse the foregoing procedure.

H V & Unblank Circuit Board (Assembly A6)

a. Remove the 3 threaded hexagonal spacers.

b. Remove the 2 screws near Intensity and Focus controls (see Fig. 4-8). Loosen the 2 screws (do not remove) shown in Fig. 4-9.

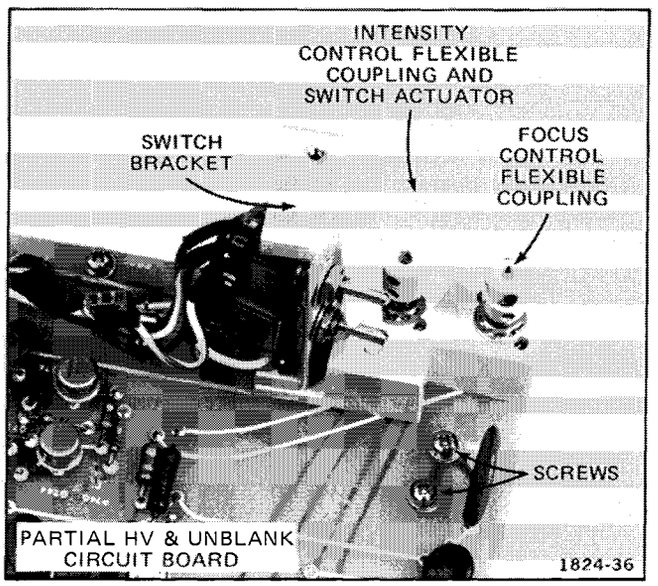


Fig. 4-8. Location of screws near Focus and Intensity controls.

c. Disconnect black 2-pin connector from P726.

d. Disconnect black 5-pin connector from P601.

e. Unsolder leads from the circuit board terminals C (black-on-gray), A (black), P (red-on-white), and G (black).

f. Remove the 2 screws holding the power switch bracket to the chassis.

g. Remove the circuit board.

h. To replace, reverse the foregoing procedure.

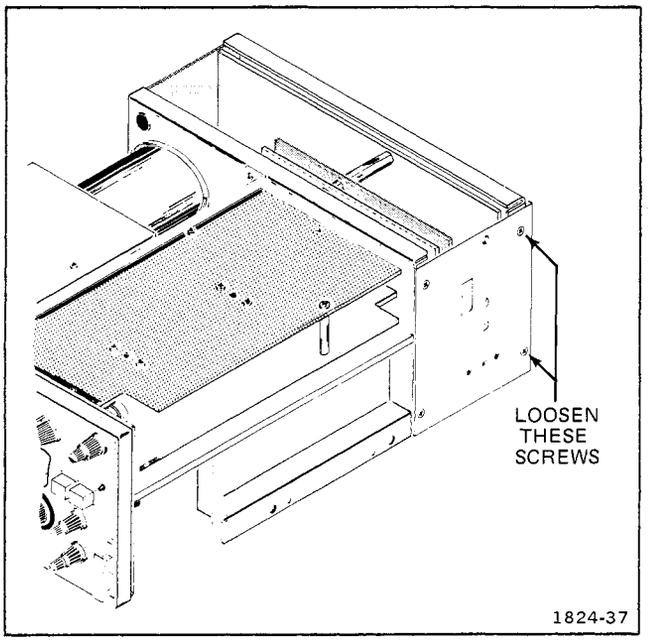


Fig. 4-9. Location of screws on power supply section.

Storage Circuit Board (Assembly A5)

a. Remove the 8 screws (see Fig. 4-10) holding the Storage circuit board to the module.

b. Carefully pull Storage circuit board away from the assembly. Do not bend inter-board connecting pins.

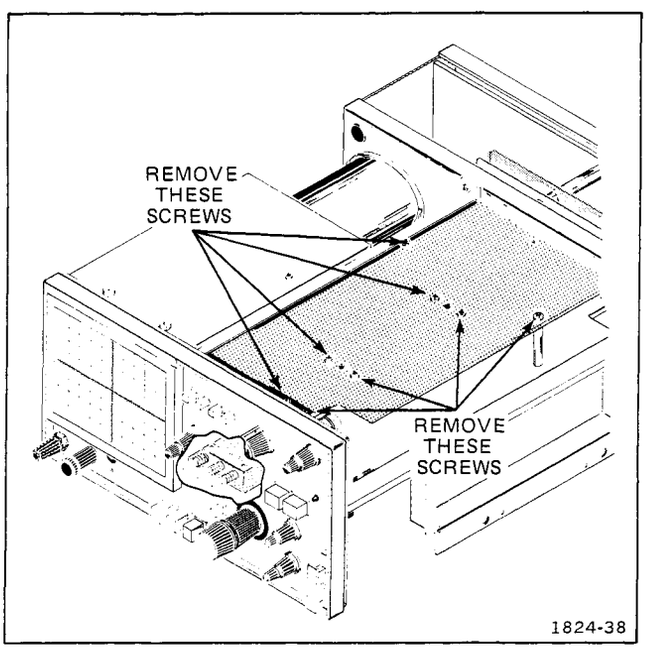


Fig. 4-10. Location of screws holding Storage circuit board to module.

c. Unplug one 5-pin connector (from P537) and one 3-pin connector (from P565) on the Storage circuit board.

d. Unsolder the blue-blue-on-gray shielded leads from the Store switch terminals.

e. To replace, reverse the foregoing procedure.

Horizontal Circuit Board (Assembly A4)

a. Leave the cam switch screws (through the Storage circuit board) in place to maintain cam block assembly alignment.

b. Unsolder the RESET button leads from the Horizontal circuit board.

c. Remove the TIME/DIV knob.

d. Loosen 2 set screws in front half of the flexible coupling on the end of Variable (CAL) shaft and remove the shaft through the front panel.

e. Remove POSITION and SWEEP MAG knobs.

f. Remove ENHANCE LEVEL and VIEWING TIME knobs.

g. Remove hex nuts holding the Position, Sweep Mag, and Enhance Level controls.

h. Remove the front panel and overlay.

i. Disconnect all connectors and record the P number to which each was connected.

j. Remove the Integrate switch from the sub-panel.

k. Remove 8 screws (see Fig. 4-11) that hold the Horizontal circuit board to the module assembly.

l. Carefully separate the horizontal circuit board from the remaining assembly.

CAUTION

Do not bend inter-board connecting pins, and avoid bending or distortiong the cam switch contacts on the Horizontal circuit board.

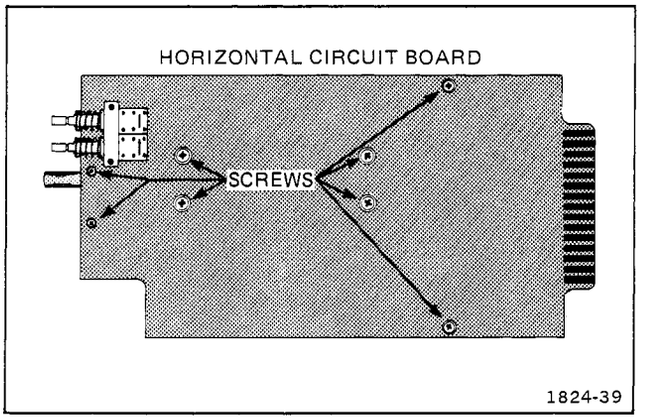


Fig. 4-11. Location of screws holding Horizontal circuit board to module assembly.

NOTE

The cam switch shaft-grounding springs and hex nuts in the bearing blocks are not captive and may drop out. Note the position of these items in case one should fall out.

m. To replace the circuit board, reverse the foregoing procedure.

Attenuator Circuit Board (Assembly A1)

a. Unsolder the 8 leads shown in Fig. 4-12 from the Vertical circuit board.

b. Unsolder 2 grounding braids from the Vertical circuit board.

c. Unsolder two shielded (orange) leads from the standoff terminals A, AG, D, and DG. When replacing these leads, remember that the shields go to the AG and DG terminals.

d. Disconnect the 2-terminal connector from P300.

e. Remove 3 screws holding the attenuator board assembly to the chassis (from opposite side). See Fig. 4-13.

f. Remove 2 flat-head screws from the chassis below the side-panel connectors. See Fig. 4-12.

g. Lift Input Coupling slide-switch arms away from the switches.

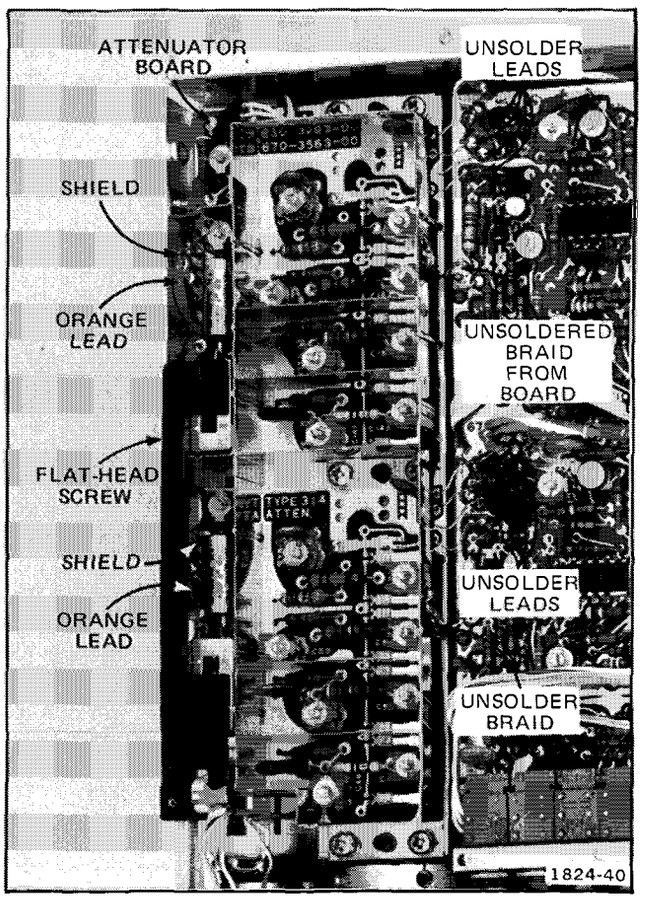


Fig. 4-12. Location of interconnecting and ground leads between Attenuator and Vertical circuit boards.

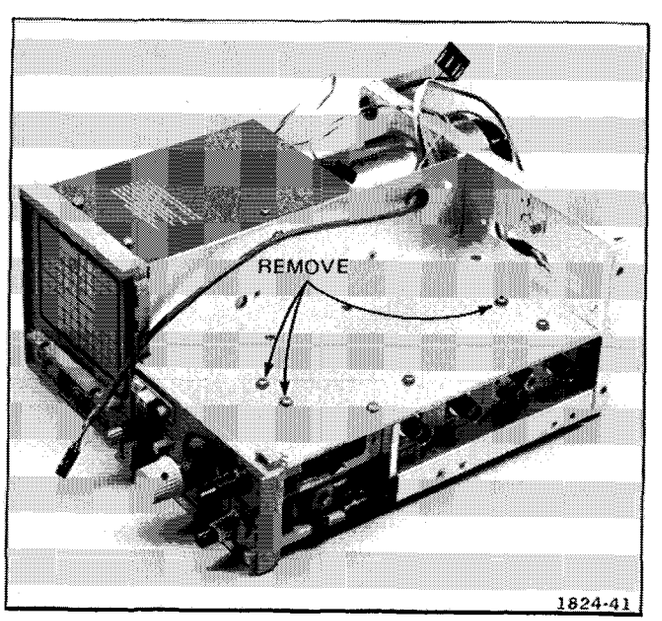


Fig. 4-13. Location of screws holding Attenuator circuit board to chassis.

h. Lift the rear of the Attenuator circuit board away from the instrument. When cam switch cover clears the chassis, pull the board assembly away from the front panel.

i. To replace the circuit board, reverse the foregoing procedure.

Vertical Circuit Board (Assembly A2)

a. Unsolder the 4 delay-line leads (see Fig. 4-14).

b. Unsolder the lead to .5 V CAL OUT front-panel connector.

c. *Unplug two 5-pin connectors (from P52 and P92).*

d. Remove the 4 screws holding output power transistors *Q205, Q206, Q215,* and *Q216* to the heat-sink bracket.

e. Pull CHOP, ALT, CH 1, CH 2, and CH 2 INVERT plastic buttons from the switch shafts.

f. Remove 4 screws that hold the circuit board to the chassis supports beneath.

g. Carefully lift the rear of the circuit board upward. Bend the cable assembly that passes through the chassis as necessary to move the board upward. When the rear of the circuit board (including the 4 power transistors) clears the chassis, carefully pull the circuit board toward the rear until the switches clear the front panel.

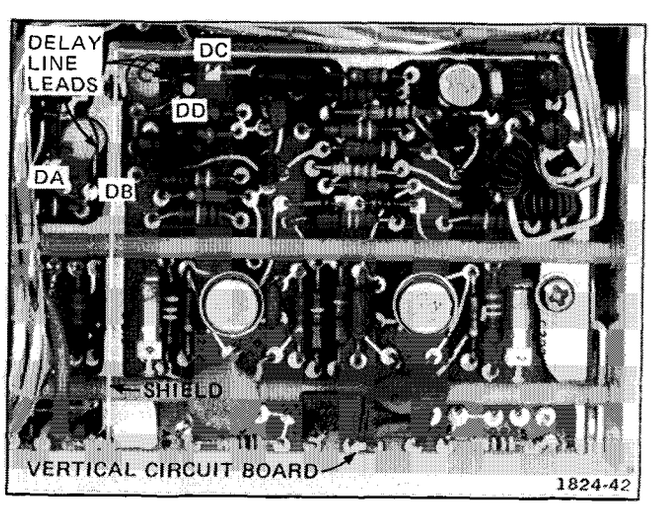


Fig. 4-14. Location of Delay Line leads.

h. Lift the front of the board out. If it is necessary to replace the circuit board, the remaining wires must be unsoldered. Record the position and color of each wire and shield and the point to which each lead is connected.

i. To replace, reverse the foregoing procedure.

Trigger Switch Circuit Board (Assembly A3)

a. Remove the Vertical circuit board as outlined in Vertical Circuit Board instructions.

b. Remove 2 hexagonal spacers and 1 screw (see Fig. 4-15).

c. Carefully lift the rear of the trigger circuit board high enough to clear the chassis at the rear. Pull the circuit board to the rear until switch shafts clear the front panel.

d. Disconnect three 2-pin connectors from the component side of the circuit board and remove circuit board from the instrument.

e. To replace, reverse the foregoing procedure.

Circuit Board Pins. A circuit board pin replacement kit, including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix part number 040-0542-00.

To replace a pin that is mounted on a circuit board, first disconnect any pin connector. Then, unsolder the damaged part and pull it from the circuit board with pliers. Avoid damage to the board wiring with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the circuit board hole. Position the pin in the same manner as the old pin and solder the pin on both sides of the board.

If the original pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

Circuit Board Pin Sockets. The pin sockets on the circuit boards are soldered on the back side of the board. To remove and replace the socket, first unsolder the pin (use a vacuum type desoldering tool to remove excess solder). Remove the socket from the hole. Place the new socket in the circuit board hole and solder the socket to the circuit board; do not get solder into the socket.

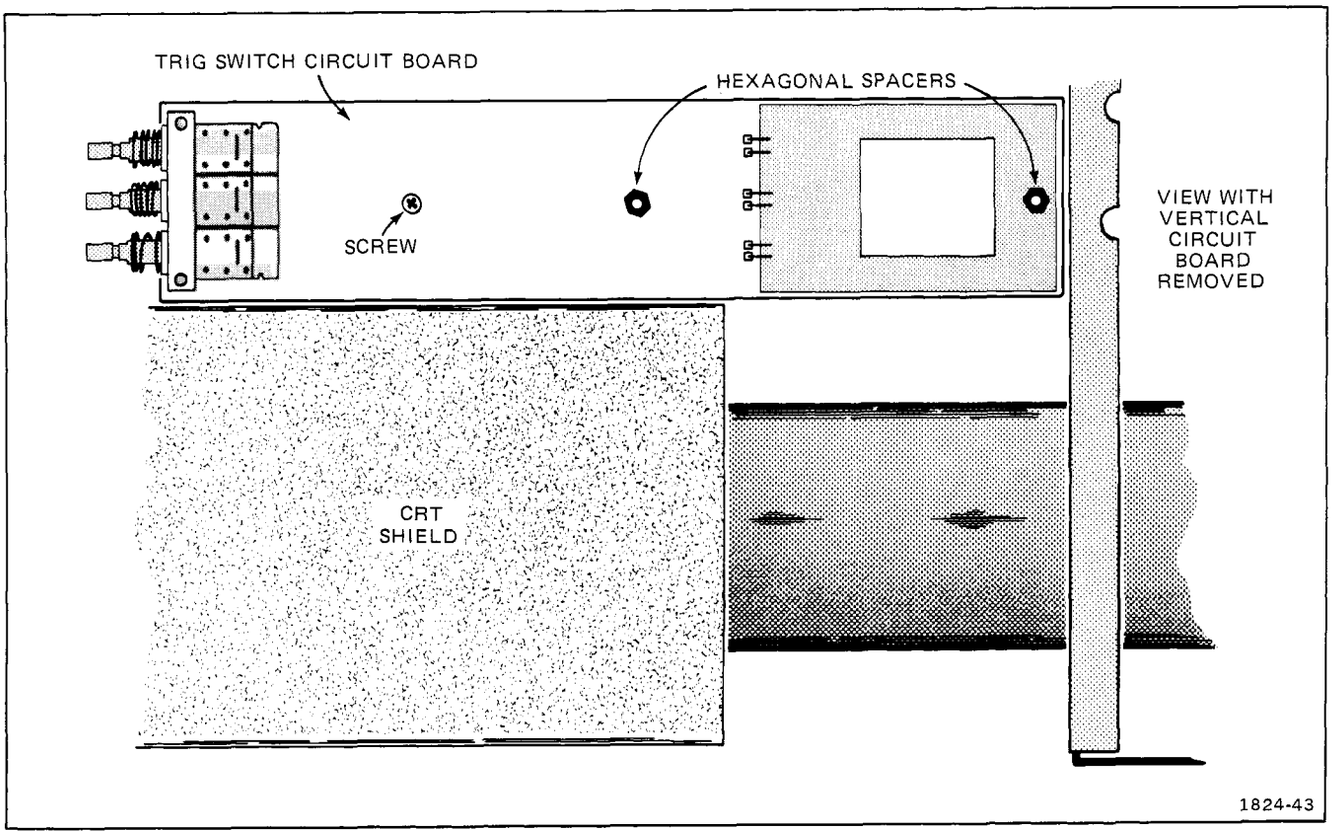


Fig. 4-15. Location of screw and spacers holding Trigger circuit board.

NOTE

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

Lead-End Pin Connectors. The pin connectors used to connect the leads to the interconnecting pins are crimped to the ends of the leads. To remove and replace damaged lead-end pin connectors, remove the damaged connector from the end of the lead and crimp the replacement connector to the lead.

Some of the pin connectors are grouped and mounted in a plastic holder. These connectors are removed and installed in the instrument as a multi-pin connector unit. To provide correct orientation of the multi-pin connector with the circuit board, an arrow is stamped on the circuit board and a matching arrow is molded into the plastic housing of the connector body. Align the arrows when connecting to the circuit board.

If individual lead-end pin connectors are removed from the plastic holder, note the wire color and position of the individual wires.

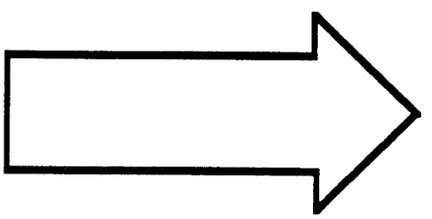
Recalibration After Repair

After any electrical component has been replaced, recheck the calibration of the affected circuit as well as the calibration of other closely related circuits. Since the low-voltage supplies affect all circuits, calibration of the entire instrument should be checked if repairs have been made to the power supply.

Instrument Repackaging

If the instrument is to be shipped for long distances by commercial transportation, it is recommended that it be repackaged in the original manner for maximum protection. Save the original shipping carton for this purpose.

SEE
OTHER
SIDE



PERFORMANCE CHECK/CALIBRATION

PERFORMANCE CHECK

Introduction

This section is divided into two parts: a Performance Check and a Calibration Procedure. Each part contains an index to aid in locating a particular step. The Equipment Required list applies to both sections, but the equipment required for calibration only is marked with a footnote.

USING THE PROCEDURE

Index

To aid in locating steps, an index precedes the Performance Check procedure.

Partial Procedure

The procedure checks completely the Performance Requirements. If you do not require the full available performance from the instrument, the required instrument list may be shortened accordingly.

A partial performance check may be desirable after replacing components or partial recalibration. To check a part of the instrument, refer to the Equipment Required list preceding that portion to be performed.

Control Settings

To aid in setting up a given test, each 314 control or switch that is named on the front, side, or rear panel is shown in the Control Settings in capital letters. Those 314 controls or switches that have an implied function, such as Source, Coupling, etc., have only the first letter capitalized.

Control and switch settings of test equipment have the first letter capitalized.

TEST EQUIPMENT REQUIRED

The test equipment required listed in Table 5-1 is required for complete check and adjustment of this instrument. Test equipment specifications given in Table 5-1 are the minimum required to meet instrument specifications listed in the Specification (Section 1). Detailed operating instructions for test equipment are not included in this procedure. Refer to the Test Equipment instruction manual if more information is needed.

Special Calibration Fixtures

Special calibration fixtures are used only when they facilitate instrument calibration. These fixtures are available from Tektronix, Inc. Order by part number from a Tektronix Field Office or representative.

Calibration Equipment Alternatives

Test equipment listed in the Examples of Applicable Test Equipment column, Table 5-1, is required to adjust or check the instrument. The procedures are based on the first item of equipment shown as an example. If equipment is substituted, control settings or test setup may need to be altered. If the exact equipment item given as an example is not available, refer to the specifications column to determine if other equipment may be substituted.

Items in column 1 having a superscript 1, are used only in the Adjustment procedure.

TABLE 5-1

Test Equipment

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
Digital Voltmeter (DVM)[1]	Range: 0 to 200 V dc; Accuracy within 0.2%, ±1 count.	Low-voltage supply, Storage, Deflection Plate dc levels.	a. Tektronix DM 501[2] b. Any 3-1/2 digit DVM having required accuracy.

[1]Use with Adjustment procedure only.
[2]Use with TM 500 Series Power Module.

TABLE 5-1 (cont)

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
DC Voltmeter[1]	Range: 0 to 2000 V; Accuracy, checked to within 1% at 1900 volts.	High Voltage supply check and adjustment.	a. Triplett Model 630NA VOM. b. Simpson Model 262 VOM.
Metered Variable DC Supply[1]	Range: 0 to 28 V at 2 A.	Adjust Regulator turnoff. Check Low Line indicator.	a. Trygon Power Supply Model HR40-5B (0-40 V at 5 A).
Time Mark Generator	Markers from 0.1 to 5 s; Marker accuracy, within 1%.	Vertical Geometry, Horizontal Timing check and adjustment.	a. Tektronix TG 501[2]. b. Tektronix 2901. c. Tektronix 184.
Standard Amplitude Calibrator	Range: 5 mV to 50 V; Accuracy, within 0.25% of amplitude setting into 1 MΩ load.	Adjust and check gain. Check Volts/Div accuracy.	a. Tektronix 067-0502-01 Calibration Fixture. b. Tektronix PG 506 Calibration Generator[2].
Square-Wave Generator	Repetition Rate: 500 kHz; Risetime of leading edge of positive pulse, 1 ns.	Check and Adjust Volts/Div compensation. Check and adjust vertical high frequency compensation.	a. Tektronix 106 Square-Wave Generator. b. Tektronix PG 506 Calibration Generator[2].
Constant Amplitude Signal Generator	Frequency Range: to at least 15 MHz; reference frequency, 50 kHz; Output amplitude, to 5 V (p-p), adjustable, into 50 Ω; amplitude accuracy, within 3% of reference frequency amplitude as output frequency changes.	Check vertical bandwidth.	a. Tektronix 191 Constant Amplitude Signal Generator.
Function Generator	Frequency Range: 0.5 Hz to 1 MHz.	Check low-frequency triggering.	a. Tektronix FG 501[2].
Cable (2 required)	Impedance, 50 Ω; connectors, BNC; length 42 inches.	Used throughout procedures for signal interconnection.	Tektronix part number 012-0057-01.
Termination Feedthrough	Impedance, 50 Ω; connectors, BNC.	Used throughout procedures to terminate signal source.	Tektronix part number 011-0049-01.

[1]**Use with Adjustment procedure only.**
[2]**Use with TM 500 Series Power Module.**

TABLE 5-1 (cont)

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
Dual-Input Cable -or-	Connectors, BNC.	To connect signal to two inputs simultaneously.	Tektronix Calibration Fixture, 067-0525-00.
T-connector and 2 short Cables	Connectors, BNC.	To connect signal to two inputs simultaneously.	T-connector, Tektronix part number 103-0030-00. Cables, 18-inch, Tektronix part number, 012-0076-00.
Normalizer	For 47 pF Input; Connectors, BNC.	Check and adjust input capacitance.	Tektronix Calibration Fixture, 067-0541-00.
Attenuator, Feedthrough	Attenuation, 10X; impedance, 50 Ω; connectors, BNC.	Reduce signal level while maintaining system impedance.	Tektronix part number, 011-0059-02.
Attenuator, Feedthrough	Attenuation, 2X; impedance, 50 Ω; connectors, BNC.	Reduce signal level while maintaining system impedance.	Tektronix part number, 011-0069-02.
Adapter	GR to BNC female.	To adapt Constant Amplitude Signal and Square-Wave Generator outputs to BNC.	Tektronix part number, 017-0063-00.
Patch Cord	BNC to banana.	Check external blanking.	Tektronix part number, 012-0090-00.
Patch Cord	Pin jack to BNC male.	Check calibrator output.	Tektronix part number, 175-1178-00.
Test Oscilloscope[1] (with included 10X probe)	Bandwidth, dc to 10 MHz; minimum deflection factor, 1 mV/Div; accuracy, within 3%.	Adjust vertical amplifier balance. Adjust external attenuator compensation.	Tektronix 465 or any general purpose oscilloscope meeting minimum specifications.
Screwdriver[1]		Adjust variable resistors.	a. Excelite R3323.
Screwdriver[1]	Low capacitance.	Adjust variable capacitors.	a. Tektronix part number, 003-0000-00.
Calibration Shield[1]		Adjusting attenuator compensation.	Tektronix part number, 067-0750-00.
Plug-in Extension Cable[1]		For extending time-base storage module.	Tektronix part number, 067-0742-00.

[1]Use with Adjustment procedure only.
[2]Use with TM 500 Series Power Module.

INDEX TO PERFORMANCE CHECK

POWER SUPPLY AND DISPLAY

Test Equipment Required

1. Variable Autotransformer
2. Time Mark Generator
3. 50-ohm BNC Cable
4. 50-ohm BNC Termination

Control Settings

Preset the 314 controls as follows:

INTENSITY	ccw
POWER	off (in)
FOCUS	midrange
CH 1 and CH 2	
VOLTS/DIV	10 m
VARIABLE	CAL
POSITION	midrange
Input Coupling	GND
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	cw
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out (non-store)
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN (side panel)	1X
Power Source	AC
Line Voltage Selector	115 V
Regulating Range	M

1. Check Low-Line Indicator (and pilot light)

a. Connect variable autotransformer to power line.

b. Set variable autotransformer output voltage level to 115 V.

c. Plug 314 ac line cord into autotransformer output.

d. Pull 314 POWER switch on.

e. CHECK—that LOW LINE Indicator (pilot light) lights.

f. Reduce autotransformer output voltage to 103.5.

g. CHECK—LOW LINE indicator still lights.

h. Reduce autotransformer output voltage further.

i. CHECK—that LOW LINE Indicator blinks at some voltage below 103.5.

2. Check Trace Rotation

a. Switch CH 1 Input Coupling to GND.

b. Set FOCUS and INTENSITY controls for best horizontal trace (normal viewing level and trace width).

c. Vertically position trace to graticule center.

d. CHECK—trace should be parallel to the center graticule line.

VERTICAL SYSTEM

Equipment Required

1. Standard Amplitude Calibrator
2. Square-Wave Generator
3. Constant Amplitude Signal Generator
4. Dual Input Cable
5. 50-ohm BNC Cable
6. 50-ohm Feedthrough Termination
7. 10X, 50-ohm Attenuator
8. 2X, 50-ohm Attenuator
9. 47 pF Input RC Normalizer
10. GR to BNC Female Adapter

Control Settings

INTENSITY	midrange
POWER	on
FOCUS	midrange
CH 1 and CH 2	
VOLTS/DIV	10 m
VARIABLE	CAL
POSITION	midrange
Input Coupling	
CH 1	DC
CH 2	GND
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	midrange
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN (side panel)	1X

1. Check Gain

a. Connect Standard Amplitude Calibrator through 50-ohm cable and through dual input cable to CH 1 and CH 2 VERT INPUT connectors.

b. Set Standard Amplitude Calibrator for 50 mV square-wave.

c. Set FOCUS and INTENSITY for normal viewing.

d. Set LEVEL control for stable display.

e. CHECK—square-wave display amplitude is 5 divisions, ±3% (±0.75 minor division).

f. Turn CH 1 VOLTS/DIV VARIABLE fully counterclockwise.

g. CHECK—display amplitude decreases to 2 divisions or less.

h. Switch DISPLAY to CH 2 and position display as necessary.

i. CHECK—square-wave display amplitude is 5 divisions, ±3% (±0.75 minor division).

j. Turn CH 2 VOLTS/DIV VARIABLE fully counterclockwise.

k. CHECK—display amplitude decreases to 2 divisions or less.

l. Return CH 1 and CH 2 VOLTS/DIV VARIABLE controls to CAL.

2. Check CH 1 and CH 2 Volts/Division Accuracy

a. Set 314 VOLTS/DIV and Standard Amplitude Calibrator output as shown in Table 5-2, columns 1 and 2.

b. Check VOLTS/DIV display and accuracies as shown in columns 3 and 4.

TABLE 5-2

(1) VOLTS/DIV Setting	(2) Standard Amplitude Calibrator	(3) Display Amplitude (in divisions)	(4) Tolerance, 3% (in minor divisions)
1 mV	5 mV	5	0.75
2 mV	10 mV	5	0.75
5 mV	20 mV	4	0.6
10 mV	50 mV	5	0.75
20 mV	.1 V	5	0.75
50 mV	.2 V	4	0.6
.1 V	.5 V	5	0.75
.2 V	1 V	5	0.75
.5 V	2 V	4	0.6
1 V	5 V	5	0.75
2 V	10 V	5	0.75
5 V	20 V	4	0.6
10 V	50 V	5	0.75
5 DIV CAL	----	5	0.75

3. Check Add Deflection Factor

a. Switch CH 1 and CH 2 VOLTS/DIV to 10 m and Input Coupling to DC.

b. Set Standard Amplitude Calibrator to 20 mV square-wave.

c. Switch DISPLAY to ADD (CHOP and ALT buttons in).

d. CHECK—for approximately 4 divisions of vertical deflection.

4. Check Alternate Operation

a. Switch DISPLAY to ALT (ALT button in and CHOP button out).

b. Observe 2 displays. Separate the displays vertically using the POSITION controls.

c. Switch TIME/DIV to 10 ms.

d. CHECK—that the displays alternate (displays alternate at all sweep speeds. Both are displayed simultaneously at fast sweep speeds).

5. Check Chopped Operation

a. Switch DISPLAY to CHOP.

b. Switch CH 1 and CH 2 Input Coupling switches to GND.

c. Set TIME/DIV to 2 ms.

d. Adjust POSITION controls to separate the traces by about 4 divisions.

e. Set TIME/DIV to 2 μs.

f. Adjust LEVEL for stable display, if necessary.

g. CHECK—chopped repetition rate for about 100 kHz, ≈8.3 μs to ≈12.5 μs (≈4.15 to ≈6.25 divisions).

6. Check CH 2 Invert

a. Switch DISPLAY to CH 2 and release CHOP button.

b. Switch CH 2 Input Coupling to DC and TIME/DIV to 1 ms.

c. CHECK—that display inverts when CH 2 INVERT button is pushed in.

7. Check Bandwidth (upper −3 dB Point)

a. Connect Constant Amplitude Signal Generator through GR to BNC female adapter, 50-ohm cable, and 50-ohm termination to CH 1 VERT INPUT connector. Set generator frequency to 50 kHz.

b. Switch CH 1 Input Coupling to DC and DISPLAY to CH 1.

c. Set CH 1 VOLTS/DIV to 10 m and TIME/DIV to 1 ms.

d. Set Constant Amplitude Signal Generator output amplitude for 4 divisions of vertical display.

e. Increase generator frequency until the display amplitude decreases to 2.8 divisions (−3 dB point).

f. CHECK—the generator frequency should be at least 10 MHz.

g. Switch CH 1 VOLTS/DIV to 1 m and return generator frequency to 50 kHz. Place 10X attenuator between signal cable and termination.

h. Adjust generator output amplitude for 4 divisions of vertical display.

i. Increase generator frequency until the display amplitude decreases to 2.8 divisions (−3 dB point).

j. CHECK—the generator frequency should be at least 10 MHz.

k. Switch DISPLAY to CH 2 and move generator signal to CH 2 VERT INPUT connector.

l. Switch generator frequency to 50 kHz. Set generator amplitude for 4 divisions of vertical display.

m. Repeat parts e through j for CH 2. Disconnect Constant Amplitude Signal Generator.

8. Check Risetime

Reset controls as follows:

DISPLAY	CH 1
CH 1 VOLTS/DIV	10 m
TIME/DIV	1 μs
SWEEP MAG	X10
TRIGGERING Mode	NORM

a. Connect Square-Wave Generator Fast-Rise, + Output through GR to BNC female adapter; 50-ohm cable; 10X, 50-ohm attenuator; 2X, 50-ohm attenuator; and 50-ohm termination, to CH 1 VERT INPUT connector.

b. Adjust generator + Transition Amplitude for a 4 division vertical display on graticule. Adjust TRIGGERING LEVEL for stable display. See Fig. 5-1.

c. CHECK—risetime (time between 10 and 90% amplitude points) should be ≤36 nanoseconds (36 ns equals 1.8 minor horizontal division). See Fig. 5-1.

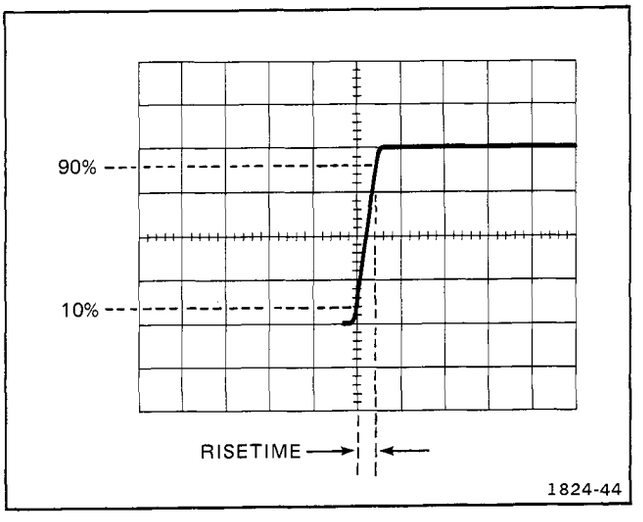


Fig. 5-1. Idealized display of risetime.

HORIZONTAL SYSTEM

Equipment Required

1. Time Mark Generator
2. Standard Amplitude Calibrator
3. Function Generator
4. 50-ohm BNC Cable
5. 50-ohm Termination

Control Settings

INTENSITY	midrange
POWER	on
FOCUS	midrange
CH 1 and CH 2	
VOLTS/DIV	.5
VARIABLE	CAL
POSITION	centered
Input Coupling	DC
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	centered
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN (side panel)	1X
Power Source	AC
Line Voltage Selector	115 V
Regulating Range	M

1. Check 1 ms Timing

a. Apply 1 ms time markers from Time Mark Generator output to CH 1 VERT INPUT connector via 50-ohm cable and 50-ohm termination.

b. Set CH 1 VOLTS/DIV and VARIABLE for about 2 divisions of vertical display.

c. CHECK—for 1 time marker/division, ±3% (±1.2 minor division) over the center 8 graticule divisions.

d. Turn TIME/DIV Variable fully counterclockwise.

e. CHECK—for 2.5, or more, markers/division.

2. Check Time/Div Accuracy (Unmagnified)

a. Using Table 5-3, check the timing accuracy (columns 3 and 4) for each of the TIME/DIV settings listed in column 1. Set Time Mark Generator as shown in column 2.

TABLE 5-3

(1) TIME/DIV Setting	(2) Time-Mark Generator	Limits (in minor div)	
		(3) Over center 8 divisions	(4) Over any 2 divisions
1 μs	1 μs	1.2	0.4
2 μs	2 μs		
5 μs	5 μs		
10 μs	10 μs		
20 μs	20 μs		
50 μs	50 μs		
.1 ms	.1 ms		
.2 ms	.2 ms		
.5 ms	.5 ms		
1 ms	1 ms		
2 ms	2 ms		
5 ms	5 ms		
10 ms	10 ms		
20 ms	20 ms		
50 ms	50 ms		
.1 s	.1 s		
.2 s	.2 s		
.5 s	.5 s	1.6	0.5
1 s	1 s		
2 s	2 s		
5 s	5 s		

3. Check Time/Div Accuracy (Magnified)

a. Set TIME/DIV to 1 μs.

b. Apply .1 μs markers to CH 1 VERT INPUT connector.

c. Horizontally center the display. Switch SWEEP MAG to X10.

d. Using Table 5-4, check magnified timing accuracy (columns 3 and 4) for each of the TIME/DIV settings listed in column 1. Set Time Mark Generator as shown in column 2.

TABLE 5-4

(1) TIME/DIV Settings	(2) Time-Mark Generator	Limits (in minor divisions) (3) Over center 8 divisions	Limits (in minor divisions) (4) Over any 2 divisions
1 μs	.1 μs	2.0	0.6 (Exclude first 2 and last 2 divisions)
2 μs	.2 μs		
5 μs	.5 μs	1.6	0.5
10 μs	1 μs		
20 μs	2 μs		
50 μs	5 μs		
.1 ms	10 μs		
.2 ms	20 μs		
.5 ms	50 μs		
1 ms	.1 ms		
2 ms	.2 ms		
5 ms	.5 ms		
10 ms	1 ms		
20 ms	2 ms		
50 ms	5 ms	1.6	0.5
.1 s	10 ms		
.2 s	20 ms		
.5 s	50 ms	2.0	0.6
1 s	.1 s		
2 s	.2 s		
5 s	.5 s		

4. Check External Horizontal Deflection Factor

a. Set INTENSITY control fully counterclockwise.

b. Set TIME/DIV to EXT HORIZ X10, and TIME/DIV Variable to CAL. Turn INTENSITY control clockwise to produce a spot on graticule.

CAUTION

High intensity spot can burn phosphor.

c. Set TRIGGERING Source to EXT/LINE (INT button out) and TRIGGERING Source to EXT DC (AC and AC LF REJ buttons in).

d. Set EXT ATTEN to 1X.

e. Connect Standard Amplitude Calibrator to EXT TRIG OR HORIZ INPUT connector.

f. Set Standard Amplitude Calibrator for 0.1 V square-wave.

g. CHECK—horizontal deflection (between spots) is 4 to 6 divisions.

h. Switch TIME/DIV to EXT HORIZ X1, and Standard Amplitude Calibrator to 1-volt square-wave.

i. CHECK—horizontal deflection (between spots) is 4 to 6 divisions.

j. Turn TIME/DIV Variable fully counterclockwise.

k. CHECK—not more than 1/10 the deflection noted in part i.

l. Switch Standard Amplitude Calibrator to 2-volt square-wave.

m. Adjust TIME/DIV Variable for exactly 5 divisions between spots.

n. Switch EXT ATTEN to 10X. Switch Standard Amplitude Calibrator output to 20-volt square-wave.

o. CHECK—horizontal deflection should be between 4.9 and 5.1 divisions.

p. Return VOLTS/DIV Variable to CAL position.

5. Check External Horizontal Bandwidth

a. Connect Function Generator through a 50-ohm cable and 50-ohm termination to EXT TRIG OR HORIZ INPUT connector.

b. Switch EXT ATTEN to X1, TIME/DIV to EXT HORIZ X1, and TRIGGERING Source to EXT (INT button out).

c. Set Function Generator frequency to 10 kHz and amplitude for 10 divisions of horizontal deflection.

d. Increase generator frequency until the horizontal trace has shortened to 7.1 divisions.

e. CHECK—the generator frequency should be at least 200 kHz.

f. Remove the generator from EXT TRIG OR HORIZ INPUT connector.

TRIGGERING SYSTEM

Equipment Required

1. Constant Amplitude Signal Generator
2. Function Generator
3. 50-ohm BNC Cable
4. 50-ohm Termination
5. 50-ohm Dual Input Cable
6. 50-ohm, 10X Attenuator

Control Settings

DISPLAY	CH 1
TRIGGERING	
Source	INT
Coupling	AC
SLOPE	+
Mode	NORM
TIME/DIV	10 μs
CH 1 and CH 2	
VOLTS/DIV	10 m
STORE	out

1. Check Triggering Levels

a. Connect Constant Amplitude Signal Generator output through GR-to-BNC female adapter; 50-ohm cable; 10X, 50-ohm attenuator; 50-ohm termination; and dual input cable, to CH 1 VERT INPUT connector and EXT TRIG OR HORIZ INPUT.

b. Set generator frequency to 1 MHz and output amplitude to produce a 0.3-division vertical display on crt.

c. CHECK—that stable triggering can be obtained with SLOPE switch in either + or − for each set of conditions listed in Table 5-5, by adjusting LEVEL control. Move signal input to CH 2 VERT INPUT connector and repeat parts b and c to check CH 2 triggering per Table 5-5.

NOTE

Use generator shown in the table for required frequency range. Set TIME/DIV for several cycles of display.

TABLE 5-5

Trigger Source (DISPLAY)	Coupling	Divisions of Display or Signal Amplitude			
		Constant Amplitude Signal Generator		Function Gen (Sinewave)	
		1 MHz	10 MHz	50 Hz	5 kHz
CH 1	AC and AC LF REJ	0.3	1.0		
	AC			0.3	
	AC LF REJ				150 mV[3]
CH 2	AC and AC LF REJ	0.3	1.0		
	AC			0.3	
COMP	AC and AC LF REJ	0.3	1.0		
	AC			0.3	
Reset TRIGGERING Source to EXT (release INT button and set EXT ATTEN to X1)					
CH 1	AC, DC and AC LF REJ	150 mV[3]	500 mV[3]		
	AC and DC			150 mV[3]	
	AC LF REJ				150 mV[3]

[3]**Switch VOLTS/DIV to suitable range and measure signal amplitude (adjust signal-generator output amplitude for correct display amplitude).**

2. Check DC Triggering Range

a. Switch CH 1 VOLTS/DIV to .5 V, TRIGGERING Coupling to DC (AC and AC LF REJ buttons in), and Source to INT.

b. Connect Function Generator, set to 1 kHz sinewave, through 50-ohm cable and 50-ohm termination to CH 1 VERT INPUT connector. Set Function Generator amplitude for 4 divisions of display.

c. Switch SLOPE to + and rotate TRIGGERING LEVEL control fully counterclockwise. Turn LEVEL control slowly clockwise and note level (on graticule) at which sweep triggers.

d. Continue to turn LEVEL control clockwise to the point at which sweep is not triggered. Note level on graticule.

e. CHECK—for at least 1.7 volts (3.4 divisions) between points noted in parts c and d. Note that triggering occurs on positive slope of sinewave.

f. Switch SLOPE to −.

g. CHECK—for at least 1.7 volts (3.4 divisions) between points at which sweep triggers, as in parts c and d. Note that triggering occurs on negative slope of sinewave.

STORAGE SYSTEM

Equipment Required

1. Time Mark Generator
2. 50-ohm BNC Cable
3. 50-ohm Termination
4. Function Generator
5. 50-ohm 10X Attenuator

Control Settings

TIME/DIV	10 μs
Variable	CAL
VOLTS/DIV CH 1	.5 V
VARIABLE	CAL
CH 1 Input Coupling	DC
DISPLAY	CH 1
TRIGGERING	
Source	INT
Coupling	AC
LEVEL	midrange
SLOPE	+
Mode	NORM
STORAGE	
STORE	out
AUTO ERASE	out
ENHANCE	out

1. Check Stored Writing Speed (80 div/ms, min)

a. Connect 10 μs markers from Time Mark Generator through 50-ohm cable and 50-ohm termination to CH 1 VERT INPUT connector.

b. Set TRIGGERING LEVEL for stable display of time markers.

c. Adjust TIME/DIV Variable for 5 markers in 4 horizontal divisions.

d. Switch CH 1 Input Coupling to GND, TRIGGERING Source to LINE (INT button out and EXT ATTEN switch to LINE), TRIGGERING Mode to SINGLE SWP (AUTO and NORM buttons in).

NOTE

This Check Procedure using part e is a close approximation of the method required to check to specifications. The more accurate method requires removing the instrument case. If greater accuracy is required, substitute the following procedure for part e.

(1) Instead of setting the INTENSITY control at the 45° setting, turn INTENSITY control fully counterclockwise.

(2) Connect DVM between TP695 and TP696 on HV & UNBLANK circuit board, and record the voltage.

(3) Turn INTENSITY control clockwise until DVM reads 0.6 V higher than voltage recorded in previous step. This voltage (between the test points) indicates 0.2 mA of cathode current.

(4) Proceed with part f.

e. Set INTENSITY control about 45° counterclockwise from fully clockwise position.

f. Press STORE button in. Press ERASE button after background is fully lighted.

g. Press RESET button. Readjust TRIGGERING LEVEL, if necessary, to write 1 horizontal trace each time RESET button is pressed.

h. Repeatedly push and release RESET button while slowly positioning trace vertically.

i. CHECK—stored lines over the inner 6 x 8 graticule divisions should show no breaks greater than 0.025 inch.

2. Check Enhanced Writing Speed (400 div/ms, min)

Do not change INTENSITY control setting from that used (either method) in previous step.

Control Settings

STORAGE	
STORE	out
ENHANCE LEVEL	ccw
TRIGGERING	
Source	INT
Mode	NORM
CH 1 Input Coupling	DC

a. Using TIME/DIV and Variable, set sweep speed for one 10 μs marker every 4 divisions.

b. Reset TRIGGERING Source to LINE, Mode to SINGLE SWP, and CH 1 Input Coupling to GND.

c. Push STORE and ENHANCE buttons in.

d. After background fully lights, push ERASE button.

e. Adjust ENHANCE LEVEL control to the point at which the background just starts to fade up when the RESET button is pressed. Erase the display after each sweep as ENHANCE LEVEL is adjusted. Background must be limited to spots less than 0.025-inch and by appearance (minimum background light). Push ERASE and RESET buttons.

f. CHECK—stored trace has no breaks greater than 0.025 inch

g. Repeat part f for the inner 6 x 8 divisions while positioning the trace vertically. Erase the display after each stored trace check.

h. Do not change ENHANCE LEVEL or INTENSITY settings.

3. Check Stored Vertical Writing Speed

Control Settings

STORE	out
TRIGGERING	
Source	INT
Mode	NORM
CH 1 Input Coupling	DC
CH 1 VOLTS/DIV	10 m
TIME/DIV	50 μs

a. Connect Function Generator (set for sinewave output) through 50-ohm cable; 10X, 50-ohm attenuator; and 50-ohm termination to CH 1 VERT INPUT.

b. Set generator frequency to 20 kHz and adjust generator output amplitude control for 6.4 div of vertical deflection.

c. Center the display vertically on the graticule.

d. Switch TRIGGERING Mode to SINGLE SWP.

e. Push STORE and ENHANCE buttons in.

f. As soon as the background fully lights press the ERASE button.

g. Push RESET button.

h. CHECK—for a stored display with no breaks greater than 0.025-inch within the center 6 x 8 graticule divisions.

i. Release STORE button and switch TRIGGERING Mode to NORM.

j. Vertically position bottom of sinewave display to graticule center.

k. Push STORE button in and switch TRIGGERING Mode to SINGLE SWP.

l. After background is fully lighted, press ERASE button.

m. Push RESET button.

n. CHECK—for a stored display with no breaks greater than 0.025-inch.

o. Repeat parts i through n with the top of the sinewave display at graticule center. Release STORE button and push NORM button in.

p. Set Function Generator to 4 kHz and adjust generator output amplitude (if necessary) for 6.4 div of vertical deflection.

q. Set TIME/DIV to .1 ms, push STORE button in, and release ENHANCE button. Set TRIGGERING Mode to SINGLE SWP. Press ERASE button.

r. Repeat the 3 position checks as previously detailed in parts c through o.

s. CHECK—for a stored display with no breaks greater than 0.025-inch over center 6 x 8 divisions for each position.

4. Check Integrate Function

Set controls as follows:

TIME/DIV	1 μs
TRIGGER Mode	AUTO
TRIGGER Source	EXT, LINE

a. Adjust INTENSITY counterclockwise just to the point at which the trace does not store.

b. Hold INTEGRATE button in (up to 5 seconds) and release.

c. CHECK—that the trace stores.

d. Release STORE button.

5. Check Auto Erase

Control Settings

STORAGE	
STORE	in
AUTO ERASE	in
VIEWING TIME	ccw
TRIGGERING	
Mode	SINGLE SWP
Source	EXT
Coupling	AC
LEVEL	midrange
EXT ATTEN (side panel)	LINE

a. Adjust LEVEL control to produce automatic erase.

b. Using watch with sweep-second hand, time the interval between erasures.

c. CHECK—time between erasures ≤1 second.

d. Turn VIEWING TIME control fully clockwise.

e. Time the interval between erasures.

f. CHECK—time between erasures ≥5 seconds.

MISCELLANEOUS

Equipment Required

1. Function Generator
2. 50-ohm BNC Cable
3. Standard Amplitude Calibrator
4. BNC-Banana Patch Cord
5. Dual-Input Cable

Control Settings

TIME/DIV	10 μs
SWEEP MAG	X1
TRIGGERING	
Source	INT
Mode	AUTO
Coupling	AC
SLOPE	+
LEVEL	≈midrange
CH 1	
VARIABLE	CAL
Input Coupling	DC
VOLTS/DIV	2 V
DISPLAY	CH 1
STORE	out

1. Check External Blanking

a. Connect Function Generator, set for 100 kHz sinewave, through unterminated 50-ohm cable to dual-input cable.

b. Connect dual-input cable to CH 1 VERT INPUT connector, and to a BNC-banana patch cord.

c. Set CH 1 Input Coupling to GND and position trace 2 divisions below graticule center (0 volt reference).

d. Set CH 1 Input Coupling to DC and adjust Function Generator amplitude and offset for a 4.5-division display with bottom of sinewave at the zero reference.

e. Connect the banana end of BNC-banana patch cord to EXT BLANK connector at rear of instrument.

f. CHECK—that all of the waveform above about 5 volts is blanked.

g. Disconnect Function Generator.

2. Check Calibrator Output Voltage

a. Connect Standard Amplitude Calibrator output (set for 0.5 V square-wave) through 50-ohm cable to CH 1 VERT INPUT connector.

b. Set TIME/DIV to 1 ms and VOLTS/DIV and VARIABLE to produce exactly 5 divisions of vertical display.

c. Disconnect Standard Amplitude Calibrator signal from CH 1 INPUT and connect CH 1 INPUT to the .5 V CAL OUT connector.

d. CHECK—that the .5 V CAL OUT signal is 5 divisions, within 0.25 minor division.

3. Check Calibrator Frequency

a. Switch CH 1 VOLTS/DIV to 5 DIV CAL and TIME/DIV to .2 ms.

b. CHECK—that the period of 1 cycle equals 4 to 6.65 divisions (1 kHz, ±250 Hz).

CALIBRATION PROCEDURE

CALIBRATION INTERVAL

To maintain instrument accuracy, check the calibration of the 314 about every 1000 operating hours, or every 6 months if used infrequently. Before complete calibration, thoroughly clean and inspect the instrument as outlined in the Maintenance section.

TEKTRONIX FIELD SERVICE

Tektronix Inc. Field Service Centers and Factory Service Centers provide instrument recalibration services. Contact a Tektronix Field Office or representative for further information.

USING THIS PROCEDURE

Index

To aid in locating Calibration procedure steps, an index precedes the Calibration procedure.

Calibration Procedure

Completion of each step of the Calibration procedure ensures that the instrument is correctly adjusted and performs within tolerances given in the Performance Requirements in the Specification (Section 1). For best overall performance, when performing a complete calibration, make each adjustment to the exact setting indicated.

Partial Procedure

A partial calibration may be desirable after component replacement, or to "touch up" a portion of the adjustments between major recalibrations. To adjust only part of the instrument, refer to the Equipment Required list that precedes that portion to be performed. To avoid unnecessary readjustment of other parts, readjust only if the step is out of tolerance. If readjustment is necessary, recheck any steps listed under INTERACTION.

INDEX TO ADJUSTMENT PROCEDURE

POWER SUPPLY AND CALIBRATOR

Equipment Required

1. Variable Autotransformer
2. Digital Voltmeter
3. Voltohmmeter
4. Variable DC Supply

See ADJUSTMENT LOCATIONS *in the pullout Diagrams section*

Control Settings

Preset the 314 controls as follows:

INTENSITY	ccw
POWER	off (in)
FOCUS	midrange
CH 1 and CH 2	
VOLTS/DIV	10 m
VARIABLE	CAL
POSITION	midrange
Input Coupling	GND
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	cw
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN (side panel)	1X
Power Source	AC
Line Voltage Selector	115 V
Regulating Range	M

1. Adjust +12-Volt Supply

a. Connect variable autotransformer to the ac power line. Set transformer output to 115 V.

b. Plug 314 ac line cord into variable autotransformer output.

c. Pull POWER-INTENSITY switch on (pull out).

d. Connect DVM between +12 V supply (terminal V) and ground (terminal K) on Storage board. See Fig. 7-3 for location of terminals V and K.

e. Check for a DVM reading of +12.0 V, ±360 mV (11.640 to 12.360 V).

f. ADJUST—R628 (see Fig. 7-3), +12 V, for 12.00 V.

2. Adjust High-Voltage Supply

a. Connect dc voltmeter between TP701 and ground (see Fig. 7-3 for location).

WARNING

Hazardous voltages in this area!

b. Check for a voltmeter reading of −1900 V, ±2% (−1862 to −1938 V).

c. ADJUST—R719, H V, for a meter reading of −1900 V.

d. Push POWER-INTENSITY switch in (off).

3. Adjust Regulator Turn-off Level

a. Set AC-DC Selector to DC, 11 V-14 V.

b. Connect variable dc supply to External DC Input on 314 (black and red banana jacks on right-side panel).

c. Set variable dc supply output votlage to 12.000 V (measure supply output with DVM).

d. Pull POWER-INTENSITY switch on.

e. Observe trace on screen and note that LOW LINE (pilot) indicator is lighted. Adjust INTENSITY as necessary.

f. Set variable dc supply output voltage to 10.75 on DVM.

g. ADJUST—R618 (see Fig. 7-3), Turn-off Level, until the instrument just turns off (LOW LINE indicator blinks, then trace disappears).

h. Push 314 POWER-INTENSITY switch in (off).

i. Change External DC Selector to 22 V-28 V.

j. Set variable dc supply to 24 V. Pull POWER-INTENSITY switch out (on).

k. Slowly decrease variable dc supply output voltage until 314 just turns off.

l. CHECK—variable dc supply voltage should be between 20 and 21 V on DVM.

m. Push POWER-INTENSITY switch off. Disconnect external dc supply.

n. Change AC-DC Selector to AC.

o. Pull POWER-INTENSITY switch on.

4. Adjust .5 V Calibrator Signal

a. Remove Q261 (see Fig. 7-4 for location).

b. Connect DVM between .5 V CAL OUT banana jack (front panel) and ground (right-side panel).

c. Check for a DVM reading of 0.5 V, ±5 mV (.4995 to .5005 V).

d. ADJUST—R762 (see Fig. 7-4), +6 V, for a 0.500 V DVM reading.

e. Replace Q261.

DISPLAY

Equipment Required

1. Digital Voltmeter
2. Time Mark Generator
3. 50-ohm BNC Cable
4. 50-ohm BNC Termination

See ADJUSTMENT LOCATIONS *in the pullout Diagrams section*

Control Settings

Same as preset in POWER SUPPLY AND CALIBRATOR section, except pull POWER-INTENSITY switch on.

1. Adjust Intensity Limit

a. Connect DVM between TP695 and TP696 (see Fig. 7-3 for location, make sure DVM negative lead is not connected to ground).

b. Turn INTENSITY control fully clockwise.

c. Check for a DVM reading of 0.90 V, ±49.5 mV (0.8505 to 0.9495 V).

d. ADJUST—R702 (see Fig. 7-3), Intens Limit, for 0.90 V.

e. Turn INTENSITY control fully counterclockwise.

f. Set TIME/DIV to 10 ms.

g. Note voltage reading on DVM.

h. Rotate INTENSITY control fully clockwise.

i. Adjust R706 (SN 300200 & up) for a reading of 0.15 V higher than the reading noted in step 1, part g. If the correct reading cannot be obtained, select a value (between 1.2 M and 2.7 M) for R708 that results in the correct reading when R706 is adjusted.

j. Remove the DVM leads from TP695 and TP696.

k. Return TIME/DIV to 1 ms.

2. Adjust Astigmatism

a. Connect 1 ms time markers from Time-Mark Generator through 50-ohm cable and 50-ohm termination, to CH 1 VERT INPUT connector. Set TIME/DIV to 1 ms.

b. Set DISPLAY to CH 1, CH 1 Input Coupling to DC, and VOLTS/DIV and Variable for 2 divisions of vertical display. Set INTENSITY and TRIGGERING LEVEL as necessary to obtain display.

c. Set INTENSITY midway between a barely visible trace and fully clockwise.

d. ADJUST—R651, Astig (see Fig. 7-4 for location), and FOCUS for best definition of time marks over the full screen (using CH 1 POSITION control to position the display).

3. Adjust Trace Rotation

a. Set CH 1 Input Coupling to GND and observe horizontal trace.

b. Position trace vertically to graticule center line. Adjust INTENSITY as necessary for thin trace.

c. Check that trace is parallel to graticule center line.

d. ADJUST—R653, Trace Rotation (see Fig. 7-3 for location), to align trace with center graticule line (position vertically as necessary).

4. Adjust Geometry

a. Set CH 1 Input Coupling to DC.

b. Turn CH 1 POSITION control to set time marker base line to bottom graticule line.

c. Set CH 1 VOLTS/DIV for slightly greater than 8 divisions of vertical display. Adjust TRIGGERING LEVEL for stable display. Set INTENSITY control as necessary to view time marks.

d. Adjust TIME/DIV Variable for one marker per division.

e. Check for ≤0.15 division of curvature of the vertical time markers over the 8 vertical divisions of display. Switch Input Coupling to GND. Position display baseline to top and bottom graticule line and check for maximum of 0.1 division of curvature of the baseline over 10 horizontal divisions. Adjust INTENSITY as necessary.

f. ADJUST—R575, Geom (see Fig. 7-5 for location), for minimum curvature of markers and baseline (switch Input Coupling as necessary).

Step 5. Adjust Holdoff, (SN 300001-SN 300199 only)

a. Set CH 1 Input Coupling to DC, TIME/DIV to 1 μs, and TIME/DIV variable to CAL.

b. Set Time Mark Generator for 1 μs time marks.

c. Set TRIGGERING LEVEL, CH 1 VOLTS/DIV, CH 1 POSITION and INTENSITY for a visible, triggered, vertically centered display about 2 divisions in amplitude.

d. Turn Horizontal POSITION to move start of trace about 2 divisions to the right of the left vertical graticule line, and set TRIGGERING LEVEL fully clockwise.

e. ADJUST—R348 (located on right side just behind RESET button)[3]. Preset R348 fully clockwise, then adjust it counterclockwise just to the point where the start of the trace reaches its maximum length (advance INTENSITY enough to ensure that all of the start of the trace is fully visible).

f. Set TIME/DIV to 10 ms and TRIGGERING LEVEL fully counterclockwise.

g. CHECK—That trace is visible at sweep speeds of 10 ms and slower.

h. INTERACTION—If trace disappears, re-adjust R348 slightly so trace is visible at sweep speeds of 10 ms and slower with TRIGGERING LEVEL fully counterclockwise while maintaining maximum length of start of trace with sweep speed at 1 μs and TRIGGERING LEVEL fully clockwise.

i. Disconnect Time Mark Generator from 314.

[3]R348 was removed and replaced with a wire at approximately SN300200.

STORAGE

Equipment Required

1. Digital Voltmeter
2. Standard Amplitude Calibrator
3. Test Oscilloscope
4. 10X Probe
5. Time-Mark Generator
6. Function Generator
7. 50-ohm BNC Cable
8. 50-ohm BNC Termination

See **ADJUSTMENT LOCATIONS** *in the pullout Diagrams section*

Control Settings

INTENSITY	midrange
POWER	on
FOCUS	midrange
CH 1 and CH 2	
VARIABLE	CAL
POSITION	midrange
Input Coupling	
CH 1	DC
CH 2	GND
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	midrange
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN (side panel)	X1

1. Adjust Operating Level

a. Push STORE button in.

b. Connect DVM between terminals N and T on the Storage circuit board (see Fig. 7-3 for location).

c. ADJUST—R519 (see Fig. 7-5), Operating Level, to the operating level shown on the crt tag. Remove DVM.

NOTE

If the operating level is not available from the crt tag, adjust the operating level as follows:

a. Release STORE button to out position.

b. Turn R519 (see Fig. 7-5), Operating Level, fully counterclockwise.

c. Set CH 1 Input Coupling to GND.

d. Set INTENSITY control for normal viewing level.

e. Push STORE button in. Let background light fully. Then press ERASE button.

f. Rotate CH 1 POSITION control to produce a series of horizontal lines vertically in viewing area. Note that the lines fade out rapidly.

g. Press ERASE button and then STORE button to erase and rewrite the lines (using Vertical POSITION control) while adjusting R519 clockwise in small increments until there is no deterioration of the stored lines about 1 minute after erasure.

h. Connect DVM between terminals T and N on the Storage circuit board. Note the voltage reading.

i. Turn R519 fully clockwise. Erase display and turn Vertical POSITION to produce a series of lines in viewing area. Note that background light level is high and lines run together.

j. Erase and rewrite lines as in part g while adjusting R519 counterclockwise in small increments until there is no fadeup (line broadening or running together) about 1 minute after erasure.

k. Connect DVM to terminals T and N and measure voltage.

l. ADJUST—R519, Operating Level, to about half way between voltage measured in parts h and k.

2. Adjust Collimation

a. Push AUTO ERASE button in and set VIEWING TIME to erase the display about once each second.

b. ADJUST—R568 (see Fig. 7-5), Collimation, to produce a display (during erase cycle) that is pulled in at top and bottom by about one-half major division.

3. Adjust High-Voltage Compensation

a. Release STORE and AUTO ERASE buttons.

b. Set CH 1 Input Coupling to DC.

c. Connect 100 mV square-wave from Standard Amplitude Calibrator to Ch 1 VERT INPUT connector via 50-ohm cable.

d. Set CH 1 VOLTS/DIV to 10 m and adjust VARIABLE for 5 divisions of vertical display.

e. Push STORE button in. When background fully lights push ERASE button.

f. ADJUST—R721, High Voltage Compensation, for 5 divisions of vertical display (erase and re-store after each adjustment of R721).

g. Disconnect Standard Amplitude Calibrator.

h. Release STORE button.

VERTICAL SYSTEM

Equipment Required

1. Constant Amplitude Signal Generator
2. Test Oscilloscope
3. 10X Probe
4. Digital Voltmeter
5. Square-Wave Generator
6. Calibration Shield
7. 50-ohm BNC Cable
8. 50-ohm BNC Termination
9. 10X, 50-ohm BNC Attenuator
10. 2X, 50-ohm BNC Attenuator
11. Dual Input Cable
12. 47 pF Normalizer
13. Low Capacitance Screwdriver

See **ADJUSTMENT LOCATIONS** *in the pullout Diagrams section*

Control Settings

INTENSITY	midrange
POWER	on
FOCUS	midrange
CH 1 and CH 2	
VARIABLE	CAL
POSITION	midrange
Input Coupling	GND
VOLTS/DIV	10 m
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGERING	
LEVEL	midrange
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out
ENHANCE LEVEL	ccw
VIEWING TIME	ccw
EXT ATTEN	X1

1. Adjust CH 1 Step Atten Balance and Volts/Div Balance

a. Using CH 1 POSITION control, position trace to graticule center (adjust INTENSITY and FOCUS as necessary).

b. Switch CH 1 VOLTS/DIV to 5 m.

c. ADJUST—R27 (see Fig. 7-4), Step Atten Bal, to position trace to graticule center.

d. Switch CH 1 VOLTS/DIV to 10 m and repeat parts a through c until there is no shift when switching between 10 m and 5 m.

e. Rotate VOLTS/DIV VARIABLE throughout its range.

f. ADJUST—R31 (see Fig. 7-4), Var Bal, until there is no trace shift while rotating VARIABLE from fully counterclockwise to fully clockwise.

g. INTERACTION—it may be necessary to repeat parts a through f because of some interaction between Step Atten Bal and VARIABLE controls. Return CH 1 VARIABLE to CAL.

2. Adjust CH 2 Step Atten Balance and Volts/Div Balance

a. Reset DISPLAY to CH 2.

b. Using CH 2 POSITION control, position trace to graticule center.

c. Switch CH 2 VOLTS/DIV to 5 m.

d. ADJUST—R67 (see Fig. 7-4), Step Atten Bal, to position trace to graticule center.

e. Switch CH 2 VOLTS/DIV to 10 m and repeat parts b through d until there is no shift while switching between 10 m and 5 m.

f. Rotate CH 2 VOLTS/DIV VARIABLE throughout its range.

g. ADJUST—R71 (see Fig. 7-4), Var Bal, until there is no trace shift while rotating VARIABLE from fully counterclockwise to fully clockwise.

h. INTERACTION—it may be necessary to repeat parts b through g because of some interaction between Step Atten Bal and VARIABLE controls. Return CH 2 VARIABLE to CAL.

3. Adjust CH 1 Limit Centering

Set controls as follows:

TIME/DIV	10 μs
CH 1 VOLTS/DIV	10 m
DISPLAY	CH 1
Input Coupling	DC

a. Connect Constant Amplitude Signal Generator output to CH 1 VERT INPUT connector via 50-ohm cable and 50-ohm termination.

b. Connect test oscilloscope 10X probe ground lead to 314 chassis ground.

c. Connect probe tip to Q150 collector. See Fig. 7-4 for location.

d. Set Constant Amplitude Signal Generator frequency to 50 kHz and adjust output amplitude to produce a clipped sinewave display on the test oscilloscope screen (at 10 mV/Div). Reduce signal generator output amplitude to the point at which clipping of the sinewave just begins.

e. ADJUST—R53 (see Fig. 7-4), Limit Centering, until clipping on the test oscilloscope display is equal at top and bottom.

f. Remove probe and disconnect sinewave generator signal from 314.

4. Adjust Deflection Plate DC Level

a. Connect DVM between upper deflection plate (terminal AB) and lower deflection plate (terminal AA). See Fig. 7-4 for location of AA and AB on Vertical circuit board (make sure DVM negative lead is not connected to ground).

b. Set DVM range to 2 V and set CH 1 POSITION control for a zero-volt reading.

c. Reconnect DVM (set to 200-volt range) between upper deflection plate (terminal AB) and ground.

d. ADJUST—R182 (see Fig. 7-4), DFLP DC Level, for a DVM reading of +50 V.

5. Adjust CH 2 Limit Centering

a. Set DISPLAY to CH 2.

b. Connect DVM between upper deflection plate (terminal AB) and lower deflection plate (terminal AA) on Vertical circuit board. Set DVM to 2-volt range. See Fig. 7-4 for locations of terminals AA and AB.

c. Adjust CH 2 POSITION control for a zero-volt DVM reading.

d. Reconnect DVM (set to 200-volt range) between upper deflection plate (terminal AB) and ground.

e. ADJUST—R93 (see Fig. 7-4), Limit Centering, for a DVM reading of +50 V.

6. Adjust Add Deflection Plate DC Level

a. Switch DISPLAY to ADD (both CHOP and ALT buttons in).

b. Connect DVM (set to 2-volt range) between upper deflection plate (terminal AB) and lower deflection plate (terminal AA).

c. Adjust either CH 1 or CH 2 POSITION control for zero-volt DVM reading.

d. Reconnect DVM (set to 200-volt range) between upper deflection plate (terminal AB) and ground.

e. ADJUST—R108 (see Fig. 7-4), Add Level, for a DVM reading of +50 V.

7. Adjust CH 1 Gain

Set controls as follows:

CH 1 and CH 2	
VOLTS/DIV	10 m
VARIABLE	CAL
Input Coupling	
CH 1	DC
CH 2	GND
DISPLAY	CH 1
CHOP and ALT	out

a. Connect Standard Amplitude Calibrator through 50-ohm cable to CH 1 and CH 2 VERT INPUT connectors via Dual Input Cable.

b. Set Standard Amplitude Calibrator for 50 mV square-wave.

c. Check for 5 divisions of vertical deflection, ±3% (0.75 minor division).

d. ADJUST—R43 (see Fig. 7-4), Gain, for exactly 5 divisions of vertical deflection. For SN 300422-up, switch CH 1 VOLTS/DIV to 1 mV and standard amplitude calibrator to 5 mV. Adjust R33B for exactly 5 divisions of vertical deflection. Return standard amplitude calibrator to 50 mV setting.

8. Adjust CH 2 Gain

Set controls as follows:

CH 1 Input Coupling	GND
CH 2 Input Coupling	DC
DISPLAY	CH 2

a. Check CH 2 for 5 divisions of vertical deflection, ±3%, (0.75 minor division).

b. ADJUST—R83 (see Fig. 7-4), Gain, for exactly 5 divisions of vertical deflection. For SN 300422-up switch CH 2 VOLTS/DIV to 1 mV and standard amplitude calibrator to 5 mV. Adjust R73B for exactly 5 divisions of vertical deflection.

c. Disconnect standard amplitude calibrator signal from the 314.

9. Adjust and Check Volts/Div Compensation

a. Install calibration shield. See Fig. 5-2.

b. Connect Square-Wave Generator High-Amplitude Output through 50-ohm cable, 50-ohm termination, and 47 pF Normalizer, to CH 1 VERT INPUT connector.

c. Set DISPLAY to CH 1, CH 1 Input Coupling to DC, TIME/DIV to 1 ms, CH 2 Input Coupling to GND, and CH 1 & CH 2 VOLTS/DIV to 10 m.

d. Set Generator to display about 5 cycles of square-wave, using an amplitude sufficient to produce about 5 vertical divisions of display. Use a 50-ohm attenuator, between cable and termination, if necessary to maintain 5 divisions of vertical display.

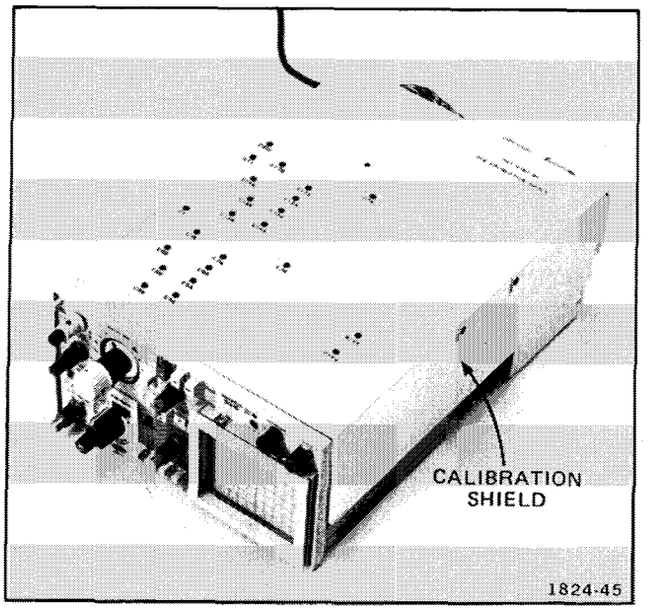


Fig. 5-2. Calibration shield in place on 314.

e. ADJUST—C1 (see Fig. 7-4) for flat top on displayed square-wave. See Fig. 5-3 for typical display.

f. Using Table 5-6 (CH 1 Adjustments) check or adjust for best flat top and front corner.

g. Move the signal (and Normalizer) to CH 2 VERT INPUT connector.

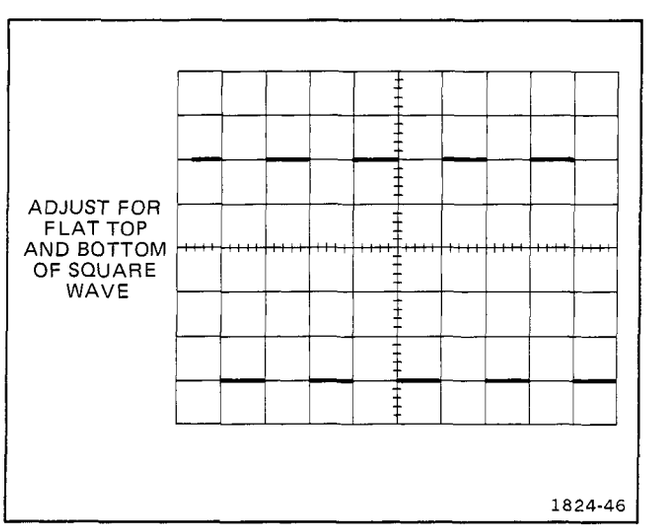


Fig. 5-3. Typical display of correct adjustment of C1 or C11.

TABLE 5-6

VOLTS/DIV Settings	CH 1		CH 2	
	Corner	Flat Top	Corner	Flat Top
20 mV	C7B	C7A	C17B	C17A
50 mV	C6B	C6A	C16B	C16A
.1 V	C5B	C5A	C15B	C15A
.2 V	Check	Check	Check	Check
.5 V	Check	Check	Check	Check
1 V[1]	C4B	C4A	C14B	C14A
2 V[1]	Check	Check	Check	Check
5 V[1]	Check	Check	Check	Check
10 V[1]	Check	Check	Check	Check
5 mV	Check	Check	Check	Check
2 mV	Check	Check	Check	Check
1 mV	Check	Check	Check	Check

[1]Output amplitude of Square-Wave Generator may not be sufficient to provide 5 divisions of vertical display, depending on Generator used.

h. Switch DISPLAY to CH 2, CH 1 INPUT COUPLING to GND, CH 2 INPUT COUPLING to DC.

i. Set Square-Wave Generator output amplitude for about 5 divisions of vertical display.

j. ADJUST—C11 for flat top on square-wave.

k. Using CH 2 section of Table 5-6, check or adjust for best flat top and front corner.

NOTE

All Attenuator board adjustments are clearly marked on circuit Attenuator board.

10. Adjust CH 1 and CH 2 Attenuator High-Frequency Compensation

a. Connect Square-Wave Generator (Fast Rise output) through 50-ohm cable and 50-ohm termination to CH 1 VERT INPUT connector.

b. Set Square-Wave Generator repetition rate to 100 kHz.

c. Set DISPLAY to CH 1, CH 1 Input Coupling to DC, and CH 1 VOLTS/DIV to 10 m.

d. Set Square-Wave Generator Fast-Rise output amplitude for 4 divisions of vertical display (use 2X attenuator between cable and termination, if necessary). Set TIME/DIV to display 3 or 4 cycles of square-wave.

e. ADJUST—C34, C154, C200, C210, and R154 (see Fig. 7-4 for location) for minimum aberrations on the square-wave upper front corner, as shown in Fig. 5-4.

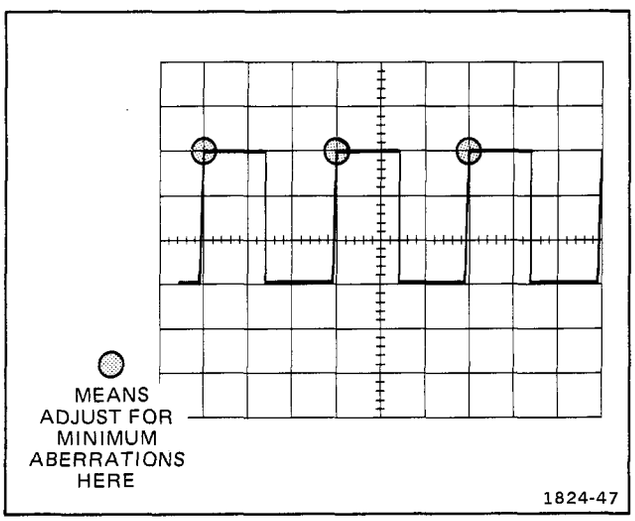


Fig. 5-4. Display of correct high-frequency compensation (idealized).

f. Move generator output signal to CH 2 VERT INPUT connector.

g. Set DISPLAY to CH 2 and CH 2 VOLTS/DIV to 10 m.

h. Set generator output amplitude for about 4 divisions of vertical display.

i. ADJUST—C74 (see Fig. 7-4) for minimum aberrations.

j. Disconnect test equipment and remove calibration shield.

HORIZONTAL SYSTEM

Equipment Required

1. Time-Mark Generator
2. Test Oscilloscope
3. 10X Probe
4. Standard Amplitude Calibrator
5. 50-ohm BNC Cable
6. 50-ohm Termination
7. Plug-in Extender Cable

See **ADJUSTMENT LOCATIONS** *in the pullout Diagrams section*

Control Settings

INTENSITY	midrange
POWER	off
FOCUS	midrange
CH 1 and CH 2	
VARIABLE	CAL
POSITION	midrange
Input Coupling	DC
VOLTS/DIV	.5
DISPLAY	CH 1
CH 2 INVERT	out
TRIGGGERING	
LEVEL	midrange
SLOPE	+
Coupling	AC
Source	INT
Mode	AUTO
TIME/DIV	1 ms
Variable	CAL
Horizontal POSITION	midrange
SWEEP MAG	X1
STORAGE	
STORE	out
ENHANCE	out
AUTO ERASE	out

Pull Storage-Time/Div module out and extend on plug-in extender cable (place insulation between module and 314 chassis). To remove module, loosen 2 screws at bottom of bezel, remove bezel and 1 screw at rear of Storage board (Fig. 7-2), and unplug module from Interface board. Turn power on.

1. Adjust Timing and Check Variable

a. Connect Time-Mark Generator marker output (set for 1 ms marker out) to CH 1 VERT INPUT connector via 50-ohm cable and 50-ohm termination.

b. Set CH 1 VOLTS/DIV and VARIABLE for about 2 divisions of vertical display.

c. Check for 1 time marker/division, ±3% (±1.2 minor division) over the center 8 graticule divisions.

d. ADJUST—R388 (see Fig. 7-6), Swp Cal, for 1 marker/division over the center 8 graticule divisions.

2. Adjust High-Speed Timing

a. Set TIME/DIV to 1 μs and Time-Mark Generator for 0.1 μs markers. Horizontally center the display on the graticule.

b. Switch SWEEP MAG to X10.

c. Check for 1 time marker/division, ±3% (±1.2 minor divisions) over center 8 graticule divisions.

d. ADJUST—C455 (see Fig. 7-6), High Speed Timing, for 1 marker/division over center 8 graticule divisions.

e. Horizontally position display start to first (left) graticule line.

f. ADJUST—C443 (see Fig. 7-6), for best sweep start linearity.

3. Adjust Magnifier Registration

a. Switch SWEEP MAG to X10.

b. Horizontally position trace start to graticule center line.

c. Switch SWEEP MAG to X1.

d. ADJUST—R437 (Fig. 7-6) to set sweep start at graticule center line.

e. Repeat parts a through d until there is no interaction between X1 and X10.

f. Remove time-marker signal cable from input.

4. Adjust External Horizontal Balance

CAUTION

Before starting part a, turn INTENSITY control fully counterclockwise. High stationary spot intensity can burn the crt phosphor.

a. Switch TIME/DIV to EXT HORIZ X10 and Horizontal POSITION to midrange.

b. Turn INTENSITY clockwise to obtain spot on crt.

c. Position spot horizontally and vertically to graticule center.

d. ADJUST—R405 (Fig. 7-6), Ext Horiz Bal, for no horizontal spot shift while rotating EXT HORIZ Variable (TIME/DIV Variable) through its range.

5. Adjust External 10X Attenuator Compensation

a. Connect Standard Amplitude Calibrator output via 50-ohm cable to EXT TRIG OR HORIZ INPUT (right-side panel). Set Standard Amplitude Calibrator for 10 V square-wave.

b. Set 314 TIME/DIV to EXT HORIZ X1 and Variable to CAL. Set INT button out and EXT ATTEN to X10.

c. Set test oscilloscope Volts/Div to 2 and Time/Div to .5 ms.

d. Connect test oscilloscope 10X probe ground to 314 chassis ground and probe tip to 314 left horizontal deflection plate (see Fig. 7-3 for location).

e. ADJUST—C301 (see Fig. 7-4) for flat top of square-wave displayed on test oscilloscope crt. See Fig. 5-5 for typical display.

f. Remove probe and square-wave.

g. Disconnect Standard Amplitude Calibrator, turn off power or unplug line cord from ac source.

h. Re-install the Storage-Time/Div module in the instrument. Replace the assembly screw and bezel. The Calibration procedure is done.

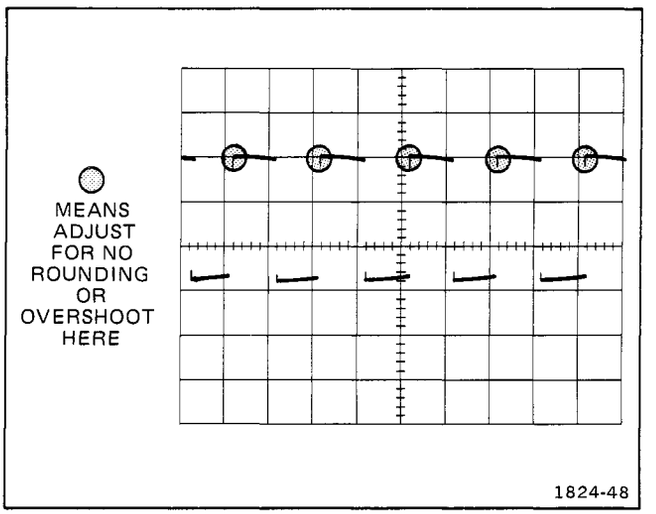
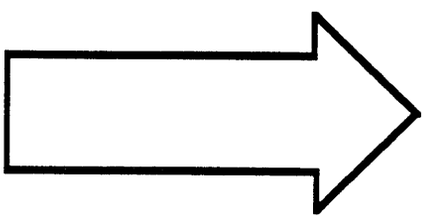


Fig. 5-5. Typical display of external X10 attenuator compensation.

SEE
OTHER
SIDE



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
0000M	SONY/TEKTRONIX CORPORATION	P O BOX 14, HANEDA AIRPORT	TOKYO 149, JAPAN
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MURTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
09353	C AND K COMPONENTS, INC.	103 MORSE STREET	WATERTOWN, MA 02172
12294	ERIE TECHNOLOGICAL PROD. OF CANADA LTD.	5 FRASER AVENUE	TRENTON, ONTARIO, CANADA
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
29604	STACKPOLE COMPONENTS COMPANY	P O BOX 14466	RALEIGH, NC 27610
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
50157	N. L. INDUSTRIES, INC., ELECTRONICS DEPT.	P. O. BOX 787	MUSKEGON, MI 49445
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
80294	BOURNS, INC., INSTRUMENT DIV.	6135 MAGNOLIA AVE.	RIVERSIDE, CA 92506
80740	BECKMAN INSTRUMENTS, INC.	2500 HARBOR BLVD.	FULLERTON, CA 92634
81073	GRAYHILL, INC.	561 HILLGROVE AVE., PO BOX 373	LA GRANGE, IL 60525
81483	INTERNATIONAL RECTIFIER CORP.	9220 SUNSET BLVD.	LOS ANGELES, CA 90069
82104	STANDARD GRIGSBY CO., DIV. OF SUN CHEMICAL CORPORATION	920 RATHBONE AVENUE	AURORA, IL 60507
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
91418	RADIO MATERIALS COMPANY, DIV. OF P.R. MALLORY AND COMPANY, INC.	4242 W BRYN MAWR	CHICAGO, IL 60646
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
93958	REPUBLIC ELECTRONICS CORPORATION	176 E 7TH STREET	PATERSON, NJ 07524
95712	BENDIX CORP., THE ELECTRICAL COMPONENTS DIV., MICROWAVE DEVICES PLANT	HURRICANE ROAD	FRANKLIN, IN 46131
98291	SEALECTRO CORP.	225 HOYT	MAMARONECK, NY 10544

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-3563-00			CKT BOARD ASSY:ATTENUATOR	80009	670-3563-00
A2	670-3564-00			CKT BOARD ASSY:VERTICAL AMPLIFIER	80009	670-3564-00
A3	670-3565-00	300000	300338	CKT BOARD ASSY:TRIGGER SWITCH	80009	670-3565-00
A3	670-3565-01	300339		CKT BOARD ASSY:TRIGGER SWITCH	80009	670-3565-01
A4	670-3566-00			CKT BOARD ASSY:HORIZONTAL	80009	670-3566-00
A5	670-3567-00	300000	300296	CKT BOARD ASSY:STORAGE	80009	670-3567-00
A5	670-3567-01	300297		CKT BOARD ASSY:STORAGE	80009	670-3567-01
A6	670-3568-00	300000	300650	CKT BOARD ASSY:HV AND UNBLANK	80009	670-3568-00
A6	670-3568-01	300651		CKT BOARD ASSY:HV AND UNBLANK	80009	670-3568-01
A7	670-3569-00			CKT BOARD ASSY:POWER SUPPLY	80009	670-3569-00
A8	670-3570-00			CKT BOARD ASSY:INTERFACE	80009	670-3570-00
A9	670-4320-00	X300339	300650X	CKT BOARD ASSY:INTENSITY	80009	670-4320-00
C1	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C2	285-0816-02	300000	301546	CAP.,FXD,PLSTC:0.019UF,10%,600V	80009	285-0816-02
C2	285-1132-00	301547		CAP.,FXD,PLSTC:0.019UF,10%,600V	80009	285-1132-00
C4A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C4B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C4C	283-0597-01			CAP.,FXD,MICA D:470PF,10%,300V	0000M	283-0597-01
C5A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C5B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C5C	283-0288-00			CAP.,FXD,CER DI:35PF,10%,500V	0000M	283-0288-00
C6A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C6B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C7A	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C7B	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C7C	283-0287-00			CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	0000M	283-0287-00
C9	283-0231-01			CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C11	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C12	285-0816-02	300000	301546	CAP.,FXD,PLSTC:0.019UF,10%,600V	80009	285-0816-02
C12	285-1132-00	301547		CAP.,FXD,PLSTC:0.019UF,10%,600V	80009	285-1132-00
C14A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C14B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C14C	283-0597-01			CAP.,FXD,MICA D:470PF,10%,300V	0000M	283-0597-01
C15A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C15B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C15C	283-0288-00			CAP.,FXD,CER DI:35PF,10%,500V	0000M	283-0288-00
C16A	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C16B	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C17A	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C17B	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C17C	283-0287-00			CAP.,FXD,CER DI:4.7PF,+1-0.5PF,500V	0000M	283-0287-00
C19	283-0231-01			CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C20	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C21	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C22	283-0068-00	300000	300180	CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C22	283-0000-00	300181		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C31	283-0757-00			CAP.,FXD,MICA D:100PF,5%,100V	0000M	283-0757-00
C34	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C37	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C41	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C44	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C57	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C58	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C59	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C60	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C61	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C62	283-0068-00	300000	300180	CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C62	283-0000-00	300181		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C71	283-0757-00			CAP.,FXD,MICA D:100PF,5%,100V	0000M	283-0757-00
C74	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C77	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C81	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C84	281-0544-00			CAP.,FXD,CER DI:5.6PF,10%,500V	72982	301-000C0H0569D
C97	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C98	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C99	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C101	290-0731-00			CAP.,FXD,ELCTLT:47UF,20%,6.3V	0000M	290-0731-00
C102	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C103	290-0271-00			CAP.,FXD,ELCTLT:9UF,+20-15%,125V	56289	109D905C2125F2
C104	290-0731-00			CAP.,FXD,ELCTLT:47UF,20%,6.3V	0000M	290-0731-00
C116	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C119	283-0238-00			CAP.,FXD,CER DI:0.01UF,10%,50V	72982	8121N075X7R0103K
C121	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C126	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C131	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C136	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C138	283-0229-00			CAP.,FXD,CER DI:220PF,10%,50V	0000M	283-0229-00
C140	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C142	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C143	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C145	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C153	281-0592-00			CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	72982	301-023C0H0479D
C154	281-0184-00			CAP.,VAR,PLSTC:2-18PF,500VDC	80031	2805D00218BN02F0
C155	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
C182	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
C185	283-0604-00			CAP.,FXD,MICA D:304PF,2%,300V	00853	D153F3040G0
C195	283-0604-00			CAP.,FXD,MICA D:304PF,2%,300V	00853	D153F3040G0
C199	283-0240-00			CAP.,FXD,CER DI:1PF,20%,500V	56289	53C141
C200	281-0095-00	300000	302951	CAP.,VAR,PLSTC:0.25-1.5PF,600V	12294	057001
C200	281-0095-01	302952		CAP.,VAR,PLSTC:0.25-1.5PF,600V	0000M	281-0095-01
C204	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C205	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C208	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C209	283-0240-00			CAP.,FXD,CER DI:1PF,20%,500V	56289	53C141
C210	281-0095-00	300000	302951	CAP.,VAR,PLSTC:0.25-1.5PF,600V	12294	057001
C210	281-0095-01	302952		CAP.,VAR,PLSTC:0.25-1.5PF,600V	0000M	281-0095-01
C214	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C215	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C218	283-0059-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8141N037Z5U0105Z
C223	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C227	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C230	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C239	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C260	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C261	290-0450-00			CAP.,FXD,ELCTLT:0.1UF,20%,35V	80009	290-0450-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C262	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C301	281-0182-00			CAP.,VAR,PLSTC:1.8-10PF,500V	80031	2805D1R810BH02F0
C302	283-0758-00			CAP.,FXD,MICA D:47PF,1%,300V	0000M	283-0758-00
C304	283-0023-00			CAP.,FXD,CER DI:0.1UF,+80-20%,12V	91418	MX0104Z1205R5
C305	283-0759-00	300000	300338	CAP.,FXD,MICA D:100PF,5%,300V	0000M	283-0759-00
C305	283-0625-00	300339		CAP.,FXD,MICA D:220PF,1%,500V	00853	D105F221F0
C306	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C307	290-0732-00			CAP.,FXD,ELCTLT:220UF,20%,6.3V	0000M	290-0732-00
C308	290-0732-00			CAP.,FXD,ELCTLT:220UF,20%,6.3V	0000M	290-0732-00
C311	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C325	281-0526-00			CAP.,FXD,CER DI:1.5PF,+/-0.5PF,500V	72982	301-000S2K0159D
C330	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C332	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C333	281-0524-00			CAP.,FXD,CER DI:150PF,+/-30PF,500V	04222	7001-1381
C335	281-0546-00			CAP.,FXD,CER DI:330PF,10%,500V	04222	7001-1380
C341	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C344	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
C345	290-0415-00			CAP.,FXD,ELCTLT:5.6UF,10%,35V	56289	150D565X9035B2
C347	283-0231-01	300000	300338	CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C347	283-0219-00	300339	301276	CAP.,FXD,CER DI:1500PF,20%,50V	93958	5145-1
C347	283-0114-00	301277		CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
C348	283-0002-00			CAP.,FXD,CER DI:0.01UF,+80-20%,500V	72982	811-546E103Z
C349	290-0267-00	300000	300338	CAP.,FXD,ELCTLT:1UF,20%,35V	56289	162D105X0035CD2
C349	283-0339-00	300339		CAP.,FXD,CER DI:0.22UF.10%,50V	72982	8131N075W5R224K
C350	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C352	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C357	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C358	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C359	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
C360, C361, C363 [1]	295-0143-00			CAP.,SET,MTCHD:10UF,0.1UF,0.001UF	80009	295-0143-00
C367	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-3E330G0
C372	283-0080-00	300000	300510X	CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C382	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C385	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C401	283-0231-01			CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C431	283-0604-00			CAP.,FXD,MICA D:304PF,2%,300V	00853	D153F3040G0
C443	281-0095-00	300000	302951	CAP.,VAR,PLSTC:0.25-1.5PF,600V	12294	057001
C443	281-0095-01	302952		CAP.,VAR,PLSTC:0.25-15PF,600V	0000M	281-0095-01
C444	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C445	283-0233-01			CAP.,FXD,CER DI:0.0022UF,20%,500V	0000M	283-0233-01
C450	283-0231-01			CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C451	290-0449-00			CAP.,FXD,ELCTLT:3UF,+100%-0%,250V	56289	600D335F250K04
C452	283-0119-00	X300083		CAP.,FXD,CER DI:2200PF,5%,200V	72982	855-535B222J
C455	281-0095-00	300000	302951	CAP.,VAR,PLSTC:0.25-1.5PF,600V	12294	057001
C455	281-0095-01	302952		CAP.,VAR,PLSTC:0.25-1.5PF,600V	0000M	281-0095-01
C458	283-0240-00			CAP.,FXD,CER DI:1PF,20%,500V	56289	53C141
C459	283-0079-02			CAP.,FXD,CER DI:0.1UF,20%,250V	72982	8131M202C103M
C464	283-0231-01			CAP.,FXD,CER DI:470PF,10%,500V	0000M	283-0231-01
C470	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C471	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C472	290-0731-00			CAP.,FXD,ELCTLT:47UF,20%,6.3V	0000M	290-0731-00

[1] Individual timing capacitors in this assembly must be ordered by the 9-digit part number, letter suffix and tolerance printed on the timing capacitor to be replaced. The letter suffix and the tolerance should be the same for all of the timing capacitors in the assembly.
EXAMPLE: 285-XXXX-XX F-

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C473	290-0731-00			CAP.,FXD,ELCTLT:47UF,20%,6.3V	0000M	290-0731-00
C501	283-0349-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C505	283-0349-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C506	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
C509	285-1109-00			CAP.,FXD,PLSTC:0.047UF,10%,50V	0000M	285-1109-00
C513	290-0729-00			CAP.,FXD,ELCTLT:15UF,20%,20V	0000M	290-0729-00
C530	290-0271-00			CAP.,FXD,ELCTLT:9UF,+20-15%,125V	56289	109D905C2125F2
C532	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
C535	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C540	283-0349-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C541	283-0349-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C545	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C546	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C548	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C551	283-0236-00			CAP.,FXD,CER DI:0.01UF,20%,50V	0000M	283-0236-00
C554	283-0349-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C555	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C565	283-0189-00			CAP.,FXD,CER DI:0.1UF,20%,400V	72982	8151N401X5R0104M
C600	290-0736-00			CAP.,FXD,ELCTLT:3300UF,+100-10%,40V	0000M	290-0736-00
C601	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
C602	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N147 C 104K
C604	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C606	290-0312-00			CAP.,FXD,ELCTLT:47UF,10%,35V	56289	150D476X9035S2
C610	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C618	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C636	290-0735-00			CAP.,FXD,ELCTLT:10UF,20%,16V	0000M	290-0735-00
C640	290-0735-00			CAP.,FXD,ELCTLT:10UF,20%,16V	0000M	290-0735-00
C650	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
C655	290-0164-00			CAP.,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA2
C657	283-0023-00			CAP.,FXD,CER DI:0.1UF,+80-20%,12V	91418	MX0104Z1205R5
C660	290-0312-00			CAP.,FXD,ELCTLT:47UF,10%,35V	56289	150D476X9035S2
C662	283-0111-00	X300040		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
C665	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C670	283-0178-00	300000	301991	CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C670	283-0346-00	301992		CAP.,FXD,CER DI:0.47UF,+80-20%,100V	72982	8131-M100F474Z
C671	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
C672	290-0305-00			CAP.,FXD,ELCTLT:3UF,20%,150V	56289	109D305X0150C2
C673	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
C674	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C675	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C676	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C677	290-0730-00			CAP.,FXD,ELCTLT:22UF,20%,16V	0000M	290-0730-00
C678	290-0734-00			CAP.,FXD,ELCTLT:100UF,20%,10V	0000M	290-0734-00
C679	290-0734-00			CAP.,FXD,ELCTLT:100UF,20%,10V	0000M	290-0734-00
C680	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C681	290-0734-00			CAP.,FXD,ELCTLT:100UF,20%,10V	0000M	290-0734-00
C682	290-0734-00			CAP.,FXD,ELCTLT:100UF,20%,10V	0000M	290-0734-00
C684	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C685	290-0305-00			CAP.,FXD,ELCTLT:3UF,20%,150V	56289	109D305X0150C2
C686	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145 E 104Z
C687	290-0305-00			CAP.,FXD,ELCTLT:3UF,20%,150V	56289	109D305X0150C2
C689	290-0733-00			CAP.,FXD,ELCTLT:330UF,20%,3.15V	0000M	290-0733-00
C690	290-0733-00			CAP.,FXD,ELCTLT:330UF,20%,3.15V	0000M	290-0733-00

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C692A-F	283-0013-00			CAP.,FXD,CER DI:0.01UF,+100-0%,1000V	56289	33C29A7
C694	283-0068-00	300000	300379	CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C694	283-0349-00	300380	300650	CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C694	283-0068-00	300651		CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C700	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C701	283-0105-00			CAP.,FXD,CER DI:0.01UF,+80-20%,2000V	56289	41C316
C710	283-0076-00	X300651		CAP.,FXD,CER DI:27PF,10%,500V	56289	40C287A2
C712	283-0349-00	X300380	300610	CAP.,FXD,CER DI:0.001UF,+100-0%,500V	0000M	283-0349-00
C712	283-0087-00	300611		CAP.,FXD,CER DI:300PF,10%,1000V	56289	403637
C726	283-0229-00			CAP.,FXD,CER DI:220PF,10%,50V	0000M	283-0229-00
C728	283-0229-00			CAP.,FXD,CER DI:220PF,10%,50V	0000M	283-0229-00
C730	290-0728-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	0000M	290-0728-00
C731	283-0236-00			CAP.,FXD,CER DI:0.01UF,20%,50V	0000M	283-0236-00
C734	283-0236-00			CAP.,FXD,CER DI:0.01UF,20%,50V	0000M	283-0236-00
C736	283-0236-00			CAP.,FXD,CER DI:0.01UF,20%,50V	0000M	283-0236-00
C738	283-0067-00	X300963		CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
C740	283-0103-00			CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638
C748	283-0079-02			CAP.,FXD,CER DI:0.01UF,20%,250V	72982	8131M202C103M
C764	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C768	290-0732-00			CAP.,FXD,ELCTLT:220UF,20%,6.3V	0000M	290-0732-00
C773	290-0732-00			CAP.,FXD,ELCTLT:220UF,20%,6.3V	0000M	290-0732-00
CR23	152-0246-00	300000	300180	SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR23	152-0323-00	300181		SEMICOND DEVICE:SILICON,35V,0.1A	80009	152-0323-00
CR24	152-0246-00	300000	300180	SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR24	152-0323-00	300181		SEMICOND DEVICE:SILICON,35V,0.1A	80009	152-0323-00
CR56	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR63	152-0246-00	300000	300180	SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR63	152-0323-00	300181		SEMICOND DEVICE:SILICON,35V,0.1A	80009	152-0323-00
CR64	152-0246-00	300000	300180	SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR64	152-0323-00	300181		SEMICOND DEVICE:SILICON,35V,0.1A	80009	152-0323-00
CR96	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR105	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR106	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR107	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR108	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR109	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR110	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR111	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR112	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR113	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR114	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR115	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR116	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR117	152-0071-00			SEMICOND DEVICE:GERMANIUM,15V,40MA	14433	G865
CR118	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR120	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR128	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR130	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR202	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR203	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR220	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR222	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR223	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR225	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR226	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR229	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR230	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR270	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR271	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR272	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR310	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR311	152-0246-00			SEMICOND DEVICE:SILICON,400PIV,200MA	80009	152-0246-00
CR312	152-0327-00	X301622		SEMICOND DEVICE:SILICON,BAX13	0000M	152-0327-00
CR333	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR336	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR337	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR340	150-1027-00			LAMP,LED:4V,30MA,GREEN	0000M	150-1027-00
CR341	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR346	152-0327-00	X300339		SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR368	152-0327-00	X300561		SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR387	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR403	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR508	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR510	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR513	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR516	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR526	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR528	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR529	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR532	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR533	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR540	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR550	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR554	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR557	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR560	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR600	152-0488-00	300000	301321	SEMICOND DEVICE:SILICON,200V,1500MA	80009	152-0488-00
CR600	152-0556-00	301322		SEMICOND DEVICE:BRIDGE,50V,2.5A	04713	SDA10271K
CR605	152-0107-00			SEMICOND DEVICE:SILICON,400V,400MA	80009	152-0107-00
CR628	152-0460-00			SEMICOND DEVICE:100V,1MA	04713	1N5299
CR636	150-1027-00			LAMP,LED:4V,30MA,GREEN	0000M	150-1027-00
CR654	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR657	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR662	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR663	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR670	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR671	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR673	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR675A-D	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR678A-D	152-0333-00			SEMICOND DEVICE:SILICON,55V,200MA	80009	152-0333-00
CR681	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR682	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR684	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR686	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR692A-F	152-0331-00			SEMICOND DEVICE:SILICON,800V,25MA	80009	152-0331-00

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CR701	152-0654-00	X300339		SEMICOND DVC PH:GAAS,1.2V,10MA LIGHT CUR	0000M	152-0654-00
CR702	152-0327-00	X300651		SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR703	152-0061-00	X300651		SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR704	152-0061-00	X300651		SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
CR720	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR725	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR726	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR727	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR728	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR741	152-0327-00			SEMICOND DEVICE:SILICON,BAX 13	0000M	152-0327-00
CR742	152-0061-00			SEMICOND DEVICE:SILICON,175V,100MA	80009	152-0061-00
DL180	175-0307-00			CABLE,SP,ELEC:APPROX 4 N/SEC	80009	175-0307-00
F600[1]	159-0130-00			FUSE,CARTRIDGE:315MA,250V,FAST-BLOW	0000M	159-0130-00
F600[2]	159-0131-00			FUSE,CARTRIDGE:0.160A,250V,FAST-BLOW	0000M	159-0131-00
F605	159-0098-00			FUSE,CARTRIDGE:1.6 AMP FAST-BLOW	0000M	159-0098-00
F606	159-0132-00			FUSE,CARTRIDGE:800MA,250V,FAST-BLOW	0000M	159-0132-00
J1	131-0106-00			CONNECTOR,RCPT,:FEMALE,BNC	95712	9856-1
J11	131-0106-00			CONNECTOR,RCPT,:FEMALE,BNC	95712	9856-1
J15	129-0103-00			POST,BDG,ELEC:ASSEMBLY	80009	129-0103-00
J275	131-0251-00			JACK,TIP:PANEL MTG,RED	98291	016-8010-2
J300	131-0106-00			CONNECTOR,RCPT,:FEMALE,BNC	95712	9856-1
J605	136-0490-00			JACK,TIP:BANANA JACK ASSY	80009	136-0490-00
J606	136-0491-00			JACK,TIP:BANANA JACK ASSY	80009	136-0491-00
J700	136-0491-00			JACK,TIP:BANANA JACK ASSY	80009	136-0491-00
J770	131-1662-00			CONN,RCPT,ELEC:15/30 CONTACTS	0000M	131-1662-00
L101	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
L103	108-0692-00			COIL,RF:TOROIDAL,270UH	0000M	108-0692-00
L104	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
L232	108-0694-00			COIL,RF:TOROIDAL,19UH	0000M	108-0694-00
L234	108-0694-00			COIL,RF:TOROIDAL,19UH	0000M	108-0694-00
L453	108-0692-00			COIL,RF:TOROIDAL,270UH	0000M	108-0692-00
L472	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
L473	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
L605	108-0488-00			COIL,RF:150UH	80009	108-0488-00
L606	108-0464-00			COIL,RF:TOROIDAL,125UH	80009	108-0464-00
L660	108-0694-00			COIL,RF:TOROIDAL,19UH	0000M	108-0694-00
L676	108-0692-00			COIL,RF:TOROIDAL,270UH	0000M	108-0692-00
L677	108-0692-00			COIL,RF:TOROIDAL,270UH	0000M	108-0692-00
L681	108-0464-00			COIL,RF:TOROIDAL,125UH	80009	108-0464-00
L682	108-0464-00			COIL,RF:TOROIDAL,125UH	80009	108-0464-00
L689	108-0463-00			COIL,RF:TOROIDAL,35UH	80009	108-0463-00
L750	108-0799-00			COIL,RF:TRACE ROTATION	0000M	108-0799-00
L769	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
L774	108-0798-00			COIL,RF:TOROIDAL,35UH	0000M	108-0798-00
Q25A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1049-00
Q51	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q55	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q65A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1049-00
Q91	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q95	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q105	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00

[1]For 115V line voltage.
[2]For 230V line voltage.

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Q110	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q115	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q125	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q135	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q145	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q150	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q160	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q165	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q188	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q198	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q200	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q202	151-0403-00			TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q205	151-0270-00			TRANSISTOR:SILICON,PNP	80009	151-0270-00
Q206	151-0403-00			TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q210	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q212	151-0403-00			TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q215	151-0270-00			TRANSISTOR:SILICON,PNP	80009	151-0270-00
Q216	151-0403-00			TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q220	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q235	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q236	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q237	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q260	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q261	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q313A,B	151-1049-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1049-00
Q318	151-0221-02			TRANSISTOR:SILICON,PNP	80009	151-0221-02
Q320	151-0221-02			TRANSISTOR:SILICON,PNP	80009	151-0221-02
Q373	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q385	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q400	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q430	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q435	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q440	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q442	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q445	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q448	151-0228-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4888	80009	151-0228-00
Q450	151-0403-00			TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q455	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q460	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q464	151-0228-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4888	80009	151-0228-00
Q465	151-0403-00	300000	302626	TRANSISTOR:SILICON,NPN	0000M	151-0403-00
Q465	151-0489-00	302627		TRANSISTOR:SILICON,NPN	0000M	151-0489-00
Q510	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q511	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q512	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q523	151-0228-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4888	80009	151-0228-00
Q525	151-0279-00			TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q528	151-0279-00			TRANSISTOR:SILICON,NPN	80009	151-0279-00
Q530	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q532	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q535	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q537	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q540	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00

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Q545	151-1018-00			TRANSISTOR;SILICON,FE,N-CHANNEL	0000M	151-1018-00
Q548	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q555	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q557	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q570	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q574	151-0292-00			TRANSISTOR:SILICON,NPN	80009	151-0292-00
Q605	151-0506-00			TRANSISTOR:SILICON,SCR	03508	C106B2
Q607	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	80009	151-0349-00
Q609	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q610	151-0516-00			TRANSISTOR:SILICON,UNIJUNCTION	0000M	151-0516-00
Q612	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q635	151-0220-00			TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q637	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q638	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q640	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q657	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q658	151-0289-00			TRANSISTOR:SILICON,PNP	80009	151-0289-00
Q660	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q688	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q690	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q700	151-0280-00			TRANSISTOR:SILICON,PNP	80009	151-0280-00
Q703	151-0350-00	X300651		TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q704	151-0350-00	X300651		TRANSISTOR:SILICON,PNP	80009	151-0350-00
Q705	151-0220-00	X300651		TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q709	151-0435-00	X300339		TRANSISTOR:SILICON,PNP	80009	151-0435-00
Q710	151-0297-00			TRANSISTOR:SILICON,NPN	80009	151-0297-00
Q712	151-1018-00			TRANSISTOR;SILICON,FE,N-CHANNEL	0000M	151-1018-00
Q717	151-0342-00			TRANSISTOR:SILICON,PNP	80009	151-0342-00
Q723	151-0376-00			TRANSISTOR:SILICON,NPN	0000M	151-0376-00
Q730	151-0220-00	300000	300610	TRANSISTOR:SILICON,PNP	80009	151-0220-00
Q730	151-0219-00	300611		TRANSISTOR:SILICON,PNP	80009	151-0219-00
Q734	151-0489-00			TRANSISTOR:SILICON,NPN	0000M	151-0489-00
Q744	151-0270-00			TRANSISTOR:SILICON,PNP	80009	151-0270-00
Q745	151-0489-00			TRANSISTOR:SILICON,NPN	0000M	151-0489-00
Q767	151-0306-00			TRANSISTOR:SILICON,NPN,CHECKED	0000M	151-0306-00
Q772	151-0455-00			TRANSISTOR:SILICON,PNP	0000M	151-0455-00
R2	322-0481-01	300000	300296	RES.,FXD,FILM:1M OHM,0.5%,0.25W	75042	CEBT0-1004D
R2	315-0105-00	300297		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R4B	322-0624-01			RES.,FXD,FILM:990K OHM,0.5%,0.25W	75042	CEBT0-9903D
R4C	321-1289-31			RES.,FXD,FILM:10.1K OHM,0.5%,0.125W	0000M	321-1289-31
R5B	322-0621-31			RES.,FXD,FILM:900K OHM,0.5%,0.25W	0000M	322-0621-31
R5C	321-1389-31			RES.,FXD,FILM:111K OHM,0.5%,0.125W	0000M	321-1389-31
R6B	322-0620-31			RES.,FXD,FILM:800K OHM,0.5%,0.25W	0000M	322-0620-31
R6C	321-0618-31			RES.,FXD,FILM:250K OHM,0.5%,0.125W	0000M	321-0618-31
R7B	322-0610-31			RES.,FXD,FILM:500K OHM,0.5%,0.25W	0000M	322-0610-31
R7C	322-0481-01			RES.,FXD,FILM:1M OHM,0.5%,0.25W	75042	CEBT0-1004D
R12	322-0481-01	300000	300296	RES.,FXD,FILM:1M OHM,0.5%,0.25W	75042	CEBT0-1004D
R12	315-0105-00	300297		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R14B	322-0624-01			RES.,FXD,FILM:990K OHM,0.5%,0.25W	75042	CEBT0-9903D
R14C	321-1289-31			RES.,FXD,FILM:10.1K OHM,0.5%,0.125W	0000M	321-1289-31
R15B	322-0621-31			RES.,FXD,FILM:900K OHM,0.5%,0.25W	0000M	322-0621-31
R15C	321-1389-31			RES.,FXD,FILM:111K OHM,0.5%,0.125W	0000M	321-1389-31

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R16B	322-0620-31			RES.,FXD,FILM:800K OHM,0.5%,0.25W	0000M	322-0620-31
R16C	321-0618-31			RES.,FXD,FILM:250K OHM,0.5%,0.125W	0000M	321-0618-31
R17B	322-0610-31			RES.,FXD,FILM:500K OHM,0.5%,0.25W	0000M	322-0610-31
R17C	322-0481-01			RES.,FXD,FILM:1M OHM,0.5%,0.25W	75042	CEBT0-1004D
R20	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R21	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R22A	315-0104-00	300000	300180	RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R22A	301-0474-00	300181		RES.,FXD,CMPSN:470K OHM,5%,0.50W	01121	EB4745
R22B	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R23	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R25	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R26	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R27	311-0607-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	82P-59-4-103K
R28	315-0393-00	300000	301726	RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R28	315-0203-00	301727		RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R29	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R30	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R31	311-1022-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	80294	3329H-X1X-503
R32	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R33	321-0087-30	300000	300421	RES.,FXD,FILM:78.7 OHM,(NOM VALUE),SEL	0000M	321-0087-30
R33	321-0068-30	300422		RES.,FXD,FILM:49.9 OHM,(NOM VALUE),SEL	0000M	321-0068-30
R33A	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R33B	311-0643-00	X300422		RES.,VAR,NONWIR:50 OHM,10%,0.50W	80740	62-52-3
R34	321-0202-30			RES.,FXD,FILM:1.24K OHM,1%,0.125W	0000M	321-0202-30
R35	321-0172-30			RES.,FXD,FILM:604 OHM,1%,0.125W	0000M	321-0172-30
R36	321-0189-30			RES.,FXD,FILM:909 OHM,1%,0.125W	0000M	321-0189-30
R37	321-0317-30			RES.,FXD,FILM:19.6K OHM,1%,0.125W	0000M	321-0317-30
R38	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
R39	321-0172-30			RES.,FXD,FILM:604 OHM,1%,0.125W	0000M	321-0172-30
R40	321-0189-30			RES.,FXD,FILM:909 OHM,1%,0.125W	0000M	321-0189-30
R41	321-0113-30			RES.,FXD,FILM:147 OHM,1%,0.125W	0000M	321-0113-30
R42A	321-0068-30	300000	300421	RES.,FXD,FILM:49.9 OHM,1%,0.125W	0000M	321-0068-30
R42A	321-0047-30	300422		RES.,FXD,FILM:30.1 OHM,1%,0.125W	0000M	321-0047-30
R42B	321-0079-30	300000	300117	RES.,FXD,FILM:64.9 OHM,1%,0.125W	0000M	321-0079-30
R42B	321-0084-00	300118		RES.,FXD,FILM:73.2 OHM,1%,0.125W	91637	MFF1816G73R20F
R43	311-0643-00	300000	300421	RES.,VAR,NONWIR:50 OHM,10%,0.50W	80740	62-52-3
R43	311-0622-00	300422		RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3326H-G48-101
R44A,B	311-1736-00			RES.,VAR,NONWIR:2K OHM X 500 OHM,0.1W	0000M	311-1736-00
R48	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R49	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R50	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R51	321-0167-30			RES.,FXD,FILM:536 OHM,1%,0.125W	0000M	321-0167-30
R52	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R53	311-0635-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	73138	82-32-0
R54	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R55	321-0167-30			RES.,FXD,FILM:536 OHM,1%,0.125W	0000M	321-0167-30
R56	321-0231-30			RES.,FXD,FILM:2.49K OHM,1%,0.125W	0000M	321-0231-30
R57	321-0247-30			RES.,FXD,FILM:3.65K OHM,1%,0.125W	0000M	321-0247-30
R58	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R59	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R60	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R61	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R62A	315-0104-00	300000	300180	RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045

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R62A	301-0474-00	300181		RES.,FXD,CMPSN:470K OHM,5%,0.50W	01121	EB4745
R62B	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R63	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R65	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R66	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R67	311-0607-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	82P-59-4-103K
R68	315-0393-00	300000	301726	RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R68	315-0203-00	301727		RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R69	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R70	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R71	311-1022-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	80294	3329H-X1X-503
R72	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R73	321-0087-30	300000	300421	RES.,FXD,FILM:78.7 OHM,(NOM VALUE),SEL	0000M	321-0087-30
R73	321-0068-30	300422		RES.,FXD,FILM:49.9 OHM,(NOM VALUE),SEL	0000M	321-0068-30
R73A	317-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.125W	01121	BB4705
R73B	311-0643-00	X300422		RES.,VAR,NONWIR:50 OHM,10%,0.50W	80740	62-52-3
R74	321-0202-30			RES.,FXD,FILM:1.24K OHM,1%,0.125W	0000M	321-0202-30
R75	321-0172-30			RES.,FXD,FILM:604 OHM,1%,0.125W	0000M	321-0172-30
R76	321-0189-30			RES.,FXD,FILM:909 OHM,1%,0.125W	0000M	321-0189-30
R77	321-0317-30			RES.,FXD,FILM:19.6K OHM,1%,0.125W	0000M	321-0317-30
R78	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
R79	321-0172-30			RES.,FXD,FILM:604 OHM,1%,0.125W	0000M	321-0172-30
R80	321-0189-30			RES.,FXD,FILM:909 OHM,1%,0.125W	0000M	321-0189-30
R81	321-0113-30			RES.,FXD,FILM:147 OHM,1%,0.125W	0000M	321-0113-30
R82A	321-0068-30	300000	300421	RES.,FXD,FILM:49.9 OHM,1%,0.125W	0000M	321-0068-30
R82A	321-0047-30	300422		RES.,FXD,FILM:30.1 OHM,1%,0.125W	0000M	321-0047-30
R82B	321-0079-30	300000	300117	RES.,FXD,FILM:64.9 OHM,1%,0.125W	0000M	321-0079-30
R82B	321-0084-00	300118		RES.,FXD,FILM:73.2 OHM,1%,0.125W	91637	MFF1816G73R20F
R83	311-0643-00	300000	300421	RES.,VAR,NONWIR:50 OHM,10%,0.50W	80740	62-52-3
R83	311-0622-00	300422		RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3326H-G48-101
R84A,B	311-1736-00			RES.,VAR,NONWIR:2K OHM X 500 OHM,0.1W	0000M	311-1736-00
R88	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R89	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R90	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R91	321-0167-30			RES.,FXD,FILM:536 OHM,1%,0.125W	0000M	321-0167-30
R92	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
R93	311-0635-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	73138	82-32-0
R94	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R95	321-0167-30			RES.,FXD,FILM:536 OHM,1%,0.125W	0000M	321-0167-30
R96	321-0231-30			RES.,FXD,FILM:2.49K OHM,1%,0.125W	0000M	321-0231-30
R97	321-0247-30			RES.,FXD,FILM:3.65K OHM,1%,0.125W	0000M	321-0247-30
R98	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R99	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
R102	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R105	321-0245-30			RES.,FXD,FILM:3.48K OHM,1%,0.125W	0000M	321-0245-30
R106	321-0245-30			RES.,FXD,FILM:3.48K OHM,1%,0.125W	0000M	321-0245-30
R107	321-0277-30			RES.,FXD,FILM:7.5K OHM,1%,0.125W	0000M	321-0277-30
R108	311-0605-00			RES.,VAR,NONWIR:200 OHM,10%,0.50W	80740	62-54-3
R109	321-0277-30			RES.,FXD,FILM:7.5K OHM,1%,0.125W	0000M	321-0277-30
R113A	321-0229-30			RES.,FXD,FILM.2.37K OHM,1%,0.125W	0000M	321-0229-30
R113B	321-0229-30			RES.,FXD,FILM.2.37K OHM,1%,0.125W	0000M	321-0229-30
R114A	321-0297-30			RES.,FXD,FILM:12.1K OHM,1%,0.125W	0000M	321-0297-30
R114B	321-0297-30			RES.,FXD,FILM:12.1K OHM,1%,0.125W	0000M	321-0297-30

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R115	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R116	321-0190-30			RES.,FXD,FILM:931 OHM,1%,0.125W	0000M	321-0190-30
R117	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R118	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R119	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
R120	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R121	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R125	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R126	321-0190-30			RES.,FXD,FILM:931 OHM,1%,0.125W	0000M	321-0190-30
R127	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
R128	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R130	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R131	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R135	321-0143-30			RES.,FXD,FILM:301 OHM,1%,0.125W	0000M	321-0143-30
R136	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R138	315-0153-00	300000	301726	RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R138	315-0223-00	301727		RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R139	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R140	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R142	315-0124-00			RES.,FXD,CMPSN:120K OHM,5%,0.25W	01121	CB1245
R143	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R144	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R145	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R146	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R147	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R148	321-0242-30			RES.,FXD,FILM:3.24K OHM,1%,0.125W	0000M	321-0242-30
R149	321-0242-30			RES.,FXD,FILM:3.24K OHM,1%,0.125W	0000M	321-0242-30
R150	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R151	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R154	311-0609-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	73138	82-26-0
R155	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R156	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R157	321-0093-30			RES.,FXD,FILM:90.9 OHM,1%,0.125W	0000M	321-0093-30
R160	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R161	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R162	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R164	321-0157-30			RES.,FXD,FILM:422 OHM,1%,0.125W	0000M	321-0157-30
R166	321-0164-30			RES.,FXD,FILM:499 OHM,1%,0.125W	0000M	321-0164-30
R167	321-0093-30			RES.,FXD,FILM:90.9 OHM,1%,0.125W	0000M	321-0093-30
R181	321-0208-30			RES.,FXD,FILM:1.43K OHM,1%,0.125W	0000M	321-0208-30
R182	311-0605-00			RES.,VAR,NONWIR:200 OHM,10%,0.50W	80740	62-54-3
R183	321-0255-30			RES.,FXD,FILM:4.42K OHM,1%,0.125W	0000M	321-0255-30
R185	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R186	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R188	321-0255-30			RES.,FXD,FILM:4.42K OHM,1%,0.125W	0000M	321-0255-30
R195	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
R196	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R198	321-0255-30			RES.,FXD,FILM:4.42K OHM,1%,0.125W	0000M	321-0255-30
R200	321-0356-30			RES.,FXD,FILM:49.9K OHM,1%,0.125W	0000M	322-0356-30
R201	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R203	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R204	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R205	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625

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R206	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R208	321-0113-30			RES.,FXD,FILM:147 OHM,1%,0.125W	0000M	321-0113-30
R209	321-0135-30			RES.,FXD,FILM:249 OHM,1%,0.125W	0000M	321-0135-30
R210	321-0356-30			RES.,FXD,FILM:49.9K OHM,1%,0.125W	0000M	322-0356-30
R211	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R214	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
R215	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R216	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R218	321-0113-30			RES.,FXD,FILM:147 OHM,1%,0.125W	0000M	321-0113-30
R222	321-0300-30			RES.,FXD,FILM:13K OHM,1%,0.125W	0000M	321-0300-30
R223	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R224	321-0260-30			RES.,FXD,FILM:4.99K OHM,1%,0.125W	0000M	321-0260-30
R225	321-0217-30			RES.,FXD,FILM:1.78K OHM,1%,0.125W	0000M	321-0217-30
R226	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R227	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R229	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R230	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
R232	321-0201-30			RES.,FXD,FILM:1.21K OHM,1%,0.125W	0000M	321-0201-30
R233	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R234	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R236	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R237	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R239	321-0239-30			RES.,FXD,FILM:3.01K OHM,1%,0.125W	0000M	321-0239-30
R240	321-0239-30			RES.,FXD,FILM:3.01K OHM,1%,0.125W	0000M	321-0239-30
R260	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R261	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R262	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R264	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R265	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R267	321-0316-30			RES.,FXD,FILM:19.1K OHM,1%,0.125W	0000M	321-0316-30
R272	321-0318-30			RES.,FXD,FILM:20K OHM,1%,0.125W	0000M	321-0318-30
R273	321-0348-30			RES.,FXD,FILM:41.2K OHM,1%,0.125W	0000M	321-0348-30
R276	321-0753-31			RES.,FXD,FILM:9K OHM,0.5%,0.125W	0000M	321-0753-31
R277	321-0193-30			RES.,FXD,FILM:1K OHM,1%,0.125W	0000M	321-0193-30
R300	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R301	322-0621-31			RES.,FXD,FILM:900K OHM,0.5%,0.25W	0000M	322-0621-31
R302	321-1389-31			RES.,FXD,FILM:111K OHM,0.5%,0.125W	0000M	321-1389-31
R304	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R305	322-0481-00			RES.,FXD,FILM:1M OHM,1%,0.25W	75042	CEBT0-1004F
R306	315-0513-00	300000	300338	RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R306	315-0243-00	300339		RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
R307	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R308	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R310	322-0481-01			RES.,FXD,FILM:1M OHM,0.5%,0.25W	75042	CEBT0-1004D
R311	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R313	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R316	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R318	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R319	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
R320	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
R321	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R323	315-0391-00	300000	301621	RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
R323	315-0331-00	301622		RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315

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R325	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R326	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
R327	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R328	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R329	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R330	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R331[1]	311-1192-00			RES.,VAR,NONWIR:10K OHM,20%,1W	71590	BA-232-001
R332	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
R333	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R334	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R335	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R336	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R337	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
R338	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
R339	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R340	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R341	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R342	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R343	315-0300-00	300000	301621	RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
R343	315-0510-00	301622		RES.,FXD,CMPSN:51 OHM,(NOM VALUE),SEL	01121	CB5105
R344	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R345	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R346	315-0754-00	X300339		RES.,FXD,CMPSN:750K OHM,5%,0.25W	01121	CB7545
R347	315-0154-00	300000	300338	RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
R347	315-0473-00	300339		RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R348[2]	311-1746-00	300000	300338X	RES.,VAR,NONWIR:200K OHM,10%,0.50W	0000M	311-1746-00
R350	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R351	315-0302-00	X301164		RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R352	321-0358-30	300000	300170	RES.,FXD,FILM:52.3K OHM,1%,0.125W	0000M	321-0358-30
R352	321-0358-30	300171		RES.,FXD,FILM:52.3K OHM,(NOM VALUE),SEL	0000M	321-0358-30
R353	321-0364-30			RES.,FXD,FILM:60.4K OHM,1%,0.125W	0000M	321-0364-30
R354	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R355	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R357	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R359	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R360	323-0498-03			RES.,FXD,FILM:1.5M OHM,0.25%,0.50W	91637	HFF129150003C
R361	323-0498-03			RES.,FXD,FILM:1.5M OHM,0.25%,0.50W	91637	HFF129150003C
R362	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R363	321-0917-03			RES.,FXD,FILM:27.2K OHM,0.25%,0.125W	91637	MFF1816D27201C
R364	321-0856-03			RES.,FXD,FILM:330K OHM,0.25%,0.125W	91637	MFF1816D33002C
R365	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R366	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	91637	MFF1816D50000C
R367	321-0916-03			RES.,FXD,FILM:289 OHM,0.25%,0.125W	91637	MFF1816D289R0C
R368	321-0269-30			RES.,FXD,FILM:6.19K OHM,1%,0.125W	0000M	321-0269-30
R369	321-0385-30			RES.,FXD,FILM:100K OHM,1%,0.125W	0000M	321-0385-30
R370[3]	311-1763-00			RES.,VAR,NONWIR:10K OHM,10%,1W	12697	381S-CM40427
R373	315-0822-00	300000	300510	RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R373	315-0392-00	300511		RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R376	321-0200-30			RES.,FXD,FILM:1.18K OHM,1%,0.125W	0000M	321-0200-30
R377	321-0830-03			RES.,FXD,FILM:2.41K OHM,0.25%,0.125W	91637	MFF1816D24100C
R378	321-0827-03			RES.,FXD,FILM:3.61K OHM,0.25%,0.125W	91637	MFF1816D36100C
R380	321-0268-03			RES.,FXD,FILM:6.04K OHM,0.25%,0.125W	91637	MFF1816D60400C
R381	321-0234-30			RES.,FXD,FILM:2.67K OHM,1%,0.125W	0000M	321-0234-30

[1]Furnished as a unit with S338.
[2]R348 replaced with a wire S/N 300339 - up.
[3]Furnished as a unit with S367.

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R382	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R384	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
R385A,B	311-1737-00			RES.,VAR,NONWIR:50K OHM X 20K OHM	0000M	311-1737-00
R386	321-0300-30			RES.,FXD,FILM:13K OHM,1%,0.125W	0000M	321-0300-30
R388	311-1742-00			RES.,VAR,NONWIR:0.5K OHM,10%,0.50W	0000M	311-1742-00
R400	321-0226-30			RES.,FXD,FILM:2.21K OHM,1%,0.125W	0000M	321-0226-30
R401	321-0193-30			RES.,FXD,FILM:1K OHM,1%,0.125W	0000M	321-0193-30
R402	321-0239-30			RES.,FXD,FILM:3.01K OHM,1%,0.125W	0000M	321-0239-30
R403	321-0318-30			RES.,FXD,FILM:20K OHM,1%,0.125W	0000M	321-0318-30
R405	311-1741-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	0000M	311-1741-00
R406	321-0260-30			RES.,FXD,FILM:4.99K OHM,1%,0.125W	0000M	321-0260-30
R408	321-0293-30	300000	300510	RES.,FXD,FILM:11K OHM,1%,0.125W	0000M	321-0293-30
R408	321-0264-30	300511		RES.,FXD,FILM:5.49K OHM,1%,0.125W	0000M	321-0264-30
R409	321-0249-30	300000	300510	RES.,FXD,FILM:3.83K OHM,1%,0.125W	0000M	321-0249-30
R409	321-0264-30	300511		RES.,FXD,FILM:5.49K OHM,1%,0.125W	0000M	321-0264-30
R410	321-0140-30			RES.,FXD,FILM:280 OHM,1%,0.125W	0000M	321-0140-30
R429	315-0150-00			RES.,FXD,CMPSN:15 OHM,5%,0.25W	01121	CB1505
R430	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R431	321-0097-30			RES.,FXD,FILM:100 OHM,1%,0.125W	0000M	321-0097-30
R432	321-0168-30			RES.,FXD,FILM:549 OHM,1%,0.125W	0000M	321-0168-30
R435	321-0255-30	300000	300039	RES.,FXD,FILM:4.42K OHM,1%,0.125W	0000M	321-0255-30
R435	321-0257-30	300040		RES.,FXD,FILM:4.64K OHM,1%,0.125W	0000M	321-0257-30
R437	311-1740-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	0000M	311-1740-00
R439	321-0251-30			RES.,FXD,FILM:4.02K OHM,1%,0.125W	0000M	321-0251-30
R440	321-0320-30			RES.,FXD,FILM:21K OHM,1%,0.125W	0000M	321-0320-30
R441	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R442	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R443A	321-0394-30			RES.,FXD,FILM:124K OHM,1%,0.125W	0000M	321-0394-30
R443B	321-0394-30			RES.,FXD,FILM:124K OHM,1%,0.125W	0000M	321-0394-30
R444	321-0226-30			RES.,FXD,FILM:2.21K OHM,1%,0.125W	0000M	321-0226-30
R445	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R446	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R447	315-0304-00			RES.,FXD,CMPSN:300K OHM,5%,0.25W	01121	CB3045
R448	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R450	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R451	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
R452	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R453	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R454	321-0313-30			RES.,FXD,FILM:17.8K OHM,1%,0.125W	0000M	321-0313-30
R455	322-0610-31			RES.,FXD,FILM:500K OHM,0.5%,0.25W	0000M	322-0610-31
R456	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R458	322-0610-31			RES.,FXD,FILM:500K OHM,0.5%,0.25W	0000M	322-0610-31
R459	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R460	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
R461	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R463	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R464	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R465	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R470	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R471	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R501	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R502	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R504	315-0304-00			RES.,FXD,CMPSN:300K OHM,5%,0.25W	01121	CB3045

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R505	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R506	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R507	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R508	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R509	315-0184-00			RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R510	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R511	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R512	321-0320-30			RES.,FXD,FILM:21K OHM,1%,0.125W	0000M	321-0320-30
R513	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R514	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R515	321-0381-30	300000	300039	RES.,FXD,FILM:90.9K OHM,1%,0.125W	0000M	321-0381-30
R515	321-0388-30	300040		RES.,FXD,FILM:107K OHM,1%,0.125W	0000M	321-0388-30
R516	321-0313-30			RES.,FXD,FILM:17.8K OHM,1%,0.125W	0000M	321-0313-30
R518	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R519	311-1744-00			RES.,VAR,NONWIR:20K OHM,10%,0.50W	0000M	311-1744-00
R522	321-0351-30			RES.,FXD,FILM:44.2K OHM,1%,0.125W	0000M	321-0351-30
R523	323-0422-00			RES.,FXD,FILM:243K OHM,1%,0.50W	75042	CECT0-2433F
R524	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R525	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
R527	301-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.5W	01121	EB1045
R529	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R530	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R531	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
R532A	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R532B	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R533	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R534	315-0184-00			RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R535	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R537A,B	311-1738-00			RES.,VAR,NONWIR:1M OHM/10K OHM,0.1W	01121	14M082
R538	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R539	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R540	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R541	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R542	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R545	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R546	315-0913-00			RES.,FXD,CMPSN:91K OHM,5%,0.25W	01121	CB9135
R547	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R548	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R550	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R551	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R554	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R555	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R557	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R558	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R559	315-0334-00			RES.,FXD,CMPSN:330K OHM,5%,0.25W	01121	CB3345
R560	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R563	308-0463-00	300000	301992X	RES.,FXD,WW:0.3 OHM,1%,3W	91637	RS2B-KR3000F
R564	315-0184-00			RES.,FXD,CMPSN:180K OHM,5%,0.25W	01121	CB1845
R565	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R566	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R568	311-1746-00			RES.,VAR,NONWIR:200K OHM,10%,0.50W	0000M	311-1746-00
R572	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
R573	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

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R574	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
R575	311-1746-00			RES.,VAR,NONWIR:200K OHM,10%,0.50W	0000M	311-1746-00
R576	321-0385-30	300000	301991	RES.,FXD,FILM:100K OHM,1%,0.125W	0000M	321-0385-30
R576	321-0368-30	301992		RES.,FXD,FILM:66.5K OHM,1%,0.125W	0000M	321-0368-30
R600	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R602	307-0093-00			RES.,FXD,CMPSN:1.2 OHM,5%,0.50W	01121	EB12G5
R603	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R604	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R605	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R607	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R609	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
R610	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R611	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R612	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R614	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
R615	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R616	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R618	311-1742-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	0000M	311-1742-00
R619	321-0267-30			RES.,FXD,FILM:5.9K OHM,1%,0.125W	0000M	321-0267-30
R620	321-0289-30			RES.,FXD,FILM:10K OHM,1%,0.125W	0000M	321-0289-30
R622	321-0329-30			RES.,FXD,FILM:26.1K OHM,1%,0.125W	0000M	321-0329-30
R626	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R627	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R628	311-1744-00			RES.,VAR,NONWIR:20K OHM,10%,0.50W	0000M	311-1744-00
R629	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
R630	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R634	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
R636	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R638	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R639	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R640	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
R650	315-0244-00			RES.,FXD,CMPSN:240K OHM,5%,0.25W	01121	CB2445
R651	311-1746-00			RES.,VAR,NONWIR:200K OHM,10%,0.50W	0000M	311-1746-00
R652	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R653	311-1743-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	0000M	311-1743-00
R655	315-0202-00	X300181		RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R656	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
R657	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R658	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R659	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
R660	307-0093-00			RES.,FXD,CMPSN:1.2 OHM,5%,0.50W	01121	EB12G5
R662	307-0106-01			RES.,FXD,COMP:4.7 OHM,5%,0.25W	0000M	307-0106-01
R663	307-0106-01			RES.,FXD,COMP:4.7 OHM,5%,0.25W	0000M	307-0106-01
R665	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R671[1]	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R680	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R684[2]	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R686	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R688	307-0106-01			RES.,FXD,COMP:4.7 OHM,5%,0.25W	0000M	307-0106-01
R690	307-0106-01			RES.,FXD,COMP:4.7 OHM,5%,0.25W	0000M	307-0106-01
R692	303-0752-00	300000	300170	RES.,FXD,CMPSN:7.5K OHM,5%,1W	01121	GB7525
R692	303-0752-00	300171		RES.,FXD,CMPSN:7.5K OHM,(NOM VALUE),SEL	01121	GB7525
R694	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325

[1]Some instruments below S/N 300962 may use 100 OHM. Replace all with 47 OHM.
[2]Some instruments below S/N 300962 may use 47 OHM. Replace all with 100 OHM.

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R695	315-0566-00			RES.,FXD,CMPSN:56M OHM,5%,0.25W	01121	CB5665
R696	315-0566-00			RES.,FXD,CMPSN:56M OHM,5%,0.25W	01121	CB5665
R697	301-0685-00	300000	300039	RES.,FXD,CMPSN:6.8M OHM,5%,0.50W	01121	EB6855
R697	301-0825-00	300040		RES.,FXD,CMPSN:8.2M OHM,5%,0.50W	01121	EB8255
R698	311-1739-00			RES.,VAR,NONWIR:5M OHM,0.50W	0000M	311-1739-00
R700	325-0189-00	300000	300039	RES.,FXD,FILM:12M OHM,5%,1W	0000M	325-0189-00
R700	301-0106-00	300040		RES.,FXD,CMPSN:10M OHM,5%,0.50W	01121	EB1065
R701	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
R702	311-1293-01			RES.,VAR,NONWIR:1M OHM,10%,0.50W	80740	82-79-0
R703	311-1739-00			RES.,VAR,NONWIR:5M OHM,0.50W	0000M	311-1739-00
R704	315-0185-00	X300651		RES.,FXD,CMPSN:1.8M OHM,5%,0.25W	01121	CB1855
R705	301-0685-00	300000	300650X	RES.,FXD,CMPSN:6.8M OHM,5%,0.50W	01121	EB6855
R706	311-1293-01	X300339		RES.,VAR,NONWIR:1M OHM,10%,0.50W	80740	82-79-0
R707	315-0185-00			RES.,FXD,CMPSN:1.8M OHM,5%,0.25W	01121	CB1855
R708	315-0185-00	X300339	300650	RES.,FXD,CMPSN:1.8M OHM,5%,0.25W	01121	CB1855
R708	315-0225-00	300651		RES.,FXD,CMPSN:2.2M OHM,5%,0.25W	01121	CB2255
R709	315-0205-00	X300339		RES.,FXD,CMPSN:2M OHM,5%,0.25W	01121	CB2055
R710	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R711	315-0511-00	X300339	300650	RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
R711	315-0153-00	300651		RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
R712	325-0190-00			RES.,FXD,FILM:50M OHM,1%,2W	0000M	325-0190-00
R713	321-0365-30			RES.,FXD,FILM:61.9K OHM,1%,0.125W	0000M	321-0365-30
R714	321-0297-30			RES.,FXD,FILM:12.1K OHM,1%,0.125W	0000M	321-0297-30
R715	321-0239-30			RES.,FXD,FILM:3.01K OHM,1%,0.125W	0000M	321-0239-30
R716	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
R717	325-0188-00			RES.,FXD,FILM:5.6M OHM,5%,0.50W	0000M	325-0188-00
R718	321-0385-30			RES.,FXD,FILM:100K OHM,1%,0.125W	0000M	321-0385-30
R719	311-1605-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	0000M	311-1605-00
R720	315-0471-00	X300651		RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R721	311-1745-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	0000M	311-1745-00
R722A	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
R722B	315-0913-00			RES.,FXD,CMPSN:91K OHM,5%,0.25W	01121	CB9135
R723	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R724	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R725	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R726	315-0335-00	X300651		RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
R727	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
R728	315-0226-00	X300651		RES.,FXD,CMPSN:22M OHM,5%,0.25W	01121	CB2265
R729	315-0103-00	X300828		RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R730	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
R731	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
R732	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
R734	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R735	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R736	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R737	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
R738	315-0105-00	X300963		RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R740	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
R742	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R743	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
R745	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R746	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R748	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015

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R760	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
R761	321-0289-30			RES.,FXD,FILM:10K OHM,1%,0.125W	0000M	321-0289-30
R762	311-1743-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	0000M	311-1743-00
R763	321-0327-30			RES.,FXD,FILM:24.9K OHM,1%,0.125W	0000M	321-0327-30
R770	321-0354-30	300000	300189	RES.,FXD,FILM:47.5K OHM,1%,0.125W	0000M	321-0354-30
R770	321-0354-01	300190		RES.,FXD,FILM:47.5K OHM,0.5%,0.125W	91637	MFF1816G47501D
R771	321-0354-30	300000	300189	RES.,FXD,FILM:47.5K OHM,1%,0.125W	0000M	321-0354-30
R771	321-0354-01	300190		RES.,FXD,FILM:47.5K OHM,0.5%,0.125W	91637	MFF1816G47501D
RT42	307-0127-00	X300118		RES.,THERMAL:1K OHM,10%	50157	2D102
RT82	307-0127-00	X300118		RES.,THERMAL:1K OHM,10%	50157	2D102
S2	260-1731-00			SWITCH,SLIDE:DP3T,1A,12VAC,CKT CARD TERM.	29604	68-0328
S5	263-1107-00			SW CAM ACTR AS:	80009	263-1107-00
S12	260-1731-00			SWITCH,SLIDE:DP3T,1A,12VAC,CKT CARD TERM.	29604	68-0328
S15	263-1107-00			SW CAM ACTR AS:	80009	263-1107-00
S98	260-1713-00	300000	303169	SWITCH,PUSH:	82104	2039PB402-0001
S98	260-1713-01	303170		SWITCH,PUSH:1 BTN,2 POLE	80009	260-1713-01
S130	260-1712-00			SWITCH,PUSH:	82104	OBD
S300	260-1730-00			SWITCH,SLIDE:DP3T,1A,125VAC,PANEL MOUNT	29604	68-0327
S305	260-1714-00	300000	303169	SWITCH,PUSH:	82104	204PB402-1003
S305	260-1714-01	303170		SWITCH,PUSH:3 BTN,2 POLE	80009	260-1714-01
S337, S338[1]	260-0735-00			SWITCH,PUSH:SPST	81073	39-1
S341	260-1228-01	300000	303201	SWITCH,PUSH:DPDT,2 BUTTON	80009	260-1228-01
S341, S367[2]	260-1228-00	303202		SWITCH,PUSH:DPDT,2 BUTTON	80009	260-1228-00
S380	263-1103-00			SW CAM ACTR AS:	80009	263-1103-00
S500	260-1715-00	300000	303169	SWITCH,PUSH:	82104	2041PB400-1004
S500	260-1715-01	303170		SWITCH,PUSH:4 BTN,2 & 4 POLE	80009	260-1715-01
S565	260-1285-00			SWITCH,PUSH:SPDT,1A,115AC,MOM	09353	P8121
S600	260-1615-00			SWITCH,TOGGLE:	09353	U318H1
S601	260-1300-00			SWITCH,SLIDE:	82389	46206LFE
S602	260-1728-00			SWITCH,SLIDE:LO/M/H	0000M	260-1728-00
S603	260-0834-00			SWITCH,TOGGLE:DPDT,5A,125VAC,0.25-40 THD	09353	U21-SHZQE
S605	260-1728-00			SWITCH,SLIDE:AC	0000M	260-1728-00
T140	120-0764-00			TRANSFORMER:TOROID CORE FERRITE	0000M	120-0764-00
T600	120-0943-00			TRANSFORMER:POWER	0000M	120-0943-00
T660	120-0944-00			TRANSFORMER:CONVERTER	0000M	120-0944-00
T665	120-0945-00			TRANSFORMER:EXCITING	0000M	120-0945-00
U40	155-0050-01			MICROCIRCUIT,LI:DIFFERENTIAL PRE-AMPL	80009	155-0050-01
U80	155-0050-01			MICROCIRCUIT,LI:DIFFERENTIAL PRE-AMPL	80009	155-0050-01
U340	155-0056-00			MICROCIRCUIT,DI:SWEEP CONTROL	80009	155-0056-00
U350	155-0042-02	300000	300235	MICROCIRCUIT,LI:MILLER INTEGRATOR	80009	155-0042-02
U350	155-0042-03	300236	300712	MICROCIRCUIT,LI:MILLER INTEGRATOR	80009	155-0042-03
U350	155-0028-00	300713		MICROCIRCUIT,LI:ML,MILLER INTEGRATOR	80009	155-0028-00
U615	156-0053-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	U5R7723393
U765	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	80009	156-0158-00
V750	154-0714-00			ELECTRON TUBE:CRT	80009	154-0714-00
VR384	152-0359-00			SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
VR386	152-0359-00			SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
VR451	152-0359-00	300000	301276	SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
VR451	152-0611-00	301277		SEMICOND DEVICE:ZENER,0.4W,9V,2%	80009	152-0611-00

[1]Furnished as a unit with R331.
[2]Furnished as a unit with R370.

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
VR527	152-0255-00			SEMICOND DEVICE:ZENER,0.4W,51V,5%	80009	152-0255-00
VR564	152-0282-00			SEMICOND DEVICE:ZENER,0.4W,30V,5%	04713	1N972B
VR565	152-0166-00	300000	300379X	SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR603	152-0243-00			SEMICOND DEVICE:ZENER,0.4W,15V,5%	80009	152-0243-00
VR604	152-0283-00			SEMICOND DEVICE:ZENER,0.4W,43V,5%	04713	1N976B
VR630	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	81483	69-9035
VR658	152-0195-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	80009	152-0195-00
VR712	152-0359-00			SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
VR722	152-0359-00			SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
VR760	152-0359-00			SEMICOND DEVICE:ZENER,0.25W,5%,9V	04713	SZ50850
W565	131-0566-00	X300380		LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

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

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

Resistors = Ohms (Ω).

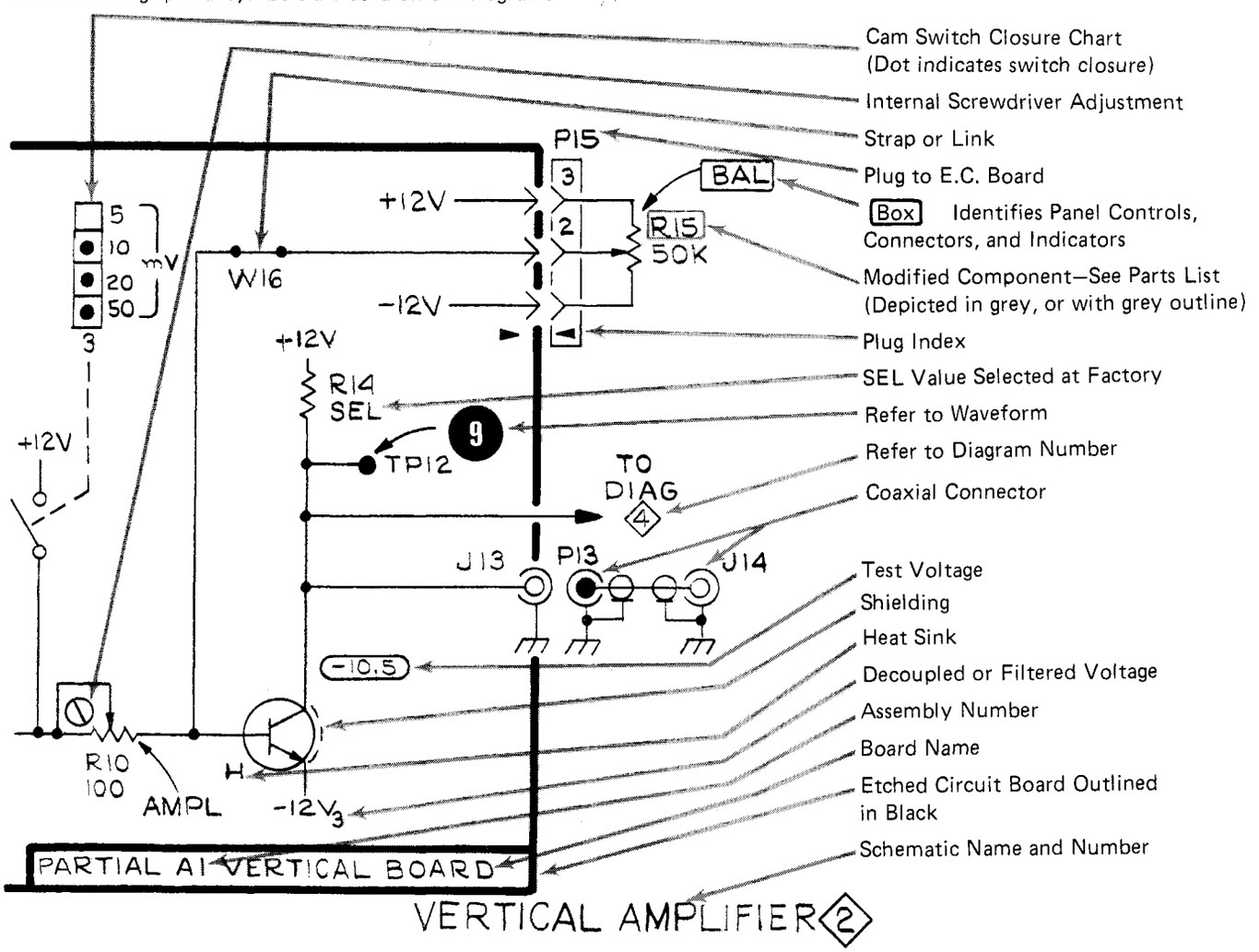
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

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

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

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

The following special symbols are used on the diagrams:



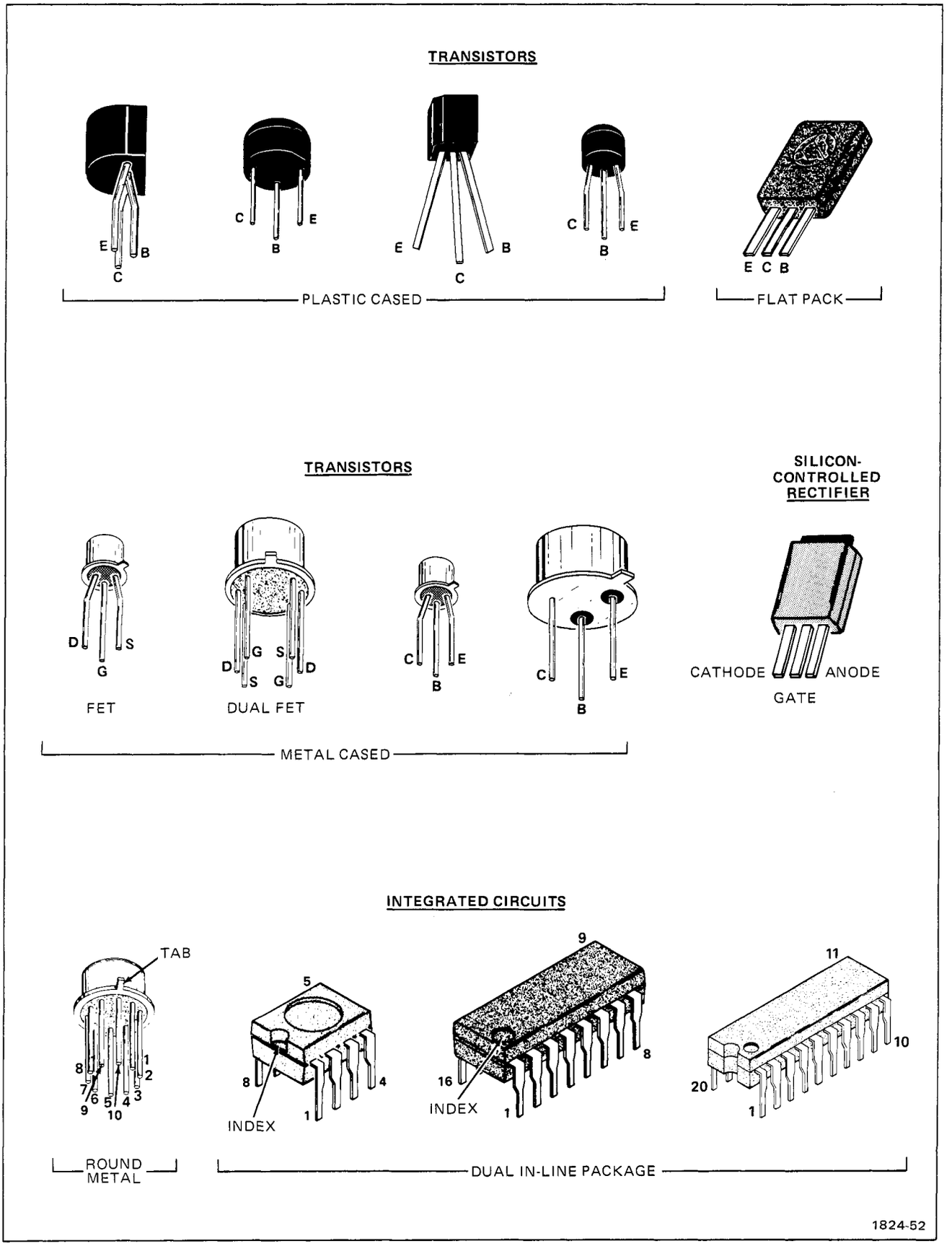
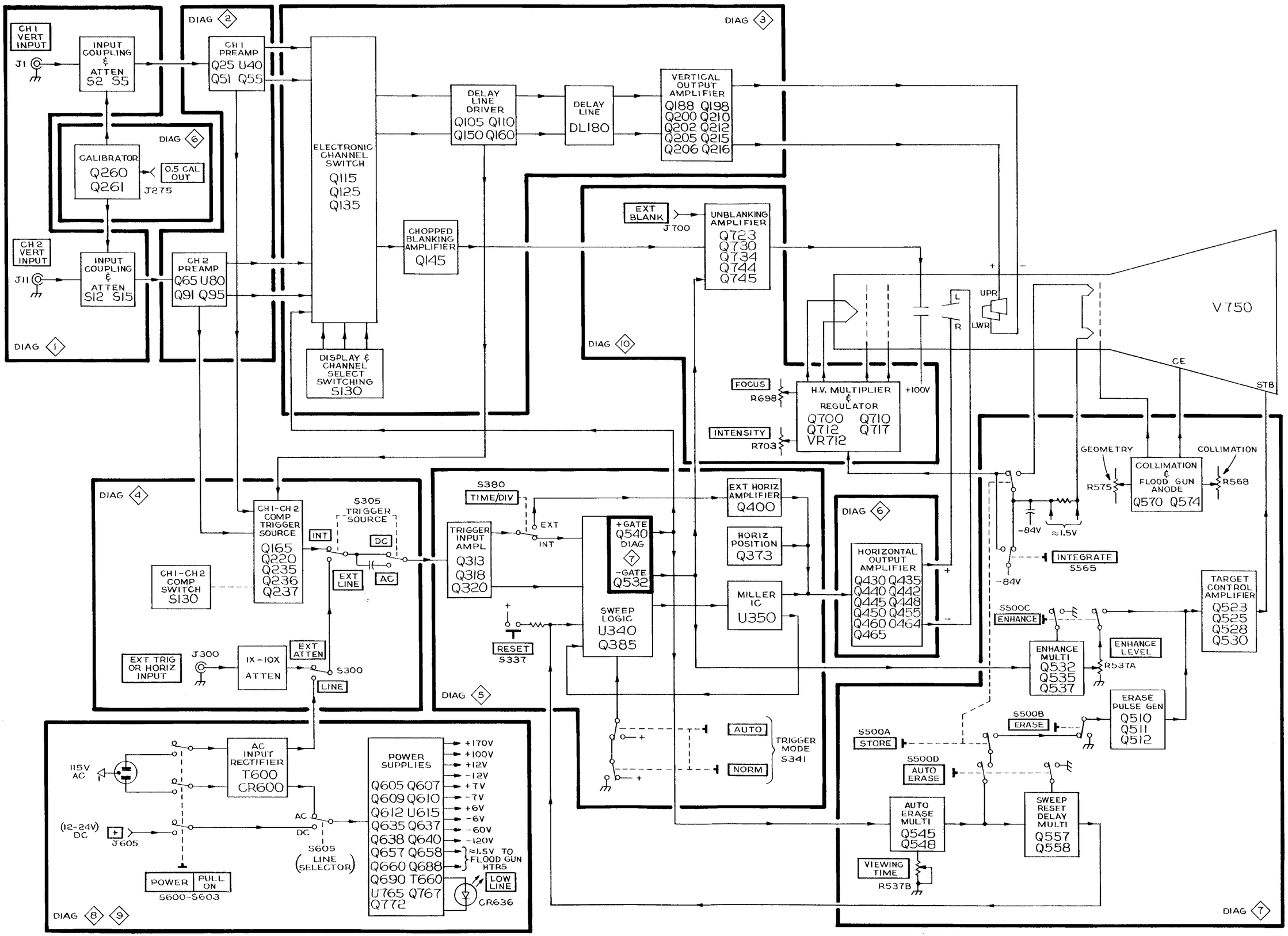


Figure 7-1. Semiconductor lead configurations.


CH 1 VERT INPUT
J1
INPUT COUPLING & ATTEN S2 S5
CH 1 PREAMP Q25 U40 Q51 Q55
DIAG 2
DIAG 3
ELECTRONIC CHANNEL SWITCH Q115 Q125 Q135
DELAY LINE DRIVER Q105 Q110 Q150 Q160
DELAY LINE DL180
VERTICAL OUTPUT AMPLIFIER Q188 Q198 Q200 Q210 Q202 Q212 Q205 Q215 Q206 Q216
DIAG 6
CALIBRATOR Q260 Q261
0.5 CAL OUT
J275
CH 2 VERT INPUT
J11
INPUT COUPLING & ATTEN S12 S15
CH 2 PREAMP Q65 U80 Q91 Q95
CHOPPED BLANKING AMPLIFIER Q145
EXT BLANK
J700
UNBLANKING AMPLIFIER Q723 Q730 Q734 Q744 Q745
DIAG 1
DISPLAY & CHANNEL SELECT SWITCHING S130
DIAG 10
FOCUS
R698
INTENSITY
R703
H.V. MULTIPLIER & REGULATOR Q700 Q710 Q712 Q717 VR712
+100V
L
R
UPR
LWR
V750
CE
STB
GEOMETRY
R575
COLLIMATION & FLOOD GUN ANODE Q570 Q574
COLLIMATION
R568
-84V
≈1.5V
INTEGRATE
S565
DIAG 4
CH1-CH2 COMP TRIGGER SOURCE Q165 Q220 Q235 Q236 Q237
S305 TRIGGER SOURCE
INT
DC
EXT LINE
AC
CH1-CH2 COMP SWITCH S130
S380
TIME/DIV
TRIGGER INPUT AMPL Q313 Q318 Q320
EXT
INT
+GATE Q540
DIAG 7
-GATE Q532
SWEEP LOGIC U340 Q385
EXT HORIZ AMPLIFIER Q400
HORIZ POSITION Q373
MILLER IC U350
DIAG 6
HORIZONTAL OUTPUT AMPLIFIER Q430 Q435 Q440 Q442 Q445 Q448 Q450 Q455 Q460 0464 Q465
-84V
S500C
ENHANCE
ENHANCE MULTI Q532 Q535 Q537
ENHANCE LEVEL
R537A
TARGET CONTROL AMPLIFIER Q523 Q525 Q528 Q530
EXT TRIG OR HORIZ INPUT
J300
IX-10X ATTEN
EXT ATTEN
S300
LINE
RESET
S337
DIAG 5
AUTO
NORM
TRIGGER MODE S341
S500B
ERASE
ERASE PULSE GEN Q510 Q511 Q512
S500A
STORE
S500D
AUTO ERASE
AUTO ERASE MULTI Q545 Q548
SWEEP RESET DELAY MULTI Q557 Q558
VIEWING TIME
R537B
115V AC
(12-24V) DC
J605
AC INPUT RECTIFIER T600 CR600
AC
DC
S605 LINE SELECTOR
POWER SUPPLIES Q605 Q607 Q609 Q610 Q612 U615 Q635 Q637 Q638 Q640 Q657 Q658 Q660 Q688 Q690 T660 U765 Q767 Q772
+170V
+100V
+12V
-12V
+7V
-7V
+6V
-6V
-60V
-120V
≈1.5V TO FLOOD GUN HTRS
LOW LINE
CR636
POWER
PULL ON
S600-S603
DIAG 8
DIAG 9
DIAG 7

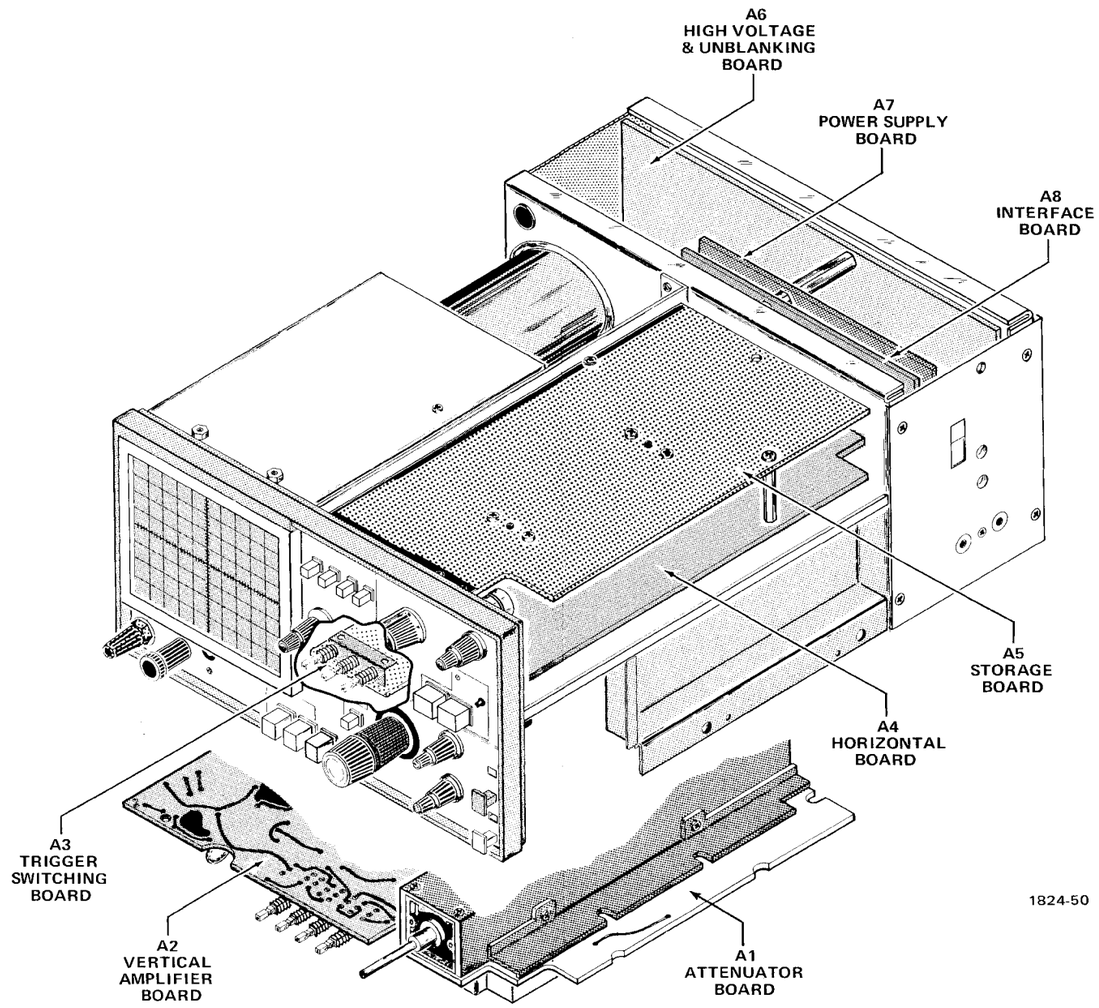


Figure 7-2. Circuit board locations.

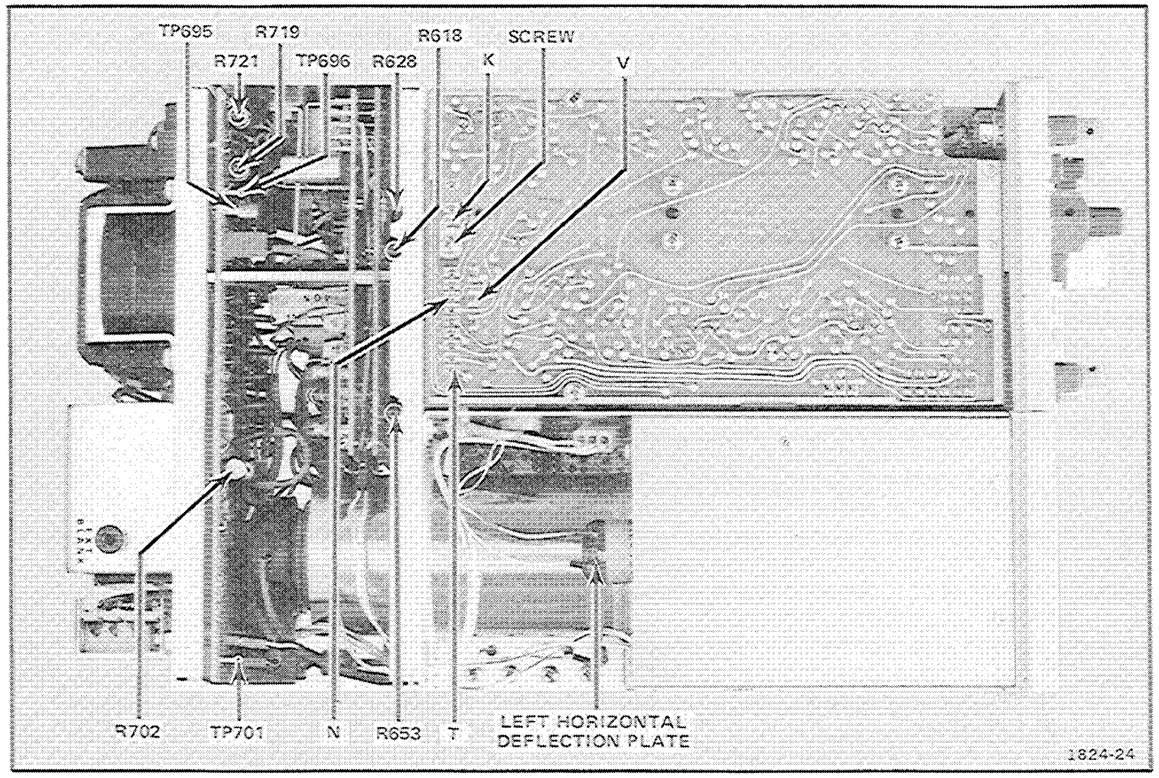


Figure 7-3. Adjustment locations.

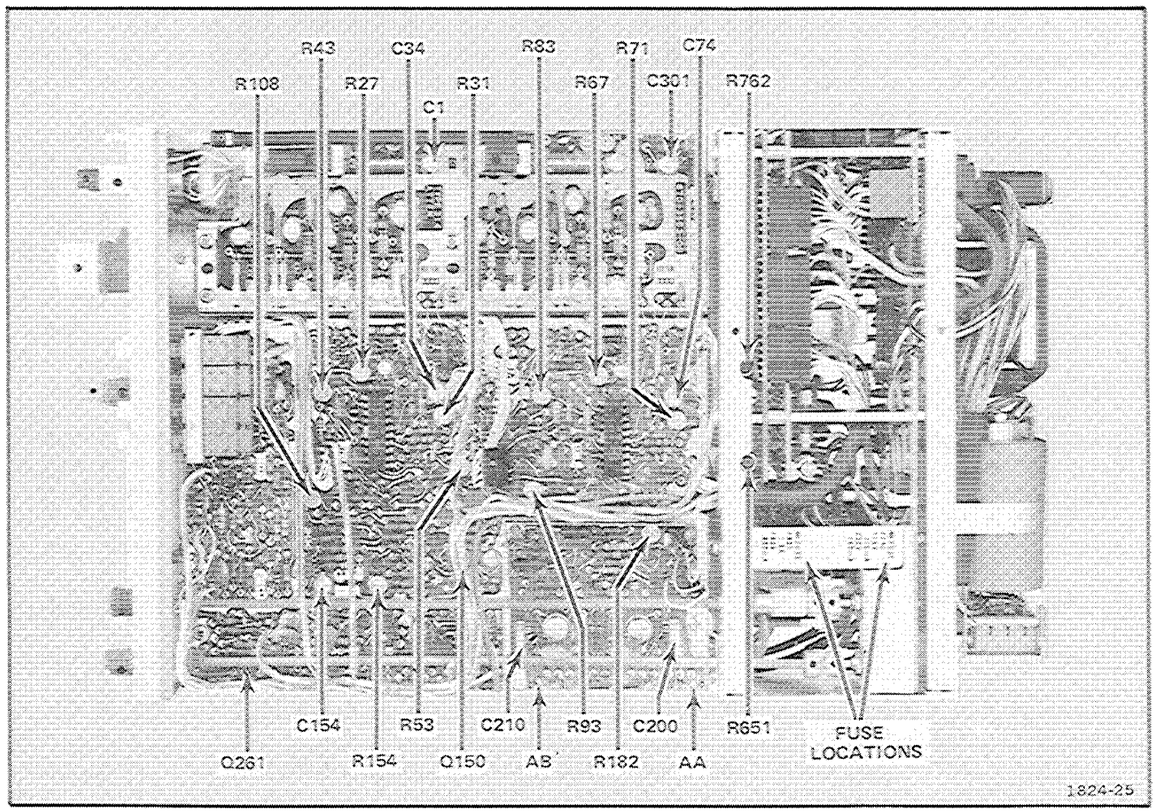


Figure 7-4. Adjustment locations.

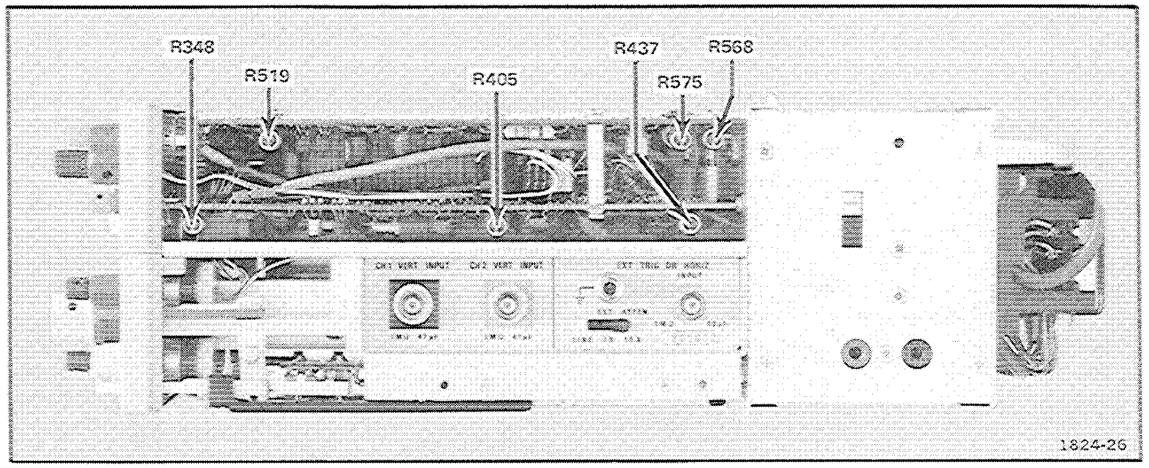


Figure 7-5. Adjustment locations.

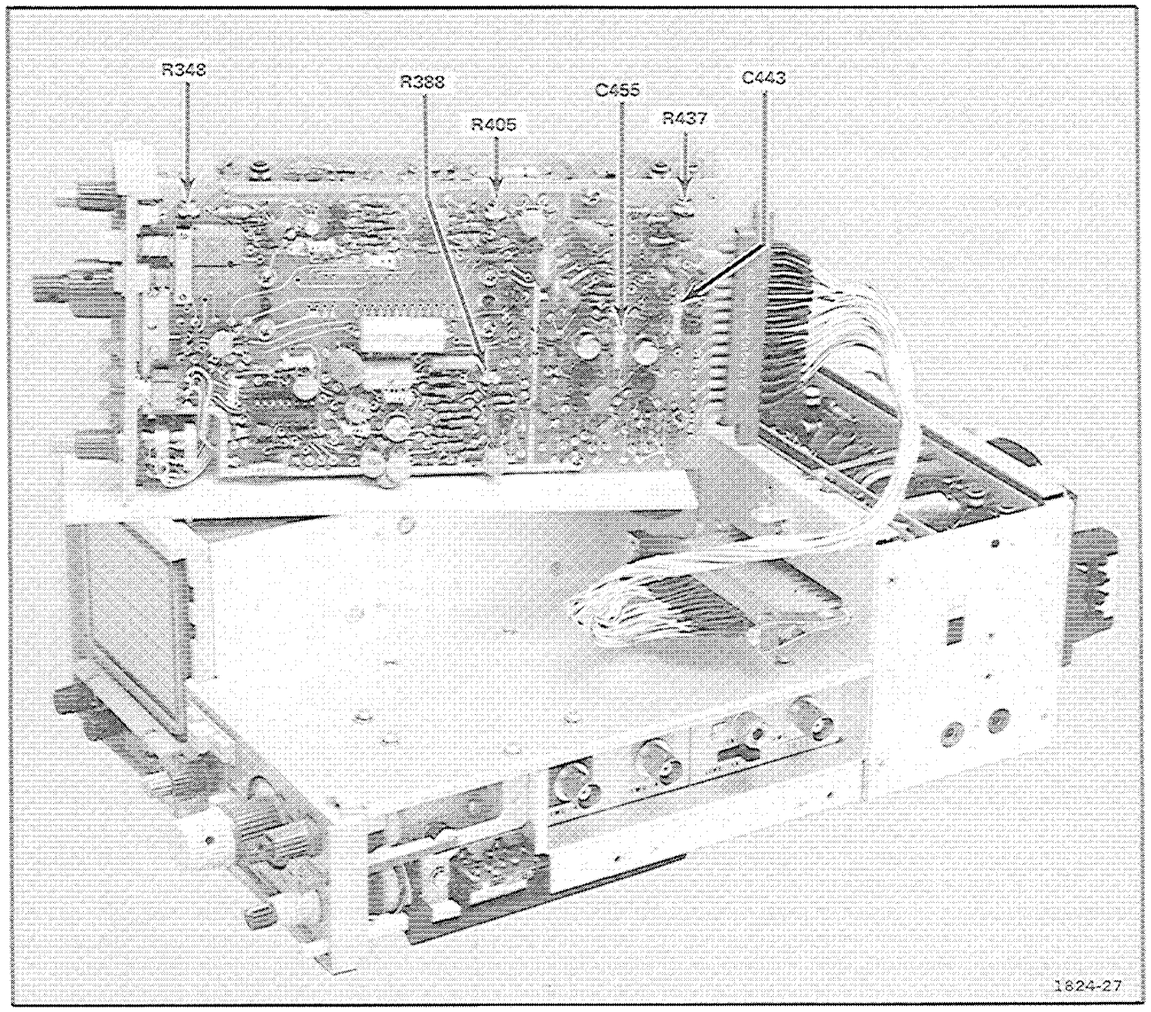


Figure 7-6. Adjustment locations.

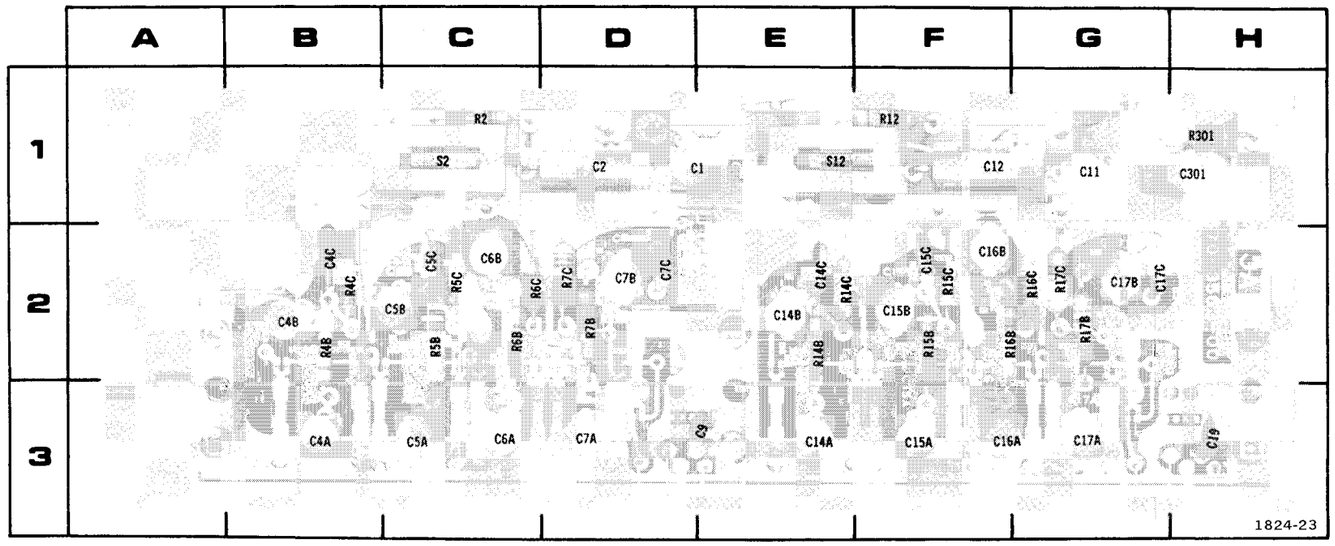
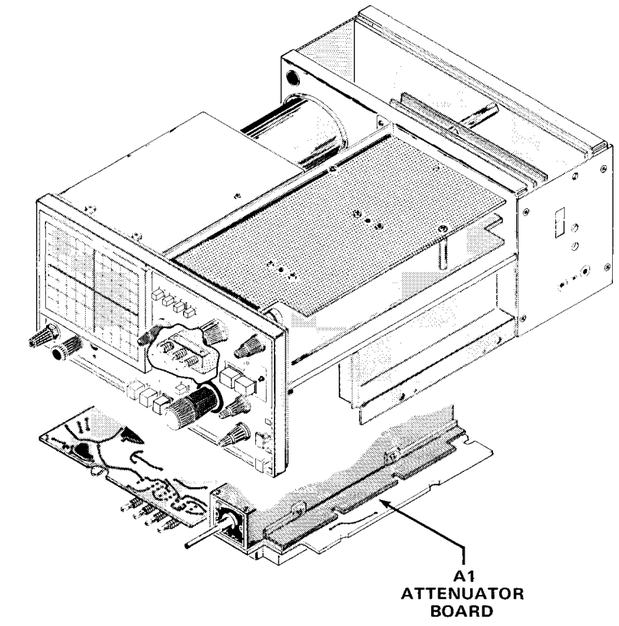
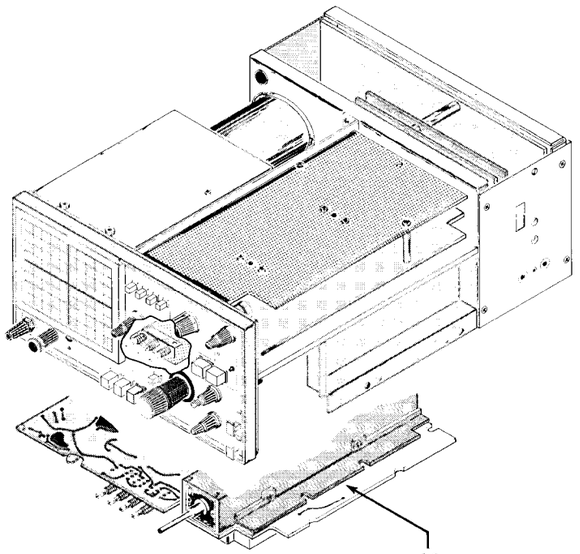


Figure 7-7. A1—Attenuator circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C1	1D	C11	1G	C301	1H	R15B	2F
C2	1D	C12	1F			R15C	2F
C4A	3B	C14A	3E	R2	1C	R16B	2F
C4B	2B	C14B	2E	R4B	2B	R16C	2G
C4C	2B	C14C	2E	R4C	2B	R17B	2G
C5A	3C	C15A	3F	R5B	2C	R17C	2G
C5B	2C	C15B	2F	R5C	2C	R301	1H
C5C	2C	C15C	2F	R6B	2C		
C6A	3C	C16A	3F	R6C	2C	S2	1C
C6B	2C	C16B	2F	R7B	2D	S12	1E
C7A	3D	C17A	3G	R7C	2D		
C7B	2D	C17B	2G	R12	1F		
C7C	2D	C17C	2G	R14B	2E		
C9	3E	C19	3H	R14C	2E		

@





VOLTAGE AND WAVEFORM CONDITIONS

Voltage Levels

All dc voltage levels were measured with a digital voltmeter (4½ digits) with no signal input (CH 1 and CH 2 Input Coupling set to GND). Both traces were centered, the time base was set to EXT HORIZ X1, and STORE and AUTO ERASE buttons out.

NOTE

The dc voltage levels are typical values and may vary from instrument to instrument.

Waveforms

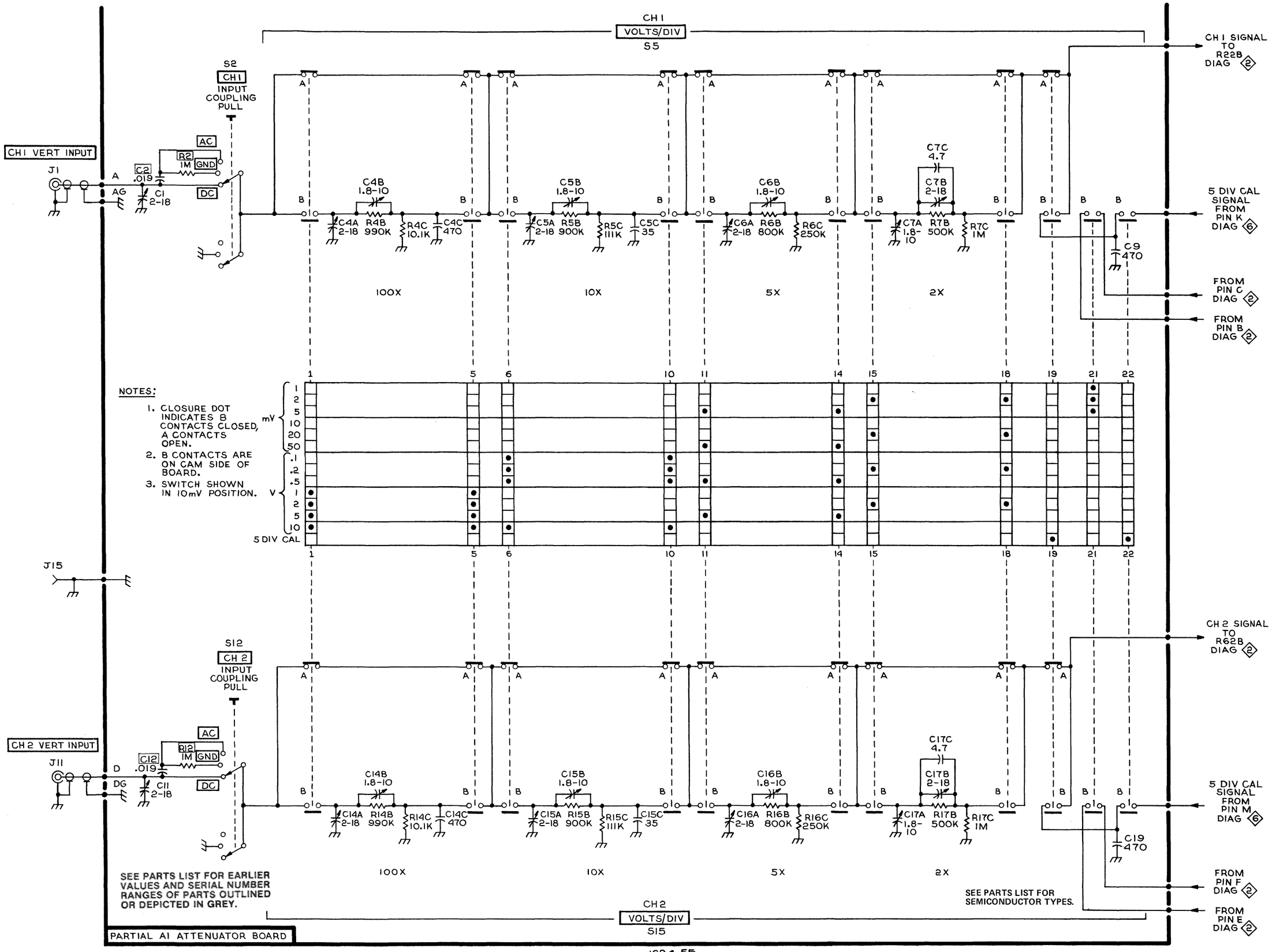
The 314 control settings used for most of the waveforms are as follows:

VOLTS/DIV	10 m
TIME/DIV	10 μs
TRIGGERING	
Mode	AUTO
Coupling	AC
Source	INT
SLOPE	+
DISPLAY	CH 1 or CH 2

Any deviation from these settings is included with the waveforms for each circuit diagram.

The signal source for the tests was a 50 kHz sine wave connected through a 50 Ω termination and Dual Input Cable (for convenience). The signal generator output amplitude was set for a 4-division display on the 314.

The test oscilloscope input coupling was set to dc except where noted.



1824-55
REV. B, AUG 1977

CH 1 & CH 2 ATTENUATOR ◇1

PS 8-74

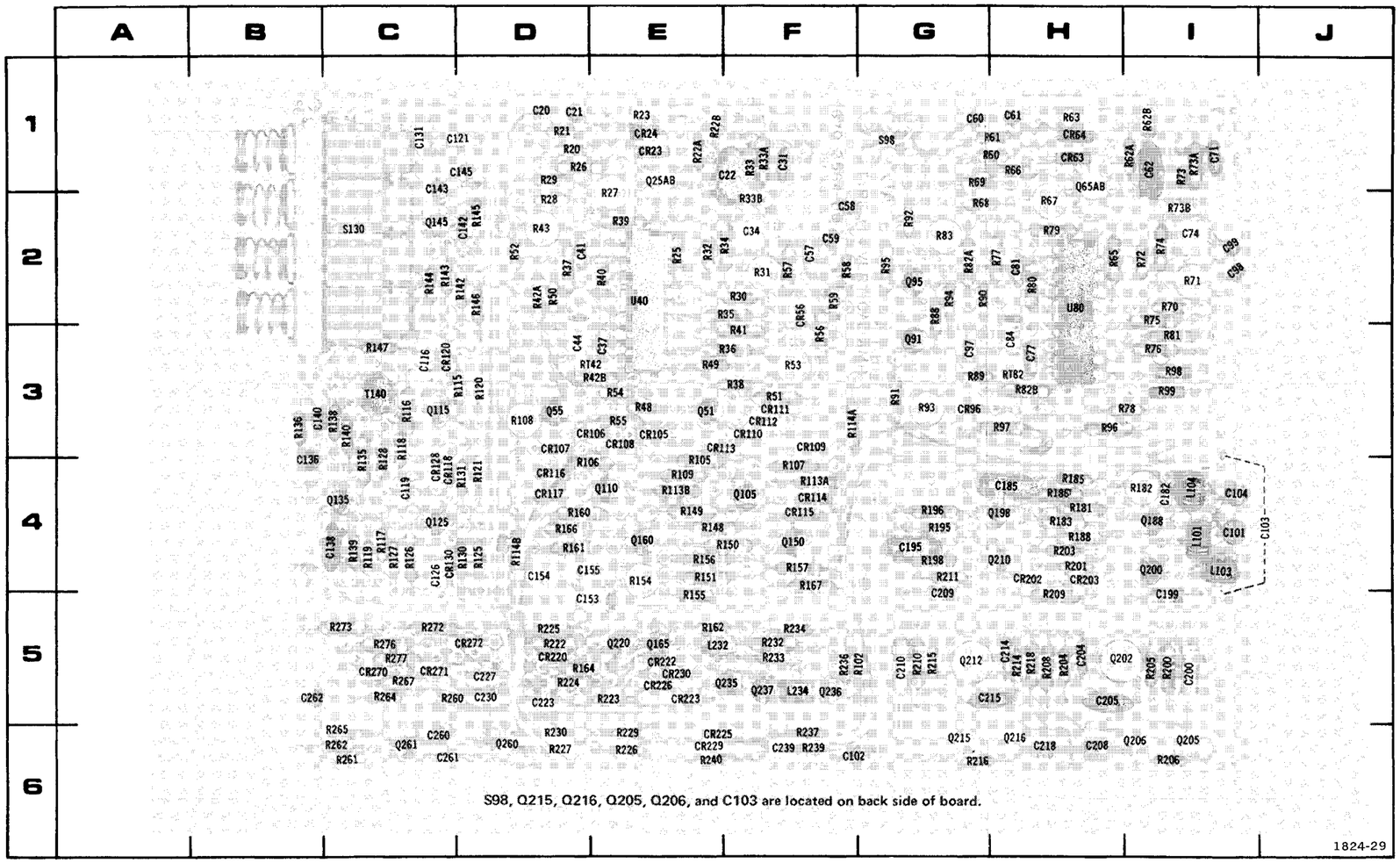
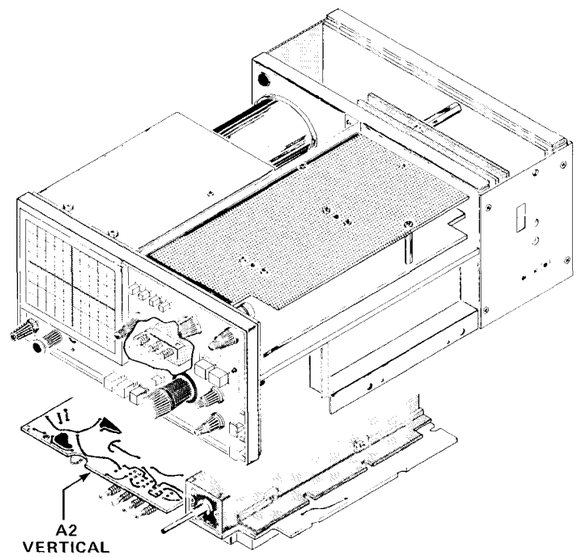


Figure 7-8. A2—Vertical Amplifier circuit board.

*See Parts List for serial number ranges.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C20	1D	C204	5H	CR226	5E	R20	1D	R67	2H	R119	4C	R203	4H
C21	1D	C205	5H	CR229	6E	R21	1D	R68	2G	R120	3D	R204	5H
C22	1F	C208	6H	CR230	5E	R22A	1E	R69	1G	R121	4D	R205	5I
C31	1F	C209	5G	CR270	5C	R22B	1E	R70	2I	R125	4D	R206	6I
C34	2F	C210	5G	CR271	5C	R23	1E	R71	2I	R126	4C	R208	5H
C37	3E	C214	5H	CR272	5D	R25	2E	R72	2I	R127	4C	R209	5H
C41	2D	C215	5G			R26	1D	R73	1I	R128	4C	R210	5G
C44	3D	C218	6H	L101	4I	R27	2E	R73A	1I	R130	4D	R211	4G
C57	2F	C223	5D	L103	4I	R28	2D	R73B*	2I	R131	4D	R214	5H
C58	2F	C227	5D	L104	4I	R29	1D	R74	2I	R135	4C	R215	5G
C59	2F	C230	5D	L232	5E	R30	2F	R75	2I	R136	3B	R216	6G
C60	1G	C239	6F	L234	5F	R31	2F	R76	3I	R138	3C	R218	5H
C61	1H	C260	6C			R32	2E	R77	2H	R139	4C	R222	5D
C62	1I	C261	6C	Q25AB	1E	R33	1F	R78	3H	R140	3C	R223	5E
C71	1I	C262	5B	Q51	3E	R33A	1F	R79	2H	R142	2D	R224	5D
C74	2I			Q55	3D	R33B*	2F	R80	2H	R143	2C	R225	5D
C77	3H	CR23	1E	Q65AB	1H	R34	2E	R81	3I	R144	2C	R226	6E
C81	2H	CR24	1E	Q91	3G	R35	2E	R82A	2G	R145	2D	R227	6D
C84	3H	CR56	2F	Q95	2G	R36	3E	R82B	3H	R146	2D	R229	6E
C97	3G	CR63	1H	Q105	4F	R37	2D	R83	2G	R147	3C	R230	6D
C98	2I	CR64	1H	Q110	4E	R38	3F	R88	2G	R148	4E	R232	5F
C99	2I	CR96	3G	Q115	3C	R39	2E	R89	3G	R149	4E	R233	5F
C101	4I	CR105	3E	Q125	4C	R40	2E	R90	2G	R150	4E	R234	5F
C102	6F	CR106	3D	Q135	4C	R41	3F	R91	3G	R151	4E	R236	5F
C103	4J	CR107	3D	Q145	2C	R42A	2D	R92	2G	R154	4E	R237	6F
C104	4I	CR108	3E	Q150	4F	R42B	3E	R93	3G	R155	5E	R239	6F
C116	3C	CR109	3F	Q160	4E	R43	2D	R94	2G	R156	4E	R240	6E
C119	4C	CR110	3F	Q165	5E	R48	3E	R95	2G	R157	4F	R260	5C
C121	1D	CR111	3F	Q188	4I	R49	3E	R96	3H	R160	4D	R261	6C
C126	4C	CR112	3F	Q198	4H	R50	2D	R97	3H	R161	4D	R262	6C
C131	1C	CR113	3E	Q200	4I	R51	3F	R98	3I	R162	5E	R264	5C
C136	4B	CR114	4F	Q202	5H	R52	2D	R99	3I	R164	5D	R265	6C
C138	4C	CR115	4F	Q205	6I	R53	3F	R102	5G	R166	4D	R267	5C
C140	3B	CR116	4D	Q206	6I	R54	3E	R105	4E	R167	4F	R272	5C
C142	2D	CR117	4D	Q210	4H	R55	3E	R106	4D	R181	4H	R273	5C
C143	1C	CR118	4C	Q212	5G	R56	3F	R107	4F	R182	4I	R276	5C
C145	1D	CR120	3C	Q215	6G	R57	2F	R108	3D	R183	4H	R277	5C
C153	5D	CR128	4C	Q216	6H	R58	2F	R109	4E	R185	4H	RT42*	3E
C154	4D	CR130	4C	Q220	5E	R59	2F	R113A	4F	R186	4H	RT82*	3H
C155	4D	CR202	4H	Q235	5F	R60	1H	R113B	4E	R188	4H	S98	1G
C182	4I	CR203	4H	Q236	5F	R61	1H	R114A	3F	R195	4G	S130	2C
C185	4H	CR220	5D	Q237	5F	R62A	1I	R114B	4D	R196	4G	T140	3C
C195	4G	CR222	5E	Q260	6D	R62B	1I	R115	3D	R198	4G	U40	2E
C199	5I	CR223	5E	Q261	6C	R63	1H	R116	3C	R200	5I	U80	2H
C200	5I	CR225	6E			R65	2H	R117	4C	R201	4H		
						R66	1H	R118	4C				

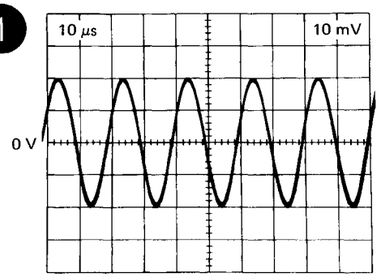
*See Parts List for serial number ranges.



A2
VERTICAL
AMPLIFIER
BOARD

VERTICAL PREAMP CIRCUIT BOARD ◈2

1



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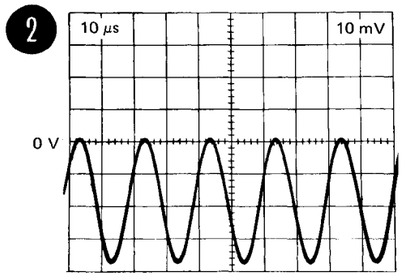

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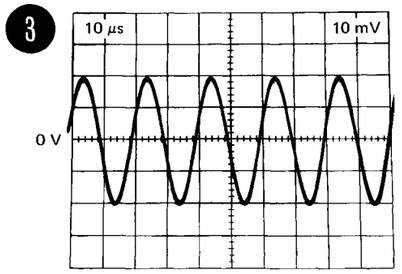

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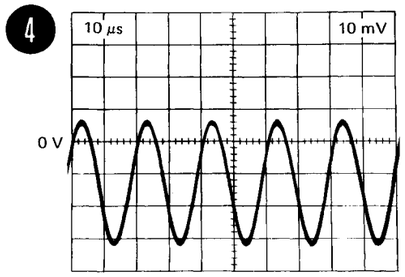


REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS

U40 PREAMP

U80 PREAMP

CH 1 SIGNAL FROM CH 1 VOLTS/DIV S5-19 DIAG 1

CH 2 SIGNAL FROM CH 2 VOLTS/DIV S15-19 DIAG 1

CH 1 VOLTS/DIV S5 SEE DIAG 1

CH 2 VOLTS/DIV S15 SEE DIAG 1

CH 1 TRIG TO CR225 DIAG 4

CH 2 TRIG TO CR229 DIAG 4

CH 1- SIGNAL TO CR105 DIAG 3

CH 1+ SIGNAL TO CR108 DIAG 3

CH 2 - SIGNAL TO CR110 DIAG 3

CH 2 + SIGNAL TO CR113 DIAG 3

LIMIT CENTERING

S98 CH 2 INVERT

WITH DISPLAY SWITCH IN CH 1

WITH DISPLAY SWITCH IN CH 2

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

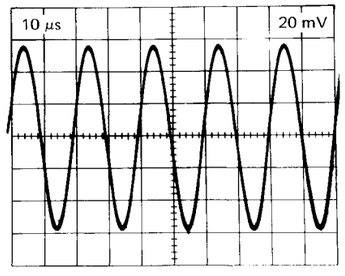
SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

PARTIAL A2 VERTICAL AMPLIFIER BOARD

VERTICAL OUTPUT AMPLIFIER ◈3

Waveforms 1 and 3 — Test oscilloscope ac coupled
Waveforms 5, 6, and 9 — DISPLAY CHOP
Waveforms 7 and 8 — DISPLAY ALT

1



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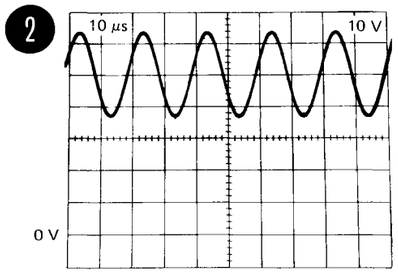

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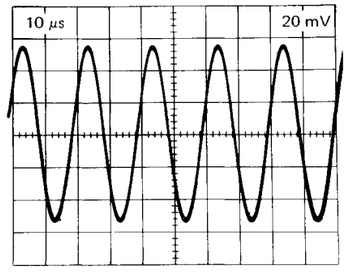

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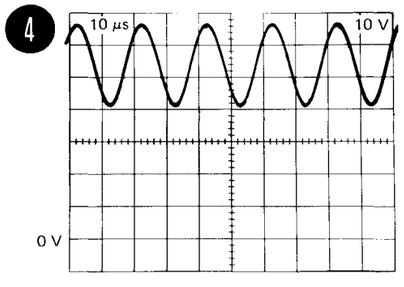

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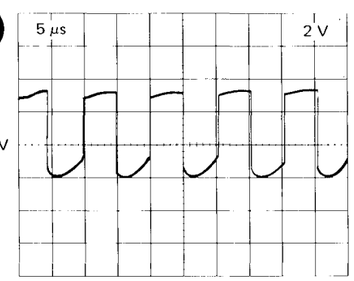

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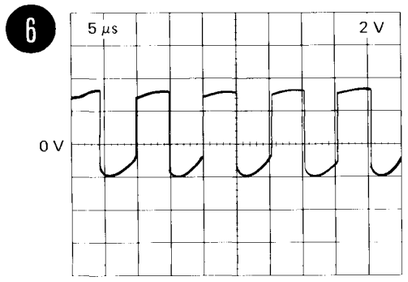

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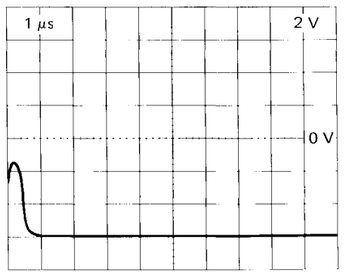
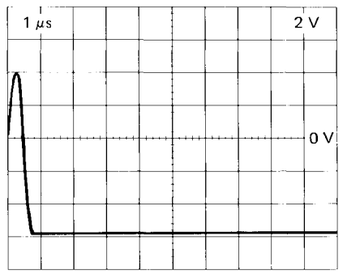


8



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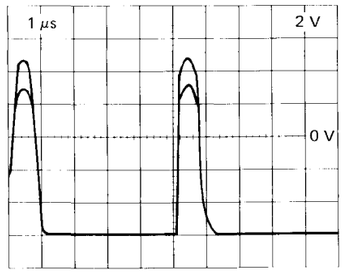


REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS

CH 1 -SIGNAL FROM Q51 DIAG 2
CH 1 +SIGNAL FROM Q55 DIAG 2
CH 2 -SIGNAL FROM S98 DIAG 2
CH 2 +SIGNAL FROM S98 DIAG 2

CR105 CR106 CR107 CR108 CR109 CR110 CR111 CR112 CR113

R105 3.48K
R106 3.48K
R107 7.50K
R109 7.50K

Q105 Q110

CR114 CR115 CR116 CR117

R113A 2.37K
R113B 2.37K
R114A 12.1K
R114B 12.1K

R148 3.24K
R149 3.24K

Q150 Q160

R150 499
R156 499
R151 499
R166 499
R161 499
R160 499

R157 90.9
R167 90.9

R155 33K
R154 2K CW
C154 2-18
C153 4.7 pF
C155 27

DELAY LINE
DL180
270 nS

DA DB DC DD

C185 304
R185 430
R186 100
C195 304
R195 430
R196 100

R188 4.42K
R198 4.42K

Q188 Q198

DFLP DC LEVEL
R181 1.43K CW
R182 200
R183 4.42K
C182 .022

Q200 Q210

R201 560
R211 560
R203 2.7K
CR202
CR203

C199 1pF
C200 0.25-1.5 pF
R200 49.9K

+100V
R205 5.6K
R215 5.6K
R210 49.9K
C209 1pF
C210 0.25-1.5 pF

Q202 Q212

R204 620
R214 620
C204 .05
C214 .05

Q205 Q215

C205 .01
C215 .01

Q206 Q216

C208 1μF
C218 1μF
R208 147
R209 249
R218 147

R206 1K
R216 1K

AA AB

2 -VERT SIGNAL TO LOWER PLATE VT750
4 + VERT SIGNAL TO UPPER PLATE VT750

VERTICAL DEFLECTION PLATES DIAG 10

COMPOSITE TRIGGER TO R162 DIAG 4

R120 100K
R121 390
R130 100K
R131 390
R115 680
R116 931
R125 680
R126 931
CR120 CR130
C116 47
C126 47
Q115 Q125
R117 1.5K
R127 1.5K
R119 3.6K
C119 .01

ADD LEVEL
R108 200 CW

R146 10
C145 2.2μF
R145 1.2K

R147 470

CHOP BLANK PULSE TO CR725 DIAG 10 THRU P761-9, P762-1 DIAG 9

CR118 CR128
R118 620
R128 620
R142 120K
C142 .001

ALT SYNC PULSE FROM P761-7 DIAG 9
C121 .022
R135 301
R139 560
C138 220
R138 22K
T140
Q135
R144 100
C143 2.2μF
Q145
R143 10
C136 2.2μF
C140 2.2μF
R136 10
R140 10
C131 .022

CH 2
IN:COMP TRIG
CH 1
ALT
IN:ADD
CHOP
S130
DISPLAY

SEE DIAG 4

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

L103 270μH
C103 9μF
L101 35μH
C101 47μF
C104 47μF
L104 35μH

+100V FROM P760-1
+6V FROM P760-2
-6V FROM P760-3
DIAG 9

PARTIAL A2 VERTICAL AMPLIFIER BOARD

1824-57
REV. B, SEP 1978

VERTICAL OUTPUT AMPLIFIER 3

PS 9-74

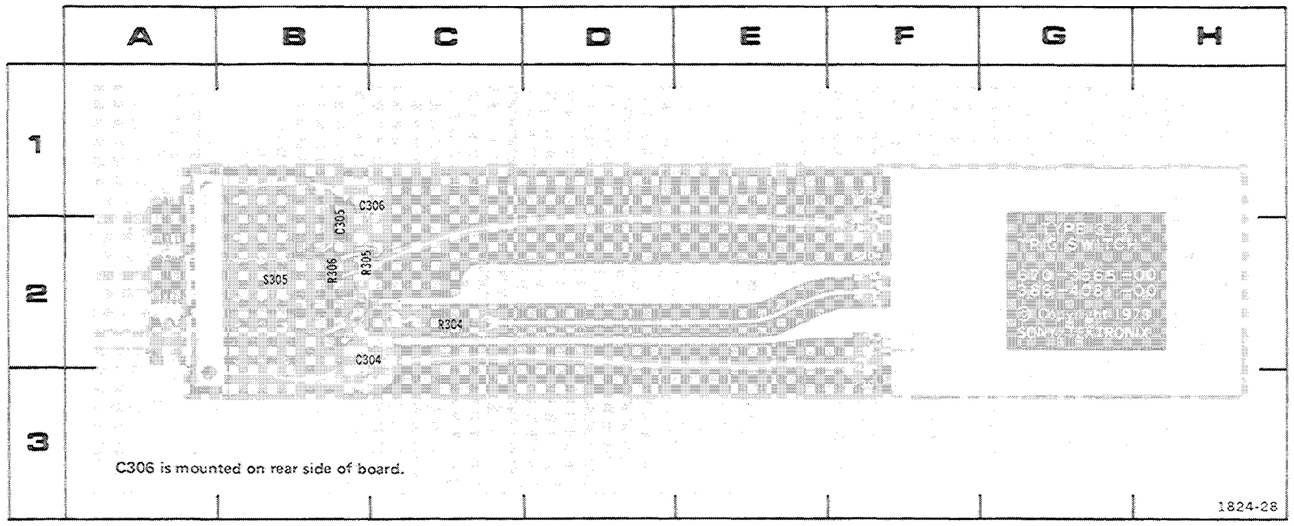
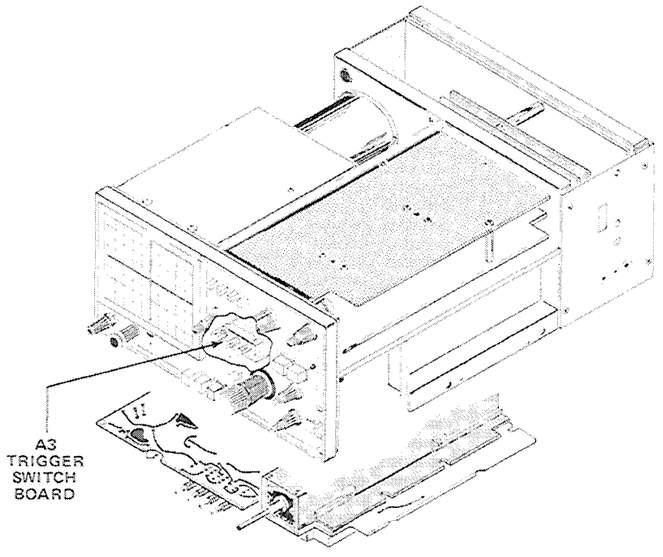


Figure 7-9B. A3—Trigger Switch circuit board below SN 300339.



CKT NO	GRID LOC
C304	2C
C305	2B
C306	2C
R304	2C
R305	2B
R306	2B
S305	2B

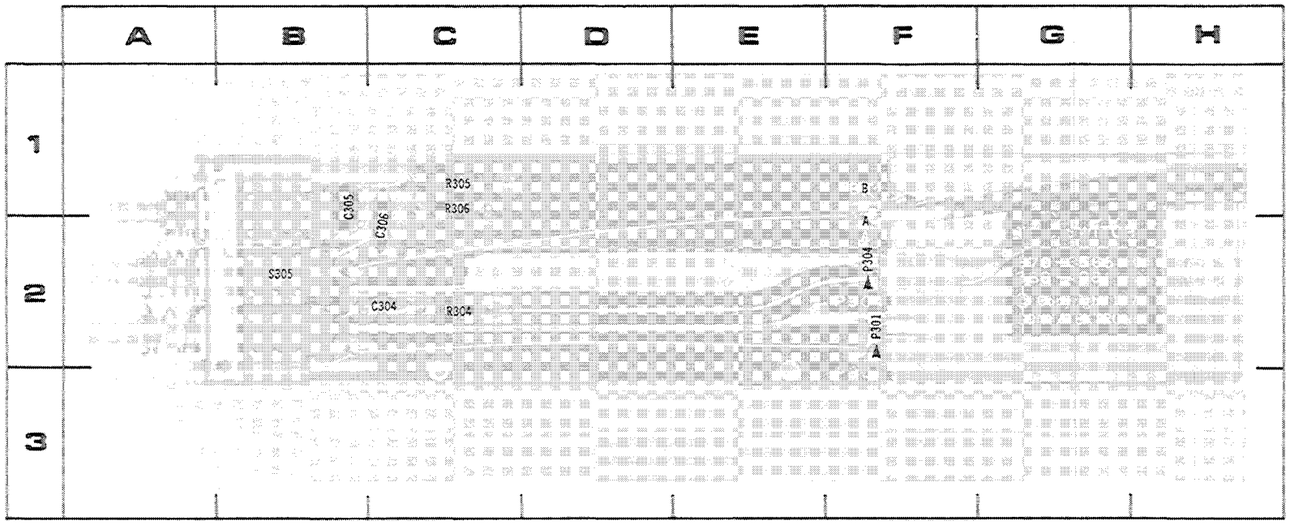
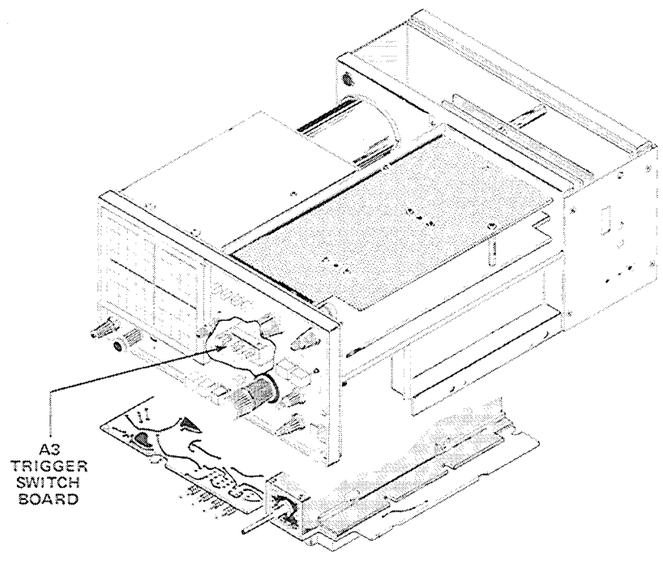


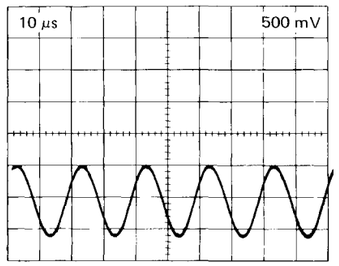
Figure 7-9A. A3—Trigger Switch circuit board SN 300339-up.

CKT NO	GRID LOC
C304	2C
C305	1B
C306	2C
P301	2F
P304	2F
R304	2C
R305	1C
R306	1C
S305	2B



TRIGGER SOURCE ◈4

1



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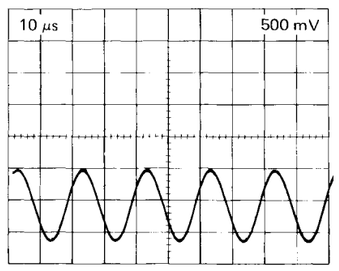


REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS

PARTIAL A2 VERTICAL AMPLIFIER BOARD

CH 1 TRIG FROM PIN 19, U40 DIAG 2

CH 2 TRIG FROM PIN 19, U80 DIAG 2

TA

TB

CR225

CR229

CR223

+6V

R102 10

C102 2.2µF

R232 1.21K

L232 19µH

R237 1K

+3.0

+3.6

Q235

Q237

C239 .022

R239 3.01K

R240 3.01K

R233 8.2K

1

L234 19µH

-2.45

Q236

R234 2.4K

-3.06

2

-6V

CH 1

IN: COMP TRIG

CH 2

DISPLAY S130 SEE DIAG 3

NF

NC

NE

NB

ND

NA

R230 680

CR230

C230 .022

R229 100K

CR222

C223 .022

R223 100K

R227 680

CR226

C227 .022

R226 100K

R222 13.0K

-0.4

Q220

-1.04

CR220

R224 4.99K

R225 1.78K

R164 422

COMPOSITE TRIGGER FROM R161 DIAG 3

R162 470

-1.85

Q165

-2.5

-6V

TRIGGER SOURCE S305

OUT EXT/LINE

INT

IN: EXT DC

AC

AC LF REJ

P304

R304 100

C304 0.1

Z

ZG

R236 3.9K

-6V

C305 220

R305 1M

R306 2.4K

C306 .01

P306

TRIGGER SIGNAL TO R311 DIAG 5

A

B

TRIGGER SIGNAL TO R311 DIAG 5

P301

S300

EXT TRIG OR HORIZ INPUT

J300

R300 470

LINE

EXT ATTEN

1X

10X

P300

C302 47

R301 900K

C301 1.8-10pF

PARTIAL A1 ATTEN BD

R302 111K

LINE TRIG FROM P748-8 DIAG 8 THRU P762-8, P760-7 DIAG 9

PARTIAL A3 TRIGGER SWITCH BOARD

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

TRIGGER SOURCE 4

1824-58 REV. B, FEB. 1977

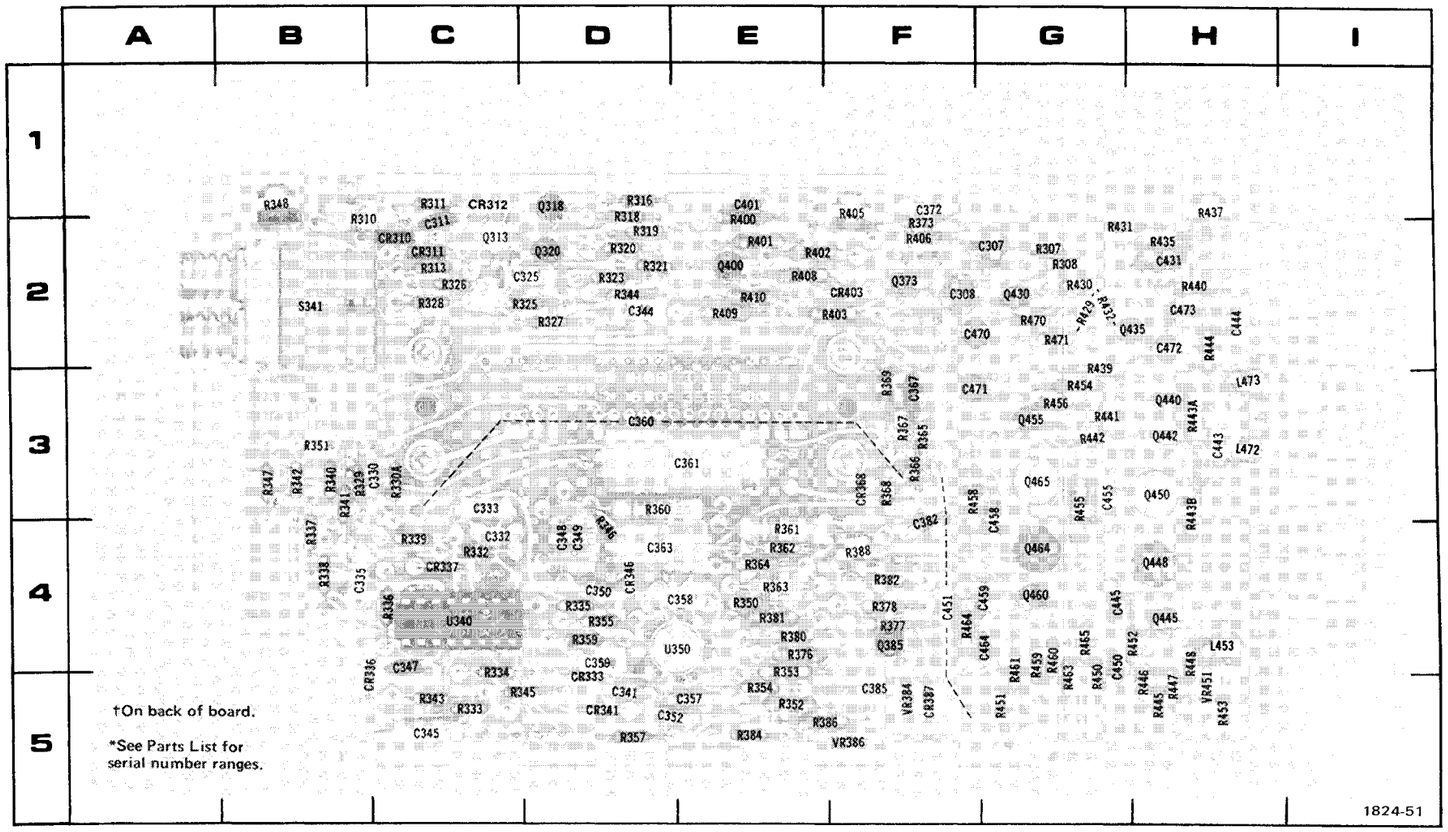
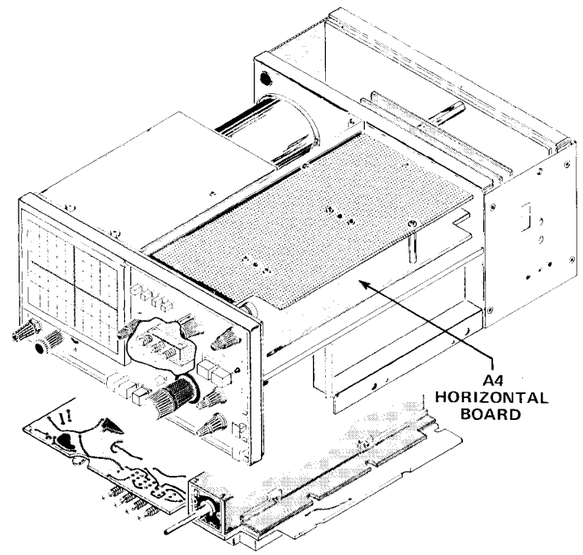


Figure 7-10. A4—Horizontal circuit board.



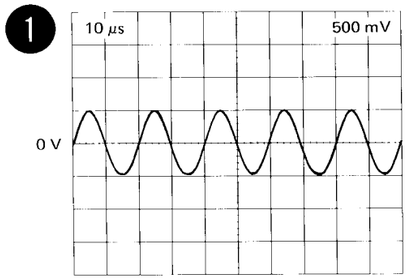
CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C307	2G	C360†	3D	C471	3F	Q320	2D	R311	1C	R337	4B	R361	4E	R400	2E	R443A	3H	R464	4F
C308	2F	C361	3E	C472	2H	Q373	2F	R313	2C	R338	4B	R362	4E	R401	2E	R443B	3H	R465	4G
C311	2C	C363	4D	C473	2H	Q385	4F	R316	1D	R339	4C	R363	4E	R402	2E	R444	2H	R470	2G
C325	2D	C367	3F	CR310	2C	Q400	2E	R318	1D	R340	3B	R364	4E	R403	2F	R445	5H	R471	2G
C330	3C	C372*	1F	CR311	2C	Q430	2G	R319	2D	R341	3B	R365	3F	R405	1F	R446	5H		
C332	4C	C382	4F	CR312*†	1C	Q435	2H	R320	2D	R342	3B	R366	3F	R406	2F	R447	5H	S341	2B
C333	3C	C385	5F	CR333	5D	Q440	3H	R321	2D	R343	5C	R367	3F	R408	2E	R448	4H		
C335	4B	C401	1E	CR336	5B	Q442	3H	R323	2D	R344	2D	R368	3F	R409	2E	R450	5G	U340	4C
C341	5D	C431	2H	CR337	4C	Q445	4H	R325	2D	R345	5C	R369	3F	R410	2E	R451	5G	U350	4E
C344	2D	C443	3H	CR341	5D	Q448	4H	R326	2C	R346*	4D	R373	2F	R429†	2G	R452	4H		
C345	5C	C444	2H	CR346*	4D	Q450	3H	R327	3D	R347	3B	R376	4E	R430	2G	R453	5H	VR384	5F
C347	4C	C445	4G	CR368*	3F	Q455	3G	R328	2C	R348	1B	R377	4F	R431	2G	R454	3G	VR386	5F
C348	4D	C450	5G	CR387	5F	Q560	4G	R329	3B	R350	4E	R378	4F	R432†	2G	R455	3G	VR451	5H
C349	4D	C451†	4F	CR403	2F	Q464	4G	R330A	3C	R351*	3B	R380	4E	R435	2H	R456	3G		
C350	4D	C455	3G	L453	4H	Q465	3G	R332	4C	R352	5E	R381	4E	R437	1H	R458	3F		
C352	5D	C458	4G	L472	3H			R333	5C	R353	4E	R382	4F	R439	2G	R459	4G		
C357	5E	C459	4G	L473	3H	R307	2G	R334	5C	R354	5E	R384	5E	R440	2H	R460	4G		
C358	4E	C464	4G	Q313	2C	R308	2G	R335	4D	R355	4D	R386	5E	R441	3G	R461	4G		
C359	4D	C470	2F	Q318	1D	R310	2B	R336	4C	R357	5D	R388	4F	R442	3G	R463	5G		
										R359	4D								
										R360	3D								

SWEEP GENERATOR ⑤

TIME/DIV

Waveforms 1 and 2	10 μs
Waveforms 3, 4, 5, and 6	1 ms

1



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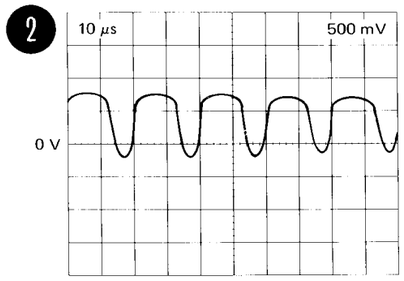

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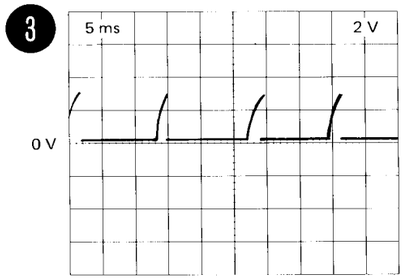

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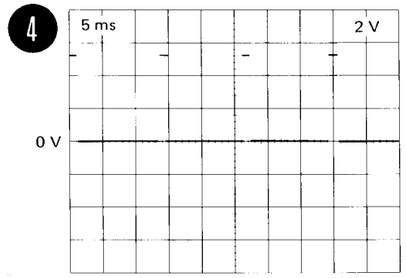

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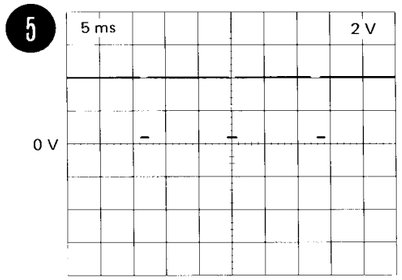

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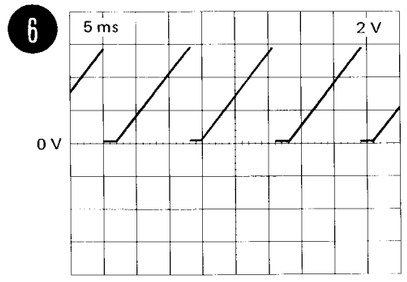


REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS

VAR EXT HORIZ CAL — R385B 50K — P400

R401 1.0K — C401 470 — R400 2.21K

S341 IN: SINGLE SWP — AUTO — NORM

READY — CR340

R341 6.8K — R351 3K — R340 6.8K — R342 270

CR341 — C341 .022 — R345 22K — C345 5.6µF

SGL SWP CONT — BRT BL CONT & EXT TRIG — READY LAMP DRIVER — BRT BL TMG — -GATE OUT

-GATE PULSE TO Q532 THRU PIN G DIAG ⑦

+GATE PULSE TO Q540 THRU PIN H DIAG ⑦

Q320 — R318 6.2K — R319 330 — R321 6.2K — R320 1.8K — Q318

R323 SEL — R316 1.8K — C325 1.5pF — R325 6.8K — R344 470 — C344 27

CR337 — TRIG SIG IN

HOLD OFF TIME — R348 — R347 47K — HOLDOFF TIMING

CR312 — R343 51 — C347 1500 — R329 1M

SEE DIAG ⑨ (TRIG) SLOPE — C348 .01 — R339 6.8K — R338 5.6K — SLOPE SELECT

TO R346 — C349 0.22

(TRIG) LEVEL SEE DIAG ⑨ — S337 RESET

R337 27 — RESET PULSE FROM CR554 THRU PIN F DIAG ⑦ — CR336 — C335 330 — R336 10K — RESET

TO CR346 — R335 3.3K — R334 6.2K — LOCKOUT — END SWP

C333 150 — C332 .022 — R332 10M — R333 10K

U340 SWEEP CONTROL

R307 10 — C307 220µF — +6V1 → +6V2

C308 220µF — R308 10 — -6V1 → -6V2

TRIGGER SIGNAL FROM P306 DIAG ④ — P310 — C311 .001 — R311 100K — CR311 — R310 1M — CR310 — A Q313 B — R313 6.8K — R326 6.2K — R327 12K — R328 12K — R330 1K — C330 .022

Q400 — R402 3.01K — R406 4.99K — R405 2K — CR403 — R403 20.0K — EXT HORIZ BAL — R409 5.49K — R410 280 — R408 5.49K

U350 MILLER INTEGRATOR

SWP GATE IN — INTEG OUT — COMP — DLY GATE — DLY CONT — INTEG INPUT — GATE OUT — GND — -SPLY

R355 4.7K — R354 6.8K — R353 60.4K — R352 SEL — C352 .022 — C350 .022 — R350 470

C358 47 — R359 100 — C359 47 — C360 10µF — C361 0.1 — C363 .001 — R362 47 — R360 1.5M — R361 1.5M — R363 27.2K — R364 330K

R357 10 — C357 .022 — R366 5.00K — C367 R365 33 2.4K — R369 100K — R368 6.19K

HORIZ SIGNAL TO Q430 DIAG ⑥

P367 — S367 SWEEP MAG — X10 — X1 — CR368 — R367 289

P370 — Q373 — R370 10K CW — R373 3.9K — C372 — POSITION

R376 1.18K — R377 2.41K — R378 3.61K — R380 6.04K — R381 2.67K — C382 2.2µF — R382 470

P380 — CW — R385A 20K — CAL — TIME/DIV VAR

VR386 9V — VR384 9V — CR387 — R384 20K — -60V

R386 13K — C385 .022 — R388 5K CW — SWP CAL — Q385 — -60V

(BELOW SN 3006631) TO -6V1 (C308) — TO TOP OF C349 — TO TOP OF R335 — R346 750K — TO P701 PIN 12 DIAG ⑥

TO TOP OF C349 — TO TOP OF R335 — CR346 R346 750K — TO P702-1 DIAG ⑩

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

S380 TIME/DIV (SWITCH SHOWN IN 1mS POSITION)

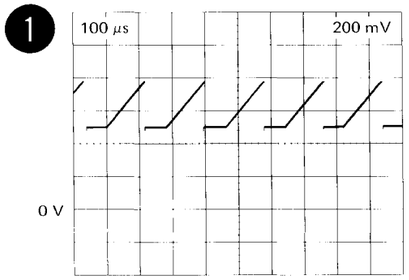
EXT HORIZ X1 X10 — S: 5 2 1 .5 .2 .1 — mS: 50 20 10 5 2 1 .5 .2 .1 — µS: 50 20 10 5 2 1

1824-59
REV D, AUG 1977

HORIZONTAL OUTPUT ◈6

VOLTAGE & WAVEFORM CONDITIONS

1



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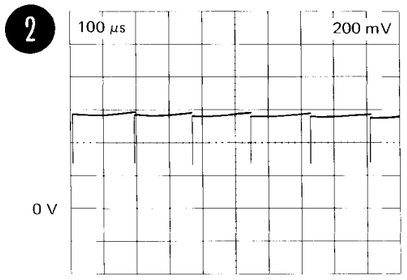

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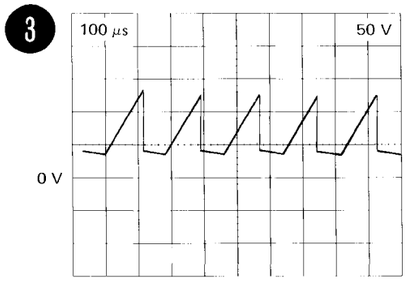

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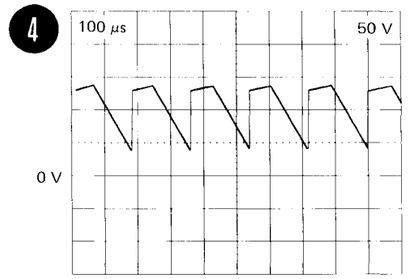
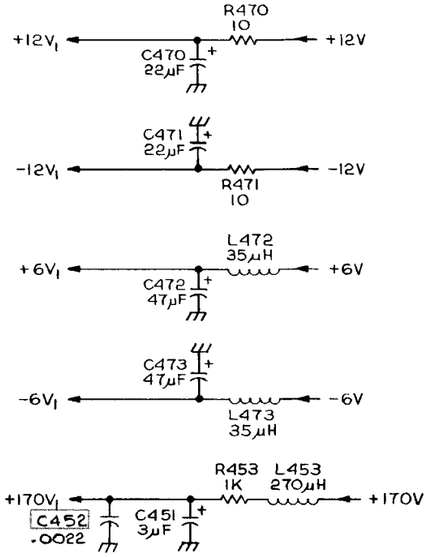
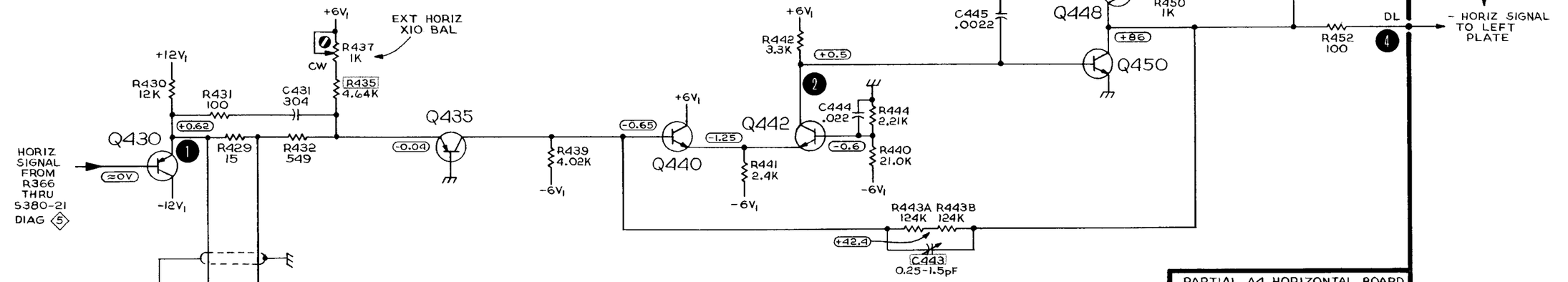
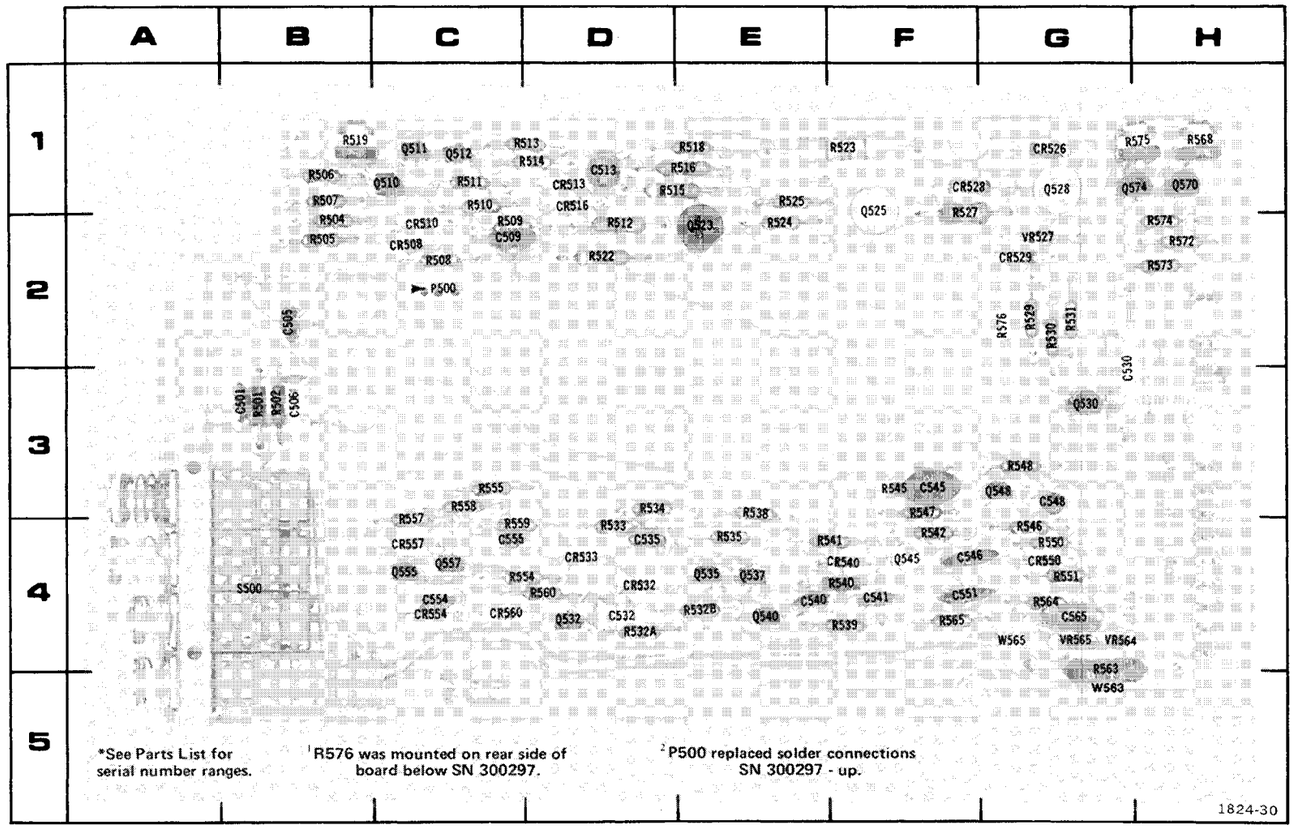


REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS







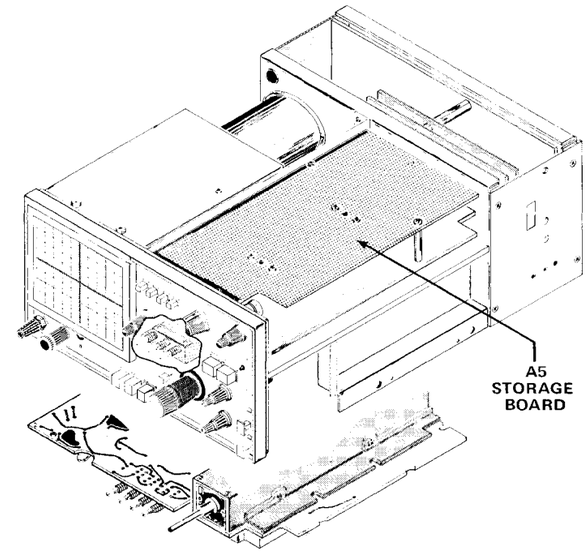
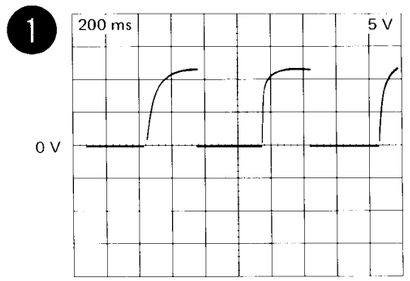


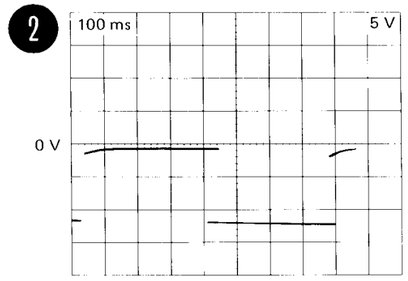
Figure 7-11. A5—Storage circuit board.

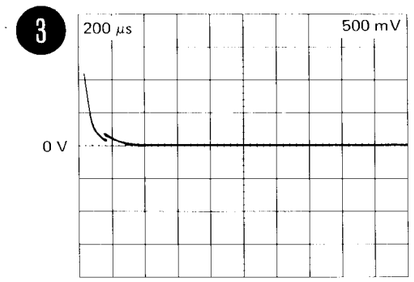
CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C501	3B	C551	4F	CR533	4D	Q530	3G	R502	3B	R516	1E	R533	4D	R551	4G	R574	2H
C505	2B	C554	4C	CR540	4F	Q532	4D	R504	2B	R518	1E	R534	3D	R554	4C	R575	1H
C506	3B	C555	4C	CR550	4G	Q535	4E	R505	2B	R519	1B	R535	4E	R555	3C	R576[1]	2G
C509	2C	C565	4G	CR554	4C	Q537	4E	R506	1B	R522	2D	R538	3E	R557	4C		
C513	1D			CR557	4C	Q540	4E	R507	1B	R523	1F	R539	4F	R558	3C	S500	4B
C530	3G	CR508	2C	CR560	4C	Q545	4F	R508	2C	R524	2E	R540	4F	R559	4C		
C532	4D	CR510	2C	P500[2]	2C	Q548	3G	R509	2C	R525	1E	R541	4F	R560	4D	VR527	2G
C535	4D	CR513	1D	Q510	1C	Q555	4C	R510	1C	R527	2F	R542	4F	R563*	5G	VR564	4G
C540	4E	CR516	1D	Q511	1C	Q557	4C	R511	1C	R529	2G	R545	3F	R564	4G	VR565*	4G
C541	4F	CR526	1G	Q512	1C	Q570	1H	R512	2D	R530	2G	R546	4G	R565	4F		
C545	3F	CR528	1F	Q523	2E	Q574	1H	R513	1D	R531	2G	R547	3F	R568	1H	W563*	5G
C546	4F	CR529	2G	Q525	1F			R514	1D	R532A	4D	R548	3G	R572	2H	W565*	4E
C548	3G	CR532	4D	Q528	1G	R501	3B	R515	1D	R532B	4E	R550	4G	R573	2H		

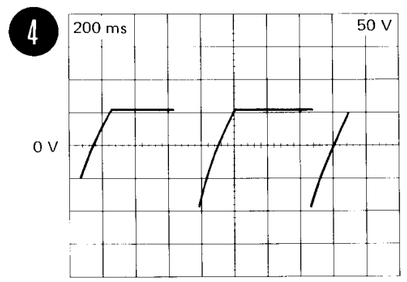
STORAGE ◇7

TRIGGERING Mode	SINGLE SWP
STORE	Button in
AUTO-ERASE	Button in









REFER TO VOLTAGE AND WAVEFORM CONDITIONS, ASSEMBLY A1 FOLDOUT, FOR ADDITIONAL INFORMATION.

VOLTAGE & WAVEFORM CONDITIONS

VOLTAGE & WAVEFORM CONDITIONS

S500A STORE
SEE DIAG 6
S500B ERASE (SPRING RETURN)
S500C ENHANCE
S500D AUTO ERASE

OPERATING LEVEL
R519 20K CW
R518 15K
R523 243K
+100V
CR528
R527 100K
Q528
C530 9μF
CR526
VR527 51V
CR529
R529 10K
+170V
Q530
R530 2.2K
R531 82K
MEASURED TO TERMINAL T
Q525
R524 75K
R525 75K
-120V
Q523
R522 44.2K
R514 3.9K
C513 15μF
CR516
R516 17.8K
CR513
R515 107K
R509 180K
C509 .047
R513 100
R508 56K
CR508
R510 33K
R511 1.2K
Q511
Q512
Q510
R512 21.0K
R504 300K
R502 10K
C505 .001
R506 10K
R501 1K
C501 .001
R505 100K
C506 100
R507 100K
CR510

PARTIAL A4 HORIZ BOARD
PARTIAL A8 INTERFACE BOARD
J770 -5
P768
STB
V750
CE
J770 -6
J770 -7
SEE DIAG 9 10
P650
R566 47
≈1.5V FROM DIAG 9
J770-2
J770-1
PARTIAL A4 HORIZ BD

ENHANCE LEVEL
P537
R538 4.7K
R537A 10K CW
R535 10K
R534 180K
C535 .05
R533 27K
CR533
Q537
Q535
R532B 47K
CR532
C532 100
Q532
R532A 3.3K
R537B 1M CW
VIEWING TIME
Q540
C540 .001
R540 1K
C541 .001
R542 47K
CR540
R541 10K
R539 3.3K

R568 200K CW
Q570
R572 33K
R573 10K
COLLIMATION
-60V
MEASURED TO TERMINAL T
R576 66.5K CW
R575 200K CW
Q574
R574 82K
GEOMETRY
MEASURED TO TERMINAL T

-GATE PULSE FROM U340-15 DIAG 5
-GATE PULSE TO J770-M DIAG 9
RESET PULSE TO CR336 DIAG 5
+GATE PULSE FROM U340-14 DIAG 5
+GATE PULSE TO J770-P DIAG 9

R555 10K
R554 10K
R559 330K
C555 2.2μF
R558 56K
R557 10K
CR557
Q557
Q555
C554 .001
CR554
CR560
R560 100K
C545 .01
R545 12K
R547 22K
CR550
C546 .01
R550 39K
R551 10K
C551 .01
R548 12K
C548 2.2μF
Q545
Q548
R546 91K

+170V
+100V
+12V
-12V
-60V
-120V

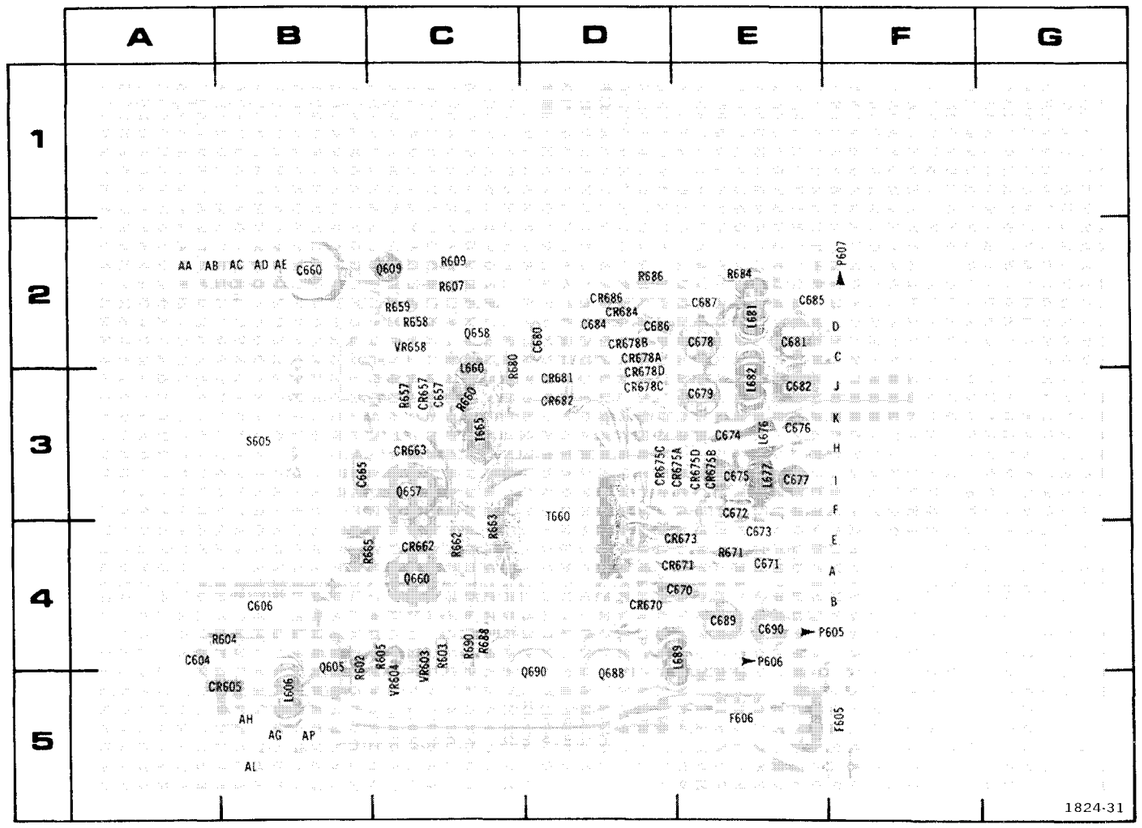
S565 INTEGRATE
C565 0.1
(PARTIAL) STORE S500A
W563
R563
P565
R564 180K
R565 220
W565
VR565
VR564 30V
INTEG/STORE TO RT22B DIAG 10 THRU J770-3, P762-6 DIAG 9

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES.

PARTIAL A4 HORIZ BOARD
PARTIAL A5 STORAGE BOARD
PARTIAL A4 HORIZ BOARD
PARTIAL A5 STORAGE BOARD

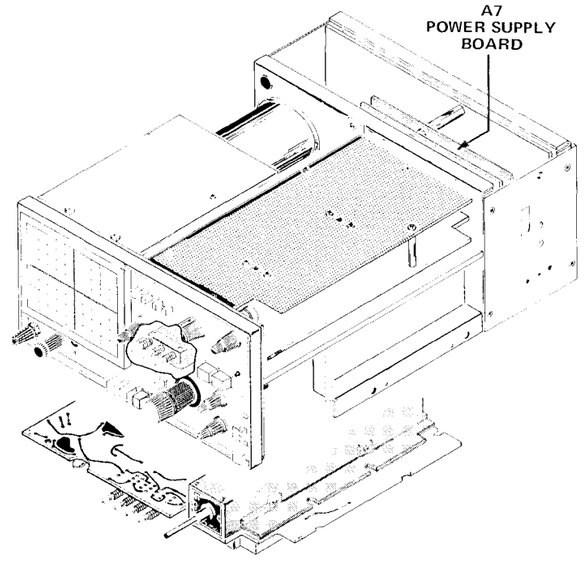
1624-61
REV.D, SEP 1978



1824-31

Figure 7-12. A7—Power Supply circuit board.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C604	4A	C685	2E	CR678C	3D	Q605	4B	R671	4E
C606	4B	C686	2D	CR678D	3D	Q609	2C	R680	3C
C657	3C	C687	2E	CR681	3D	Q657	3C	R684	2E
C660	2B	C689	4E	CR682	3D	Q658	2C	R686	2D
C665	3B	C690	4E	CR684	2D	Q660	4C	R688	4C
C670	4E			CR686	2D	Q688	5D	R690	4C
C671	4E	CR605	5B			Q690	5D		
C672	3E	CR657	3C	F605	5F			S605	3B
C673	4E	CR662	4C	F606	5E	R602	4B		
C674	3E	CR663	3C			R603	4C	T660	3D
C675	3E	CR670	4D	L606	5B	R604	4B	T665	3C
C676	3E	CR671	4E	L660	2C	R605	4C		
C677	3E	CR673	4E	L676	3E	R607	2C	VR603	4C
C678	2E	CR675A	3E	L677	3E	R609	2C	VR604	5C
C679	3E	CR675B	3E	L681	2E	R657	3C	VR658	2C
C680	2D	CR675C	3D	L682	3E	R658	2C		
C681	2E	CR675D	3E	L689	4E	R659	2C		
C682	3E	CR678A	2D			R660	3C		
C684	2D	CR678B	2D	P605	4E	R662	4C		
				P606	4E	R663	4C		
				P607	2F	R665	4C		



Power Supply Circuit Description

-VR605/Q605 detect overvltage. At about +43v Q605 latches and blows F600.

-Q605 and associated parts are crowbar overvoltage protection. If +12v rises above +15 or +27.8 rises above 43 then Q605 latches and blows whichever fues is supplying power

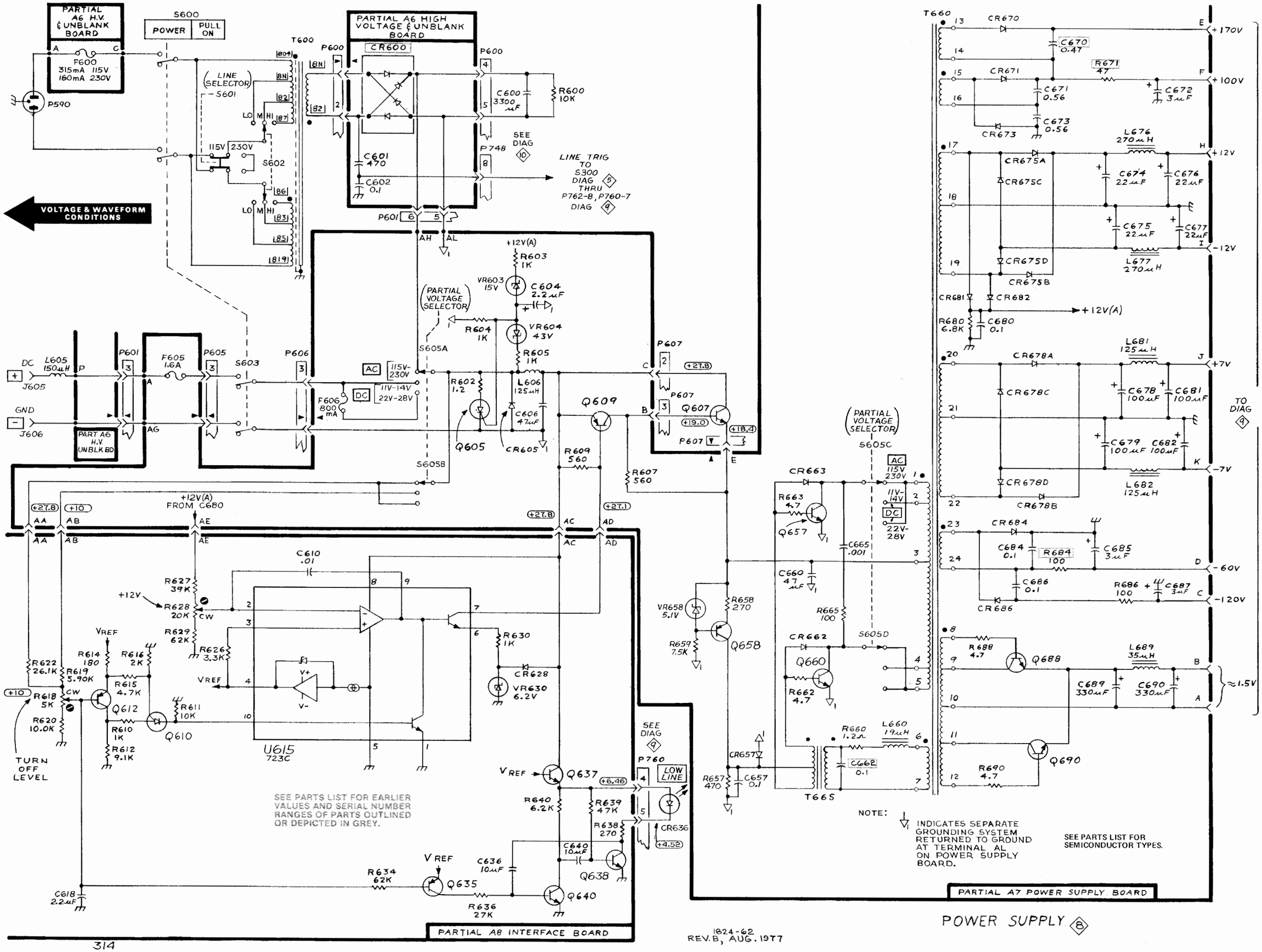
-U615 regulates in put votage to T660 so that the +12v is +12v

-S605 in 11-14v range uses a different set of taps on T660 and the output voltage from Q607 will be lower to match.

-Q658 is a constant current bias circuit which powers the inverter transistors Q657 and Q660.

-Q612 and Q610 shut off the regulator if input voltage falls below 10v.

-Q635/Q637 warn of low input voltage.



1824-62
REV.B, AUG. 1977

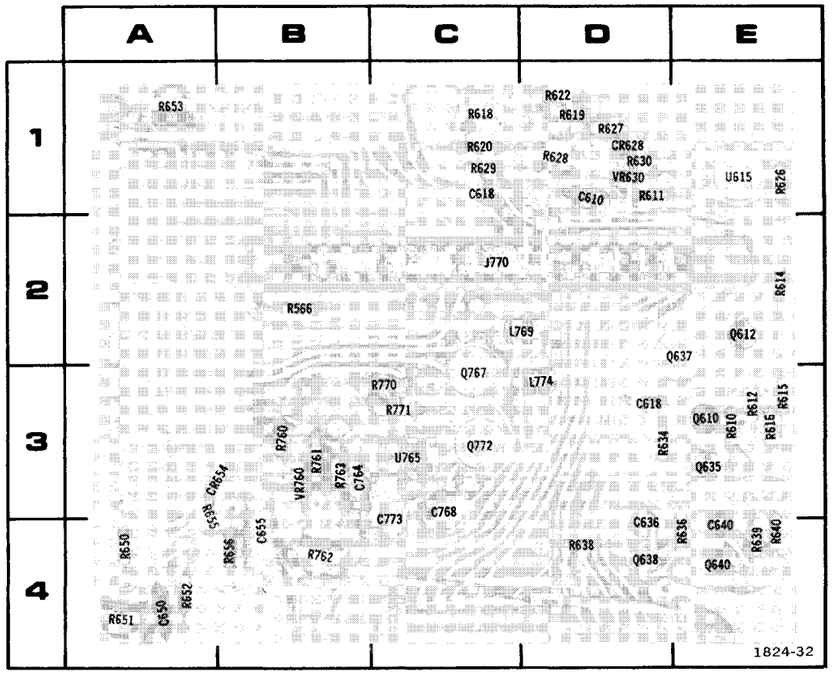
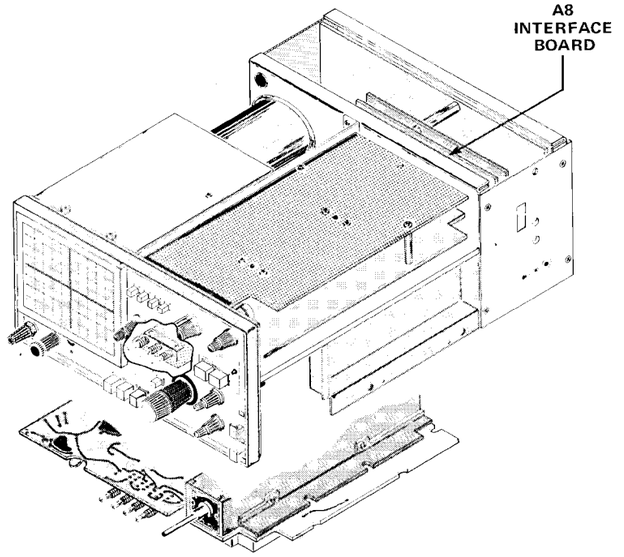


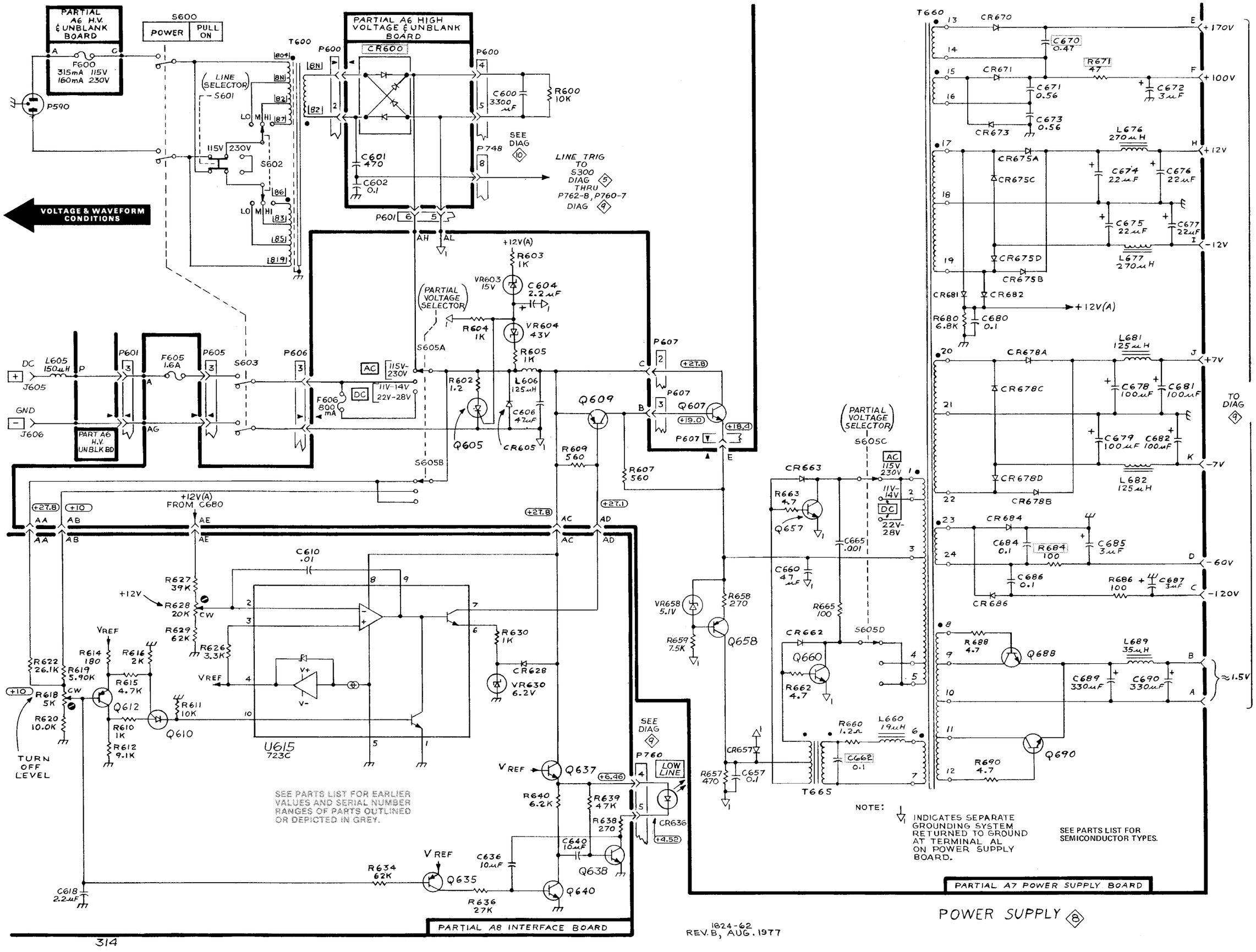
Figure 7-13. A8—Interface circuit board.

[1]Late production location

[2]Early production location



CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C610	1D	CR628	1D	Q612	2E	R610	3E	R622	1D	R639	4E	R762	4B
C618[1]	1C	CR654	3A	Q635	3E	R611	1D	R626	1E	R640	4E	R763	3B
C618[2]	3D			Q637	2E	R612	3E	R627	1D	R650	4A	R770	3C
C636	4D	J770	2C	Q638	4D	R614	2E	R628	1D	R651	4A	R771	3C
C640	4E			Q640	4E	R615	3E	R629	1C	R652	4A		
C650	4A	L769	2D	Q767	3C	R616	3E	R630	1D	R653	1A	U615	1E
C655	4B	L774	3D	Q772	3C	R618	1C	R634	3D	R655*	3A	U765	3C
C764	3B					R619	1D	R636	4E	R656	4B	VR630	1D
C768	3C	Q610	3E	R566	2B	R620	1C	R638	4D	R760	3B	VR760	3B
C773	4C									R761	3B		



1824-62 REV. B, AUG. 1977

VOLTAGE & WAVEFORM CONDITIONS

PARTIAL A4 HORIZONTAL BOARD

PARTIAL A7 POWER SUPPLY BOARD

PARTIAL A8 INTERFACE BOARD

J770

FROM DIAG 8

≈+1.5V, -120V, -60V, +170V, 100V, +12V, -12V, +7V, -7V

-120V — DIAG 7 FROM INTEGRATE/STORE THRU PIN T

-60V — DIAG 7 FROM R563 THRU PIN R

DIAG 7 FROM INTEGRATE/STORE THRU PIN P — +170V

+100V — DIAG 7 FROM VR527 THRU PIN N

+12V — DIAG 7 FROM R573 THRU PIN M

-12V — DIAG 7 FROM R574 THRU PIN L

+6V

-6V

DIAG 7 -GATE PULSE FROM R532A THRU PIN J

-6V$_I$

DIAG 5 TO R330

DIAG 7 +GATE PULSE FROM R539 THRU PIN I

+6V$_I$

DIAG 5 SLOPE SELECT TO R339

R566 47

P650 — SEE DIAG 7 10 — TO FLOOD GUN HEATERS DIAG 7

P762 — INTEGRATE/STORE TO R722B THRU PIN 6, P748 DIAG 10

P768 — (+56.5) TO STB; (-4.67) TO CE — CRT DIAG 7

P650 — GEOMETRY TO CRT DIAG 7 — SEE DIAG 7 10

U765A 1/2 5558

+12V, +7V, -12V, +6V

L769 35μH; C768 220μF; L774 35μH; C773 220μF

Q767; Q772

R770 47.5K; R771 47.5K

R761 10.0K; R760 2.7K; R762 10K; R763 24.9K; VR760 9V; C764 .022

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

U765B 1/2 5558

P762 — -GATE TO Q723 DIAG 10

P761 — +6V$_I$; -6V$_I$ — R331 10K CW — (TRIG) LEVEL — SEE DIAG 5

ALT SYNC TO R139 DIAG 3 (-0.49)

SEE DIAG 5 — (TRIG) SLOPE S338

(-5.7) — CHOP BLANK PULSE FROM R147 THRU PIN Y DIAG 3

+100V, +6V, -6V — SEE DIAG 8 P760 — PARTIAL A2 VERTICAL AMPLIFIER BOARD — +100V TO L103; +6V TO L101; -6V TO L104 — DIAG 3

(0V) — LINE TRIG TO S300 DIAG 5

LINE TRIG FROM C602 P748-8 DIAG 8

THRU P748-7; -6V THRU P748-5; +6V THRU P748-4; +100V TO R748 THRU P748-3; CHOP BLANK TO CR725 THRU P748-1 — DIAG 10

1824-63 REV. B, FEB. 1977

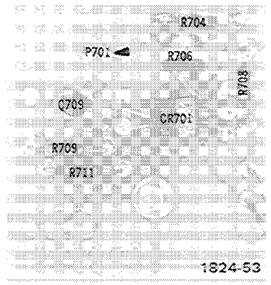


Fig. 7-15. A9—Intensity Limit circuit board (SN 300339—SN 300651).

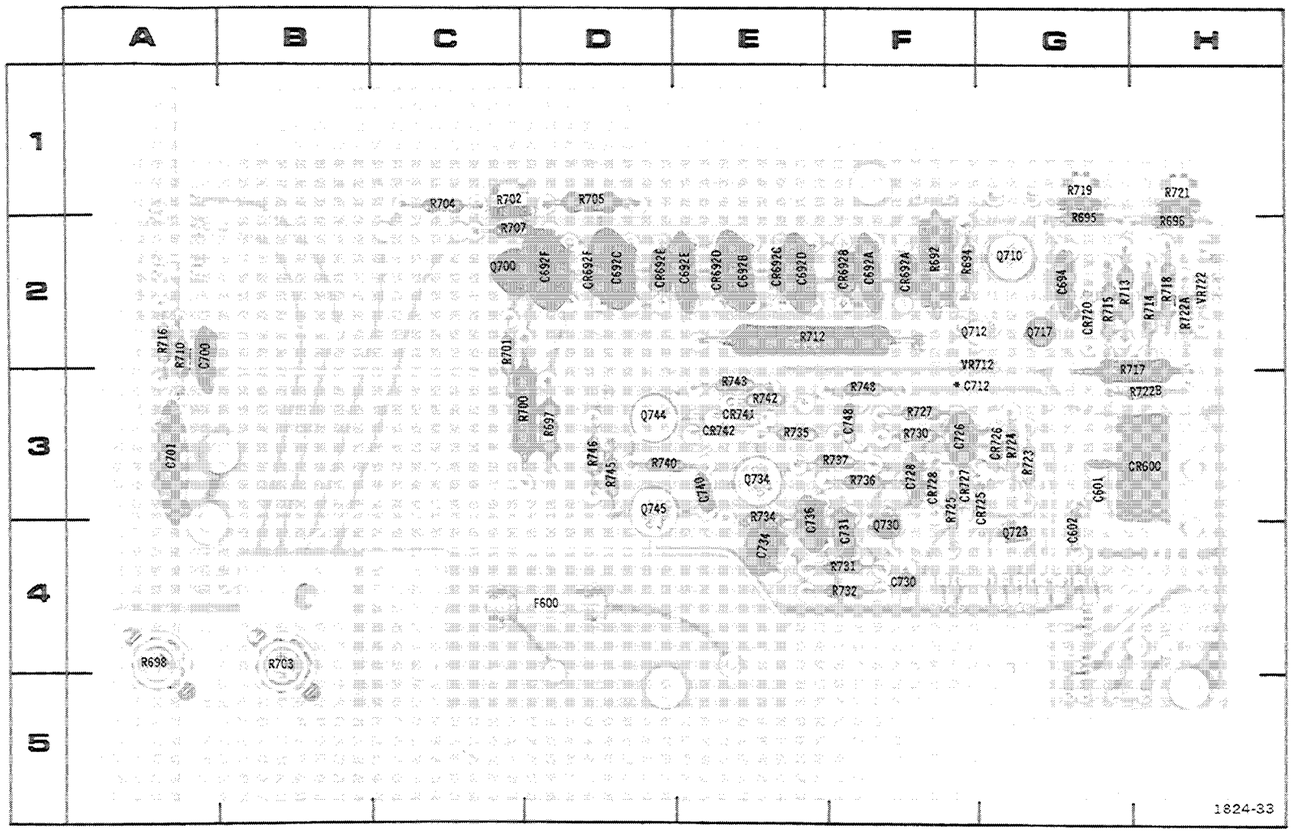


Figure 7-14B. A6—HV & Unblanking circuit board (SN 300000-300650).

*See Parts List for serial number ranges.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C601	3G	C726	3F	CR692D	2E	Q700	2C	R695	2G	R712	2E	R724	3G	R743	3E
C602	4G	C728	3F	CR692E	2D	Q710	2G	R696	2H	R713	2G	R725	3F	R745	3D
C692A	2F	C730	4F	CR692F	2D	Q712	2F	R697	3D	R714	2H	R727	3F	R736	3D
C692B	2E	C731	4F	CR720	2G	Q717	2G	R698	4A	R715	2G	R730	3F	R748	3F
C692C	2D	C734	4E	CR725	3G	Q723	4G	R700	3D	R716	2A	R731	3F		
C692D	2E	C736	3E	CR726	3G	Q730	4F	R701	2C	R717	2G	R732	4F	VR712	2G
C692E	2E	C740	3E	CR727	3F	Q734	3E	R702	1C	R718	2H	R734	3E	VR722	2H
C692F	2D	C748	3F	CR728	3F	Q744	3D	R703	4B	R719	1G	R735	3E		
C694	2G	CR600	3H	CR741	3E	Q745	3D	R704	1C	R721	1H	R736	3F		
C700	2A	CR692A	2F	CR742	3E			R705	1D	R722A	2H	R737	3F		
C701	3A	CR692B	2F			R692	2F	R707	2C	R722B	3H	R740	3D		
C712*	3G	CR692C	2E	F600	4D	R694	2F	R710	2A	R723	3G	R742	3E		

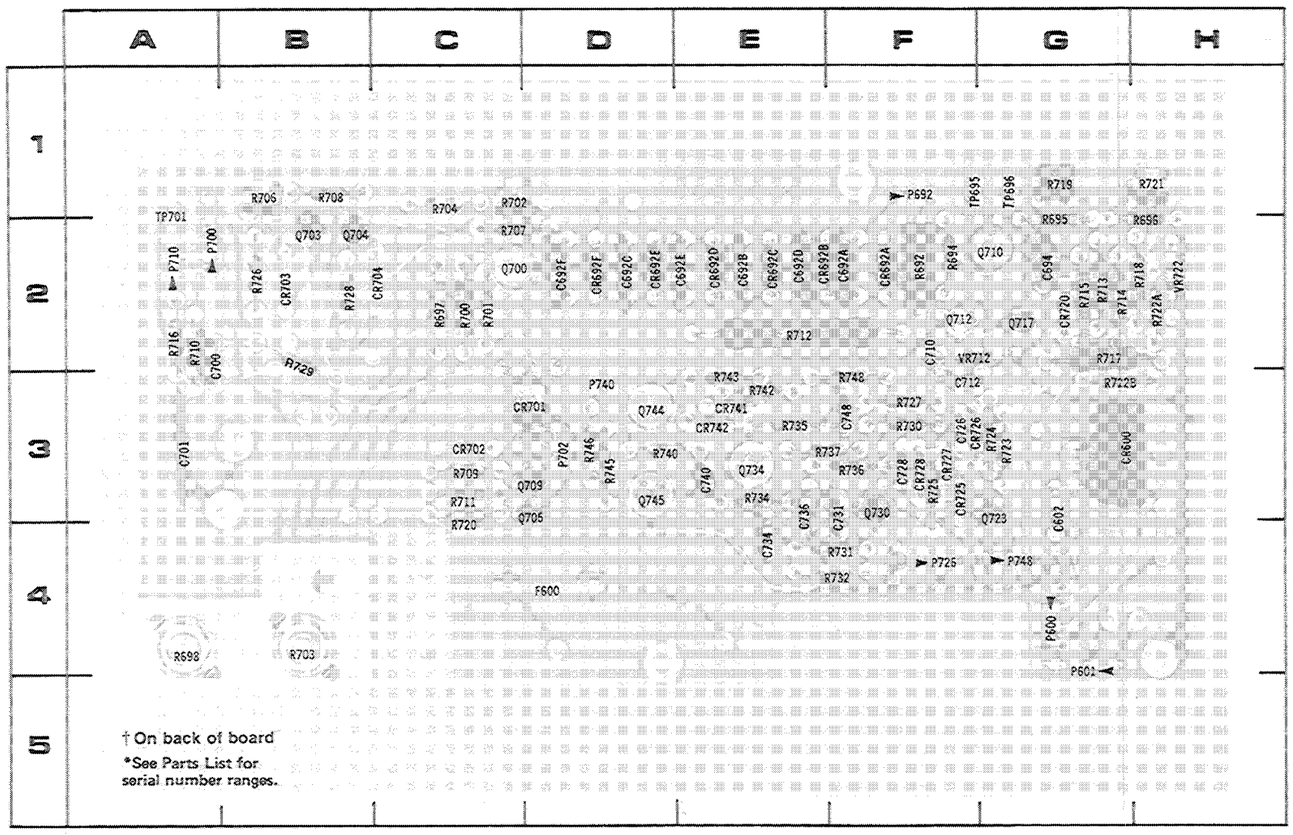


Figure 7-14A. A6—HV & Unblanking circuit board (SN 300651-up).

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C601	3G	C731	3F	CR720	2G	Q712	2F	P748	4G	R710	2A	R722A	2H	R738*†	
C602	4G	C734	4E	CR725	3F	Q717	2G					R722B	3G	R740	3D
C692A	2F	C736	3E	CR726	3F	Q723	3G	R692	2F	R709	3C	R723	3G	R742	3E
C692B	2E	C738*†		CR727	3F	Q730	3F	R694	2F	R710	2A	R724	3G	R743	3E
C692C	2D	C740	3E	CR728	3F	Q734	3E	R695	2G	R711	3C	R725	3F	R745	3D
C692D	2E	C748	3F	CR741	3E	Q744	3D	R696	2H	R712	2E	R726	2B	R746	3D
C692E	2E	CR600	3G	CR742	3E	Q745	3D	R697	2C	R713	2G	R727	3F	R748	3F
C692F	2D	CR692A	2F					R698	4A	R714	2G	R728	2B		
C694	2G	CR692B	2E	F600	4D	P600	4G	R700	2C	R715	2G	R729*	2B	TP695	1F
C700	2A	CR692C	2E			P601	4G	R701	2C			R730	3F	TP696	1G
C701	3A	CR692D	2E	Q700	2C	P692	1F	R702	1C	R716	2A	R731	4F	TP701	1A
C710	2F	CR692E	2D	Q703	2B	P692	1F	R703	4B	R717	2G	R732	4F		
C712	3F	CR692F	2D	Q704	2B	P700	2A	R704	1C	R718	2H	R734	3E	VR712	2F
C726	3F	CR701	3D	Q705	3D	P702	3D	R706	1B	R719	1G	R735	3E	VR722	2H
C728	3F	CR702	3C	Q709	3D	P710	2A	R707	2C	R720	4C	R736	3F		
C730	4F	CR703	2B	Q710	2G	P726	4F	R708	1B	R721	1H	R737	3F		
		CR704	2C			P740	3D								

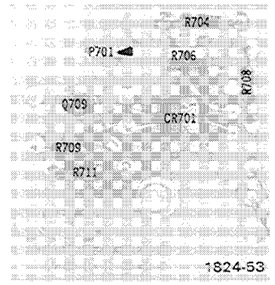
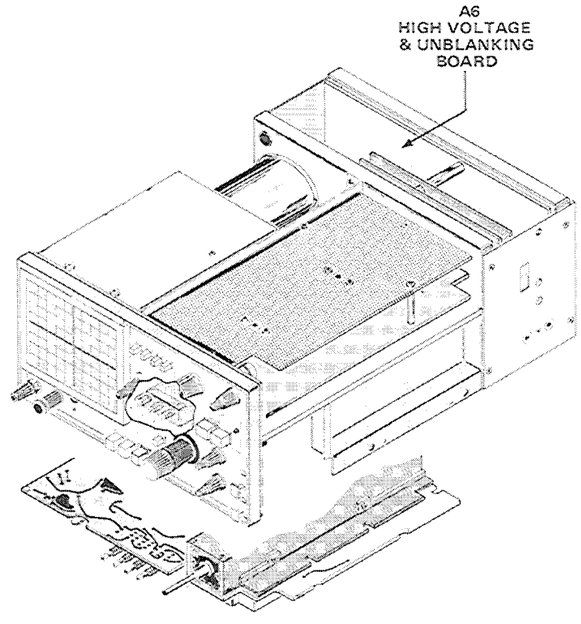
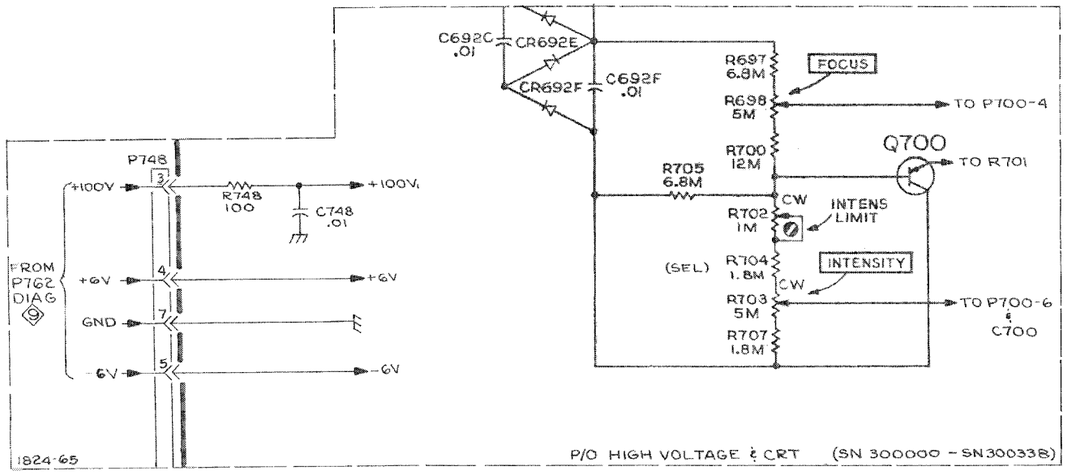
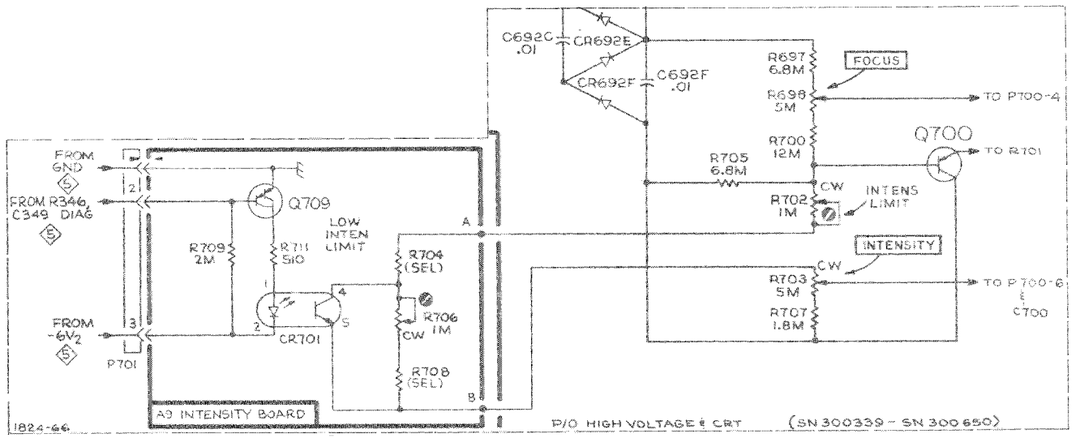
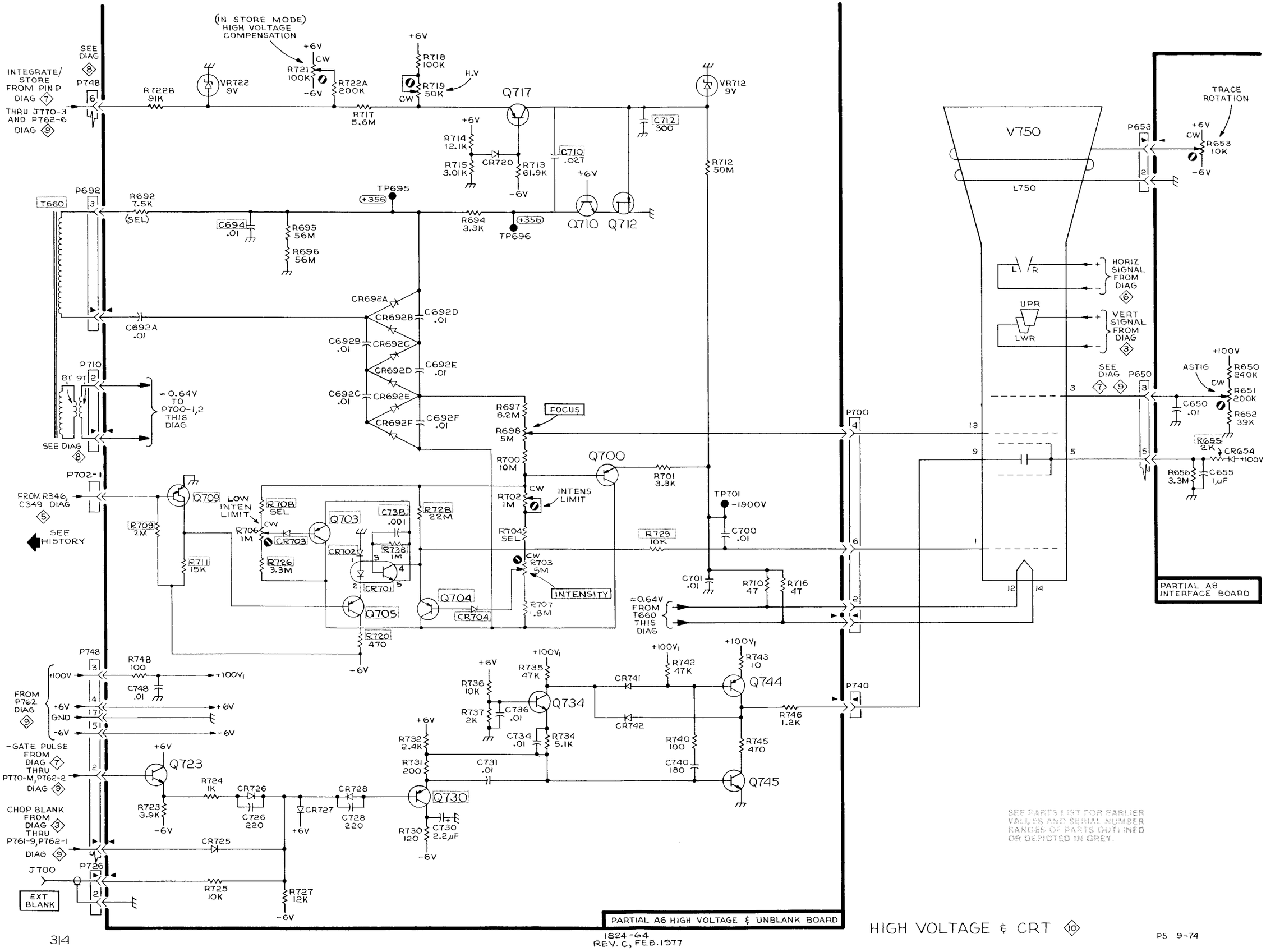


Fig. 7-15. A9—Intensity Limit circuit board (SN 300339—SN 300651).

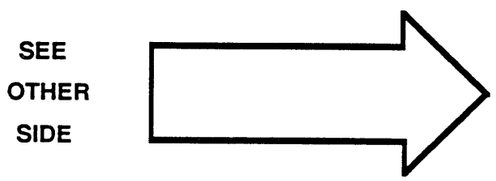



C692C .01
CR692E
CR692F
C692F .01
R697 6.8M
FOCUS
R698 5M
TO P700-4
R700 12M
Q700
TO R701
R705 6.8M
CW
INTENS LIMIT
R702 1M
(SEL)
R704 1.8M
INTENSITY
CW
R703 5M
TO P700-6 & C700
R707 1.8M
P748
3
+100V
R748 100
+100V
C748 .01
FROM P762 DIAG 9
4
+6V
+6V
7
GND
5
-6V
-6V
1824-65
P/O HIGH VOLTAGE & CRT (SN 300000 - SN300338)


C692C .01
CR692E
CR692F
C692F .01
R697 6.8M
FOCUS
R698 5M
TO P700-4
R700 12M
Q700
TO R701
R705 6.8M
CW
INTENS LIMIT
R702 1M
INTENSITY
CW
R703 5M
TO P700-6 & C700
R707 1.8M
FROM GND 5
2
FROM R346, C349 DIAG 5
Q709
LOW INTEN LIMIT
R709 2M
R711 510
A
R704 (SEL)
1
4
R706 1M
CW
2
3
S
CR701
FROM -6V2 5
P701
R708 (SEL)
B
A9 INTENSITY BOARD
1824-66
P/O HIGH VOLTAGE & CRT (SN 300339 - SN 300650)



HIGH VOLTAGE & CRT 10


SEE
OTHER
SIDE

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
000BK	STAUFFER SUPPLY	105 SE TAYLOR	PORTLAND, OR 97214
0000M	SONY/TEKTRONIX CORPORATION	P O BOX 14, HANEDA AIRPORT	TOKYO 149, JAPAN
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
05820	WAKEFIELD ENGINEERING, INC.	AUDUBON ROAD	WAKEFIELD, MA 01880
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
42838	NATIONAL RIVET AND MFG. CO.	1-21 EAST JEFFERSON ST.	WAUPUN, WI 53963
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
70276	ALLEN MFG. CO.	P. O. DRAWER 570	HARTFORD, CT 06101
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82647	TEXAS INSTRUMENTS, INC., CONTROL PRODUCTS DIV.	34 FOREST ST.	ATTLEBORO, MA 02703
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
85471	BOYD, A. B., CO.	2527 GRANT AVENUE	SAN LEANDRO, CA 94579
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
87308	N. L. INDUSTRIES, INC., SOUTHERN SCREW DIV.	P. O. BOX 1360	STATESVILLE, NC 28677
88245	LITTON SYSTEMS, INC., USECO DIV.	13536 SATICOY ST.	VAN NUYS, CA 91409
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
95712	BENDIX CORP., THE ELECTRICAL COMPONENTS DIV., MICROWAVE DEVICES PLANT	HURRICANE ROAD	FRANKLIN, IN 46131
97464	INDUSTRIAL RETAINING RING CO.	57 CORDIER ST.	IRVINGTON, NJ 07111
98278	MALCO A MICRODOT COMPANY, INC. CONNECTOR AND CABLE DIVISION	220 PASADENA AVE.	SOUTH PASADENA, CA 91030
98291	SEALECTRO CORP.	225 HOYT	MAMARONECK, NY 10544

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	200-1775-00			1		BEZEL,CRT:	0000M	200-1775-00
						(ATTACHING PARTS)		
-2	211-0644-00			2		SCREW,MACHINE:4-40 X 7.9 MM LONG,PNH SST	0000M	211-0644-00
						- - - * - - -		
-3	331-0394-00			1		WINDOW,CRT:CLEAR	0000M	331-0394-00
-4	366-1023-01			1		KNOB:GRAY	80009	366-1023-01
	213-0246-00			1		. SETSCREW:5-40 X 0.093 INCH L,HEX SOC	71159	OBD
-5	366-1379-00			1		KNOB:GRAY,POWER ON	0000M	366-1379-00
	213-0239-00			1		. SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	OBD
-6	366-1257-02			1		PUSH BUTTON:GRAY--AC	80009	366-1257-02
-7	366-1557-18			1		PUSH BUTTON:GRAY--AC LF REJ	80009	366-1557-18
-8	366-1557-17			1		PUSH BUTTON:GRAY-INT	80009	366-1557-17
-9	366-1391-00			1		KNOB:GRAY	80009	366-1391-00
	213-0140-00			1		. SETSCREW:2-56 X 0.94 INCH,HEX SOC STL	70276	OBD
-10	366-1077-00			1		KNOB:GRAY	80009	366-1077-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-11	366-1559-00			1		PUSH BUTTON:GRAY	80009	366-1559-00
-12	366-1402-37			1		PUSH BUTTON:GRAY--CHOP	80009	366-1402-37
-13	366-1402-36			1		PUSH BUTTON:GRAY--ALT	80009	366-1402-36
-14	366-1328-39			1		PUSH BUTTON:CHARCOAL GRAY	80009	366-1328-39
-15	366-1257-20			1		PUSH BUTTON:GRAY--CH2	80009	366-1257-20
-16	366-1597-00			1		KNOB:ASSY,V/DIV	0000M	366-1597-00
	213-0048-00			2		. SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
						(ATTACHING PARTS FOR KNOB)		
-17	211-0159-00			2		SCREW,MACHINE:2-56 X 0.375 INCH,PNH STL	87308	OBD
-18	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
-19	354-0551-00			2		RING,RETAINER:28.4 MM ID X 31.5 MM INCH OD	0000M	354-0551-00
						- - - * - - -		
-20	131-1682-00			1		CONTACT,ELEC:GROUNDING	0000M	131-1682-00
						(ATTACHING PARTS)		
-21	211-0180-00			2		SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-22	377-0438-00			1		INSERT,KNOB:25 MM OD,GROUND CONTACT	0000M	377-0438-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-23	354-0549-00			1		PACKING,PREFMD:27.7 MM ID X 34.7 MM OD	0000M	354-0549-00
-24	366-1602-00			2		KNOB:RED	80009	366-1602-00
	213-0239-00			1		. SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	OBD
-25	366-1077-00			1		KNOB:GRAY	80009	366-1077-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-26	366-1603-00			1		KNOB:SILVER GRAY	80009	366-1603-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-27	----- -----			1		RES.,VAR:LEVEL/SLOPE(SEE R331/S338 EPL)		
						(ATTACHING PARTS)		
-28	220-0740-00			1		NUT,PLAIN,HEX:0.25-32 X 4.6 MM LG,BRS	0000M	220-0740-00
-29	210-3035-00			1		WASHER,FLAT:7.6 MM ID X 11 MM OD	0000M	210-3035-00
						- - - * - - -		
-30	----- -----			2		RES.,VAR:POS,CH1 AND CH2(SEE R44A,B,R84A,B EPL)		
						(ATTACHING PARTS FOR EACH)		
-31	220-0739-00			1		NUT,PLAIN,HEX:6 MM THD X 4.6 MM LG,BRS	0000M	220-0739-00
-32	210-3035-00			1		WASHER,FLAT:7.6 MM ID X 11 MM OD	0000M	210-3035-00
-33	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-34	426-0681-00			7		FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-35	426-1072-00			1		FRAME,PUSH BTN:PLASTIC	80009	426-1072-00
-36	333-2015-00			1		PANEL,FRONT:MAIN	80009	333-2015-00
						(ATTACHING PARTS)		
-37	358-0542-00			1		BSHG,MACH THD:0.25-31 X 11.88 MM L,HEX HD	0000M	358-0542-00
-38	210-0940-00			1		WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-39	210-0046-00			1		WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
-40	210-0465-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
						- - - * - - -		
	016-0380-00	X300713	302306	1		COVER,PROT:FRONT PANEL	80009	016-0380-00
	016-0380-01	302306		1		COVER,PROT:FRONT PANEL	0000M	016-0380-01

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-41	366-1598-00			1		PUSH BUTTON:GRAY,AC-DC-GND,CH1	0000M	366-1598-00
-42	366-1599-00			1		PUSH BUTTON:SI GRAY,AC-DC-GND CH2	0000M	366-1599-00
-43	334-2390-00	300000	302741	2		PLATE IDENT:MARKED,AC-DC-GND	0000M	334-2390-00
	334-2390-01	302742		2		PLATE,IDENT:MARKED AC,GND,DC	80009	334-2390-01
-44	131-0251-00			1		JACK,TIP:PANEL MTG,RED	98291	016-8010-2
-45	384-1331-00			1		EXTENSION SHAFT:0.125 OD X 9.35 INCH LONG	0000M	384-1331-00
-46	384-1330-00			1		EXTENSION SHAFT:0.124 OD X 9.26 INCH LONG	0000M	384-1330-00
-47	407-1618-00			1		BRKT,BEZEL MTG:1.2 MM THK,SST	0000M	407-1618-00
						(ATTACHING PARTS)		
-48	211-0038-00			1		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-49	386-3200-00			1		SUBPANEL,FRONT:GRAY MOLDED	0000M	386-3200-00
						(ATTACHING PARTS)		
-50	211-0649-00			4		SCREW,MACHINE:2-56 X 4.1 MM,FLH,STL	0000M	211-0649-00
-51	210-0405-00			4		NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-52	211-0038-00			1		SCREW,MACHINE:4-40 X 0.312"100 DEG,FLH STL	83385	OBD
-53	210-0406-00			1		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-54	210-0003-00			1		WASHER,LOCK:EXT,0.123 ID X 0.245" OD,STL	78189	1104-00-00-0541C
-55	211-0101-00			1		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
-56	213-0055-00			1		SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL	93907	OBD
						- - - * - - -		
-57	384-1100-00			1		EXTENSION SHAFT:0.13 SQ X 6.215" LONG,PLSTC	80009	384-1100-00
-58	----- -----			1		CKT BOARD ASSY:VERTICAL AMP(SEE A2 EPL)		
						(ATTACHING PARTS)		
-59	211-0116-00			4		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-60	131-0608-00			10		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-61	136-0252-04			127		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-62	214-0579-00			2		. TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-63	337-2151-00			1		. SHIELD,ELEC:VERT AMP	0000M	337-2151-00
-64	337-2152-00			1		. SHIELD,ELEC:VERT AMP	0000M	337-2152-00
-65	----- -----			1		. SW,PUSH:VERT MODE/TRIG SOURCE(SEE S130 EPL)		
-66	361-0726-00			4		. SPACER,PB SW:9.5 MM X 21.5 MM L,TEFLON	0000M	361-0726-00
-67	----- -----			1		. SWITCH,PUSH:CH2 INVERT(SEE S98 EPL)		
-68	361-0385-00			2		. SPACER,PB SW:0.164 INCH LONG	80009	361-0385-00
-69	175-0826-00			FT		. WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00
-70	----- -----			1		CKT BOARD ASSY:TRIGGER SWITCH(SEE A3 EPL)		
						(ATTACHING PARTS)		
-71	211-0116-00			1		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-72	361-0703-00			2		SPACER,CKT BD:0.188 HEX X 0.984 INCH LONG	0000M	361-0703-00
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-73	131-0589-00			6		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-74	----- -----			1		. SWITCH,PUSH:TRIG COUPLING/SOURCE(SEE S305 EPL)		
-75	361-0726-00	X300171		3		. SPACER,PB SW:9.5 M X 21.5 MM L,TEFLON	0000M	361-0726-00
-76	384-1325-00			1		EXTENSION SHAFT:BLACK	0000M	384-1325-00
	213-0195-00			1		. SETSCREW:2-56 X 0.188 INCH,HEX SOC STL	000BK	OBD
-77	384-1324-00			1		EXTENSION SHAFT:BLACK	0000M	384-1324-00
-78	376-0169-00			1		COUPLING,SWITCH:6.5 MM OD X 0.83 MM LONG,BRS	0000M	376-0169-00
	213-0140-00			1		. SETSCREW:2-56 X 0.94 INCH,HEX SOC STL	70276	OBD
-79	376-0170-00			1		COUPLING SWITCH:10 MM OD X 8.6 MM L,BRS	0000M	376-0170-00
	213-0140-00			2		. SETSCREW:2-56 X 0.94 INCH,HEX SOC STL	70276	OBD
-80	343-0537-00			1		RETAINER,SHAFT:PLASTIC	0000M	343-0537-00
						(ATTACHING PARTS)		
-81	211-0012-00			1		SCREW,MACHINE:4-40 X 0.375 INCH,PNH STL	83385	OBD
-82	210-0004-00			1		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-83	361-0709-00			1		SPACER,SLEEVE:3.1 MM ID X 7 MM X 4.8 MM L	0000M	361-0709-00
						- - - * - - -		
-84	386-3203-00			1		SPT,FRONT PANEL:	0000M	386-3203-00
						(ATTACHING PARTS)		
-85	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-86	211-0097-00			1		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-87	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-88	----- -----			1		CKT BOARD ASSY:ATTENUATOR(SEE A1 EPL)		
						(ATTACHING PARTS)		
-89	211-0087-01			2		SCREW,MACHINE:2-56 X 0.188" 82 DEG,FLH,STL	83385	OBD
-90	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-91	210-0004-00			3		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL •	78189	1204-00-00-0541C
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-92	131-0344-00			4		. TERMINAL,STUD:BIFURCATED	88245	421837-9
-93	358-0135-00			4		. INSULATOR,BSHG:0.075 ID X 0.141 OD	88245	421456
-94	131-0589-00			2		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-95	136-0333-00			11		. SOCKET,PIN TERM:0.138 INCH LONG	00779	1-331677-4
-96	----- -----			2		. SWITCH,SLIDE:CH1 AND CH2 AC/DC(SEE S2,S12 EPL)		
-97	337-2154-00			1		. SHIELD ELEC:ATTEN BOARD,BOTTOM	0000M	337-2154-00
						(ATTACHING PARTS)		
-98	211-0007-00			2		. SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-99	210-0004-00			2		. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-100	210-0994-00			2		. WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5714-147-20N
						- - - * - - -		
-101	200-1776-00			1		. COVER,CAM SW:	80009	200-1776-00
						(ATTACHING PARTS)		
-102	211-0008-00			6		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-103	210-0004-00			6		. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
	263-1107-00			1		. ACTR ASSY,CAM S:VOLTS/DIVISION	80009	263-1107-00
						(ATTACHING PARTS)		
-104	211-0116-00			6		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . ACTUATOR ASSY INCLUDES:		
-105	131-0963-00			2		. . CONTACT,ELEC:GROUNDING	80009	131-0963-00
-106	210-0406-00			2		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-107	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-108	214-1127-00			2		. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-109	401-0081-02			1		. . BEARING,CAM SW:FRONT	80009	401-0081-02
						(ATTACHING PARTS)		
-110	354-0391-00			1		. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
						- - - * - - -		
-111	105-0644-00			1		. . ACTR,CAM SWITCH:VOLTS/DIV CHANNEL 1	80009	105-0644-00
-112	210-0406-00			4		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-113	401-0115-00			1		. . BEARING,CAM SW:CENTER	80009	401-0115-00
-114	105-0645-00			1		. . ACTR,CAM SW:VOLTS/DIV CHANNEL 2	80009	105-0645-00
						(ATTACHING PARTS)		
-115	354-0391-00			1		. . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
						- - - * - - -		
-116	210-0406-00			4		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-117	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-118	214-1127-00			2		. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-119	401-0081-02			1		. . BEARING,CAM SW:FRONT	80009	401-0081-02
-120	131-1030-00			18		. CONT ASSY,ELEC:CAM SWITCH,BOTTOM	80009	131-1030-00
-121	131-1031-00			22		. CONTACT ASSY,EL:CAM SWITCH,TOP	80009	131-1031-00
	210-0779-00			22		. RIVET,TUBULAR:0.051 OD X 0.115 INCH LONG	42838	RA-29952715
-122	337-2155-00			1		. SHIELD,ELEC:ATTEN BOARD,TOP	0000M	337-2155-00
-123	131-0106-00			3		CONNECTOR,RCPT,:FEMALE,BNC	95712	9856-1
						(ATTACHING PARTS FOR EACH)		
-124	210-0255-00			1		TERMINAL,LUG:0.391" ID INT TOOTH	80009	210-0255-00
						- - - * - - -		
	129-0103-00			1		POST,BDG,ELEC:ASSEMBLY	80009	129-0103-00
-125	200-0103-00			1		. NUT,PLAIN,KNURL:0.25-28 X 0.375" OD,BRASS	80009	200-0103-00
-126	129-0077-00			1		. STUD,SHOULDERED:0.938 INCH LONG,BRASS	80009	129-0077-00
						(ATTACHING PARTS)		
-127	210-0455-00			1		. NUT,PLAIN,HEX.:0.25-28 X 0.375 INCH,BRASS	73743	3089-402
-128	210-0223-00			1		. TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-129	333-2017-00	300000	302741	1		PANEL,SLIDE:INPUT BRACKET	80009	333-2017-00
	333-2017-01	302742		1		PANEL,SIDE:	80009	333-2017-01
-130	----- -----			1		SWITCH,SLIDE:LINE/X1/X10(SEE S300 EPL)		
						(ATTACHING PARTS)		
-131	211-0645-00			2		SCREW,MACHINE:2-56 X 3.77 MM,FLH STL	0000M	211-0645-00
-132	210-0405-00	300000	302741	2		NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
	220-0627-00	302742		1		NUT,PLAIN,HEX.:2-56 X 0.156 INCH,BRS	73743	10002-56-101
-133	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-134	348-0031-00			2		GROMMET,PLASTIC:0.156 INCH DIA	80009	348-0031-00
-135	337-2156-00			1		SHIELD,ELEC:INPUT BRACKET	0000M	337-2156-00
-136	407-1611-00	300000	302741	1		BRACKET,CMPNT:INPUT	0000M	407-1611-00
	407-1611-01	302742		1		BRACKET,CMPNT:INPUT	80009	407-1611-01
						(ATTACHING PARTS)		
-137	211-0008-00			4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-138	210-0004-00			4		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-139	----- -----			1		ELECTRON TUBE:(SEE V750 EPL)		
-140	131-0707-00			2		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-141	352-0169-00			1		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-142	348-0435-00			1		CUSHION,CRT:FRONT	0000M	348-0435-00
-143	211-0517-00	010100	301546	2		SCREW,MACHINE:6-32 X 1 INCH,PNH,STL	83385	OBD
	211-0517-01	301546		2		SCREW,MACHINE:6-32 X 1.0 L,PNH,STL,CDP	83385	5305-00-841-8094
-144	386-3377-00			1		SUPPORT,CRT:PLATE	0000M	386-3377-00
-145	343-0550-00			2		RETAINER,CUSH:CRT	0000M	343-0550-00
						(ATTACHING PARTS FOR EACH)		
-146	211-0022-00			2		SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-147	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-148	----- -----			1		COIL,RF:TRACE ROTATION(SEE L750 EPL)		
						(ATTACHING PARTS)		
-149	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-150	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
	----- -----			-		. COIL INCLUDES:		
-151	131-0707-00			2		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-152	352-0169-00			1		. CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-153	175-0307-00			FT		CABLE,SP,ELEC:APPROX 4 N/SEC	80009	175-0307-00
-154	276-0674-00			1		FORM,DELAY LINE:BOBBIN,NYLON	0000M	276-0674-00
						(ATTACHING PARTS)		
-155	213-0055-00			2		SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL	93907	OBD
						- - - * - - -		
-156	129-0537-00			2		SPACER,POST:4-40 X 10 MM THD EA END	0000M	129-0537-00
						(ATTACHING PARTS)		
-157	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
-158	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-159	210-0004-00			1		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-160	391-0136-00			1		BLOCK,MOUNTING:15 MM SQ X 3.0 MM THK,STL	0000M	391-0136-00
						(ATTACHING PARTS)		
-161	211-0108-00			2		SCREW,MACHINE:2-56 X 0.156 INCH,PNH STL	83385	OBD
-162	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-163	407-1613-00			1		BRKT,CRT SHLD:MOUNTING,FRONT	0000M	407-1613-00
						(ATTACHING PARTS)		
-164	211-0022-00			2		SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-165	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-166	348-0003-00			2		GROMMET,RUBBER:0.312 INCH DIAMETER	70485	1411B6040
-167	348-0063-00			1		GROMMET,PLASTIC:0.50 INCH DIA	80009	348-0063-00
-168	386-3201-00			1		SPRT,CRT REAR:PLASTIC	0000M	386-3201-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-169	----- -----			4		TRANSISTORS:(SEE Q205,Q206,Q215,Q216 EPL)		
						(ATTACHING PARTS FOR EACH)		
-170	211-0007-00			1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-171	210-0004-00			1		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-172	214-2208-00			1		HEAT SINK,XSTR:CUP CLIP,INSULATED	0000M	214-2208-00
						- - - * - - -		
-173	348-0031-00			2		GROMMET,PLASTIC:0.156 INCH DIA	80009	348-0031-00
-174	407-1617-00			1		BRKT,HEAT SK:	0000M	407-1617-00
						(ATTACHING PARTS)		
-175	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-176	210-0004-00			3		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-177	337-2149-00			1		SHIELD,CRT:	0000M	337-2149-00
						(ATTACHING PARTS)		
-178	211-0645-00			2		SCREW,MACHINE:2-56 X 3.7 MM,FLH STL	0000M	211-0645-00
-179	210-0405-00			2		NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-180	210-0001-00			2		WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-181	348-0063-00			1		GROMMET,PLASTIC:0.50 INCH DIA	80009	348-0063-00
-182	343-0088-00			1		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-183	----- -----			1		TRANSISTOR:(SEE Q607 EPL)		
						(ATTACHING PARTS)		
-184	211-0025-00			1		SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
-185	210-0406-00			1		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-186	210-0071-00			1		WASHER,SPR TNSN:0.146 ID X 0.323" OD,STL	78189	4706-05-01-0531
						- - - * - - -		
-187	342-0163-00			1		INSULATOR,PLATE:XSTR,0.675 X 0.625 X 0.001"	80009	342-0163-00
-188	441-1270-00			1		CHASSIS,MAIN:	0000M	441-1270-00
						(ATTACHING PARTS)		
-189	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-190	210-0004-00			3		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-191	136-0266-01			1		SKT,PL-IN ELEK:ELCTRN TUBE,12 CONT,W/LEADS	85471	OBD
-192	179-2301-00			1		WIRING HARNESS:CRT SOCKET	0000M	179-2301-00
-193	131-0707-00			10		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-194	352-0171-00			1		. CONN BODY,PL,EL:1 WIRE BLACK	80009	352-0171-00
-195	352-0163-00			1		. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00
-196	352-0164-02			1		. CONN BODY,PL,EL:6 WIRE RED	80009	352-0164-02
-197	179-2302-00			1		WIRING HARNESS:VERTICAL AMPLIFIER	0000M	179-2302-00
-198	131-0707-00			16		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-199	175-0828-00			FT		. WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
-200	352-0165-00			1		. CONN BODY,PL,EL:7 WIRE BLACK	80009	352-0165-00
-201	352-0167-00			1		. CONN BODY,PL,EL:9 WIRE BLACK	80009	352-0167-00
-202	136-0620-00			1		SOCKET,ASSEMBLY:W/CONNECTOR AND WIRE	0000M	136-0620-00
	131-0707-00			3		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
	175-0862-00			FT		. WIRE,ELECTRICAL:3 WIRE RIBBON	08261	SS-0322-1910610C
-203	352-0161-00			1		. CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0161-00
-204	131-0883-00			4		CONTACT,ELEC:CRT	98278	101-001-019
-205	175-0825-00			FT		WIRE,ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00
-206	175-0828-00			FT		WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
	131-0707-00			18		CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-207	352-0169-00			3		CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
	352-0169-04			1		CONN BODY,PL,EL:2 WIRE YELLOW	80009	352-0169-04
	352-0169-06			2		CONN BODY,PL,EL:2 WIRE BLUE	80009	352-0169-06
-208	352-0163-00			2		CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	614-0561-00			1		MODULE,ASSY:STORAGE	0000M	614-0561-00
						(ATTACHING PARTS)		
-1	211-0116-00			1		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. STORAGE ASSY INCLUDES:		
-2	366-1559-00			4		. PUSH BUTTON:GRAY	80009	366-1559-00
-3	366-1391-00			2		. KNOB:GRAY	80009	366-1391-00
	213-0239-00			1		. . SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	OBD
-4	366-1077-00			2		. KNOB:GRAY	80009	366-1077-00
	213-0153-00			1		. . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-5	366-1031-03			1		. KNOB:RED--CAL	80009	366-1031-03
	213-0153-00			1		. . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-6	366-1029-00			1		. KNOB:GRAY	80009	366-1029-00
	213-0153-00			2		. . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-7	366-1257-07			1		. PUSH BUTTON:GRAY--AUTO	80009	366-1257-07
-8	366-1257-05			1		. PUSH BUTTON:GRAY--NORM	80009	366-1257-05
-9	----- -----			1		. RES.,VAR:POSITION/SWP MAG(SEE R370/S367 EPL)		
						(ATTACHING PARTS)		
-10	220-0740-00			1		. NUT,PLAIN,HEX:0.25-32 X 4.6 MM L BRS	0000M	220-0740-00
-11	210-3035-00			1		. WASHER,FLAT:7.6 MM ID X 11 MM OD	0000M	210-3035-00
						- - - * - - -		
-12	----- -----			1		. RES.,VAR:LEVEL/VIEWING TIME(SEE R537A,B EPL)		
						(ATTACHING PARTS)		
-13	220-0739-00			1		. NUT,PLAIN,HEX:6 MM THD X 4.6 MM L,BRS	0000M	220-0739-00
-14	210-3035-00			1		. WASHER,FLAT:7.6 MM ID X 11 MM OD	0000M	210-3035-00
-15	210-0046-00			1		. WASHER,LOCK:INTL,0.26 ID X 0.40" OD,STL	78189	1214-05-00-0541C
						- - - * - - -		
-16	426-0681-00			2		. FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-17	426-1072-00			4		. FRAME,PUSH BTN:PLASTIC	80009	426-1072-00
-18	333-2016-00			1		. PANEL,FRONT:STORAGE MODULE	80009	333-2016-00
-19	386-3202-00			1		. SUBPANEL,FRONT:STORAGE MODULE	0000M	386-3202-00
-20	----- -----			1		. SWITCH,PUSH:W/HDWR,RESET(SEE S337 EPL)		
						(ATTACHING PARTS)		
-21	210-0008-00			1		. WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
						- - - * - - -		
-22	----- -----			1		. SW,PUSH:W/HDWR,INTEGRATE(SEE S565 EPL)		
-23	337-2153-00			1		. SHIELD,ELEC:REAR,STORAGE MODULE	0000M	337-2153-00
						(ATTACHING PARTS)		
-24	213-0055-00	300000	301025	4		. SCR,TPG,THD FOR:2-32 X 0.188 INCH,PNH STL	93907	OBD
	211-0180-00	301026		4		. SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS	83385	OBD
-25	210-0053-00	300000	301025	4		. WASHER,LOCK:INTL,0.092 ID X 0.175"OD,STL	83385	OBD
	211-0180-00	301026		4		. SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS	83385	OBD
	210-1042-00	300000	301025	1		. WASHER,LOCK:0.285 ID X 0.50 INCH OD	78189	1216-01-00-0541C
	211-0180-00	301026		4		. SCR,ASSEM WSHR:2-56 X 0.25 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----	X300339	300650X	1		. CKT BOARD ASSY:INTENSITY(SEE A9 EPL)		
						(ATTACHING PARTS)		
	211-0105-00	X300339	300650X	1		. SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. . CIRCUIT BOARD ASSEMBLY INCLUDES:		
	361-0774-00			7		. . SPACER,CKT BD:6.5 MM L X 4.78 MM HEX BRS	0000M	361-0774-00
	131-0589-00			3		. . TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	136-0252-04			3		. . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	210-0054-00			1		. . WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
	211-0007-00			1		. . SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
	672-0501-00			1		. CKT BOARD ASSY:HORIZONTAL STORAGE	0000M	672-0501-00
-26	----- -----			1		. . CKT BOARD ASSY:STORAGE(SEE A5 EPL)		
						(ATTACHING PARTS)		
-27	211-0116-00			6		. . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-28	131-0608-00			8		. . . TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-29	136-0252-04			51		. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-30	136-0327-01			18		. . . SOCKET,PIN TERM:0.067 INCH DIA	00779	86281-2
-31	----- -----			1		. . . SWITCH,PUSH:STORAGE(SEE S500A-D EPL)		
-32	361-0725-00			1		. . . SPACER,PB SW:9.5 MM X 33.5 MM L,TEFLON	0000M	361-0725-00
-33	361-0726-00			3		. . . SPACER,PB SW:9.5 MM X 21.5 MM L,TEFLON	0000M	361-0726-00
	131-0566-00	X301992		1		. . . LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
-34	361-0707-00			2		. . SPACER,CKT BD:0.188 HEX X 0.976" L,BRS	0000M	361-0707-00
						(ATTACHING PARTS FOR EACH)		
-35	211-0116-00			1		. . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-36	384-1332-00			1		. . EXTENSION,SHAFT:0.125 OD X 5.99 INCH L	0000M	384-1332-00
-37	376-0051-01			1		. . CPLG,SHAFT,FLEX:FOR 0.125 INCH DIA SHAFTS	80009	376-0051-01
	213-0048-00			4		. . . SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-38	----- -----			1		. . RES.,VAR:T/DIV,EXT CAL(SEE R385A,B EPL)		
-39	407-0803-00			1		. . BRACKET,CMPNT:	80009	407-0803-00
	263-1103-00			1		. . DRUM ASSY,CAM S:	80009	263-1103-00
						(ATTACHING PARTS)		
-40	211-0116-00			4		. . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . . ACTUATOR ASSY INCLUDES:		
-41	131-0963-00			2		. . . CONTACT,ELEC:GROUNDING	80009	131-0963-00
-42	210-0406-00			2		. . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-43	214-1139-02			1		. . . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . . SPRING,FLAT:RED COLORED	80009	214-1139-03
-44	214-1127-00			2		. . . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-45	401-0081-02			1		. . . BEARING,CAM SW:FRONT	80009	401-0081-02
						(ATTACHING PARTS)		
-46	354-0391-00			1		. . . RING,RETAINING:0.395"FREE ID X 0.025" STL	97464	3100-43-CD
						- - - * - - -		
-47	105-0638-00			1		. . . ACTR,CAM SW:VOLTS/DIV	80009	105-0638-00
-48	210-0406-00			4		. . . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-49	401-0115-00			1		. . . BEARING,CAM SW:CENTER	80009	401-0115-00
-50	175-0825-00			FT		. . WIRE,ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00
-51	131-0707-00			4		. . CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-52	352-0169-00			2		. . CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-53	----- -----			1		. . CKT BOARD ASSY:HORIZONTAL(SEE A4 EPL)		
-54	131-0589-00			2		. . . TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-0608-00			10		. . . TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-55	131-0593-00			18		. . . CONTACT,ELEC:1.15 INCH LONG	22526	47354
-56	352-0274-00			3		. . . HOLDER,TERMINAL:FOR 8 SQUARE PINS	80009	352-0274-00
-57	131-0604-00			18		. . . CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-58	136-0252-04			64		. . . SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-59	136-0260-02			1		. . . SOCKET,PLUG-IN:16 CONTACT,LOW CLEARANCE	82647	C9316-18
-60	----- -----			1		. . . SWITCH,PUSH:SWEEP MODE(SEE S341 EPL)		
	175-0826-00	X300339	300650	FT		. . . WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00
	175-0921-00	300651		FT		. . . WIRE,ELECTRICAL:STRD,24 AWG,7KV,CD BRN	08261	OBD
	131-0707-00	X300339	300650	3		. . . CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
	131-0707-00	300651		1		. . . CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
	352-0161-00	X300339	300650	1		. . . CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0161-00
	352-0171-00	300651		1		. . . CONN BODY,PL,EL:1 WIRE BLACK	80009	352-0171-00
-61	175-0826-00			FT		. WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00
-62	175-0828-00			FT		. WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
-63	131-0707-00			14		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-64	352-0161-00			3		. CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0161-00
-65	352-0163-00			1		. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00
-66	342-0260-00			1		INSUL,PWR SPLY:CLEAR,TOP	0000M	342-0260-00
-67	342-0261-00			1		INSUL,PWR SPLY:CLEAR,BOTTOM	0000M	342-0261-00
-68	348-0063-00			2		GROMMET,PLASTIC:0.50 INCH DIA	80009	348-0063-00
-69	348-0031-00			2		GROMMET,PLASTIC:0.156 INCH DIA	80009	348-0031-00
-70	252-0564-00			FT		PLASTIC EXTR:1.563 FT LONG	80009	252-0564-00
-71	352-0304-00	300000	300712	1		HOLDER,CKT BD:ANGLE	0000M	352-0304-00
	407-1836-00	300713		1		BRACKET,CKT BD:	0000M	407-1836-00
						(ATTACHING PARTS)		
-72	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-73	210-0004-00			1		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		

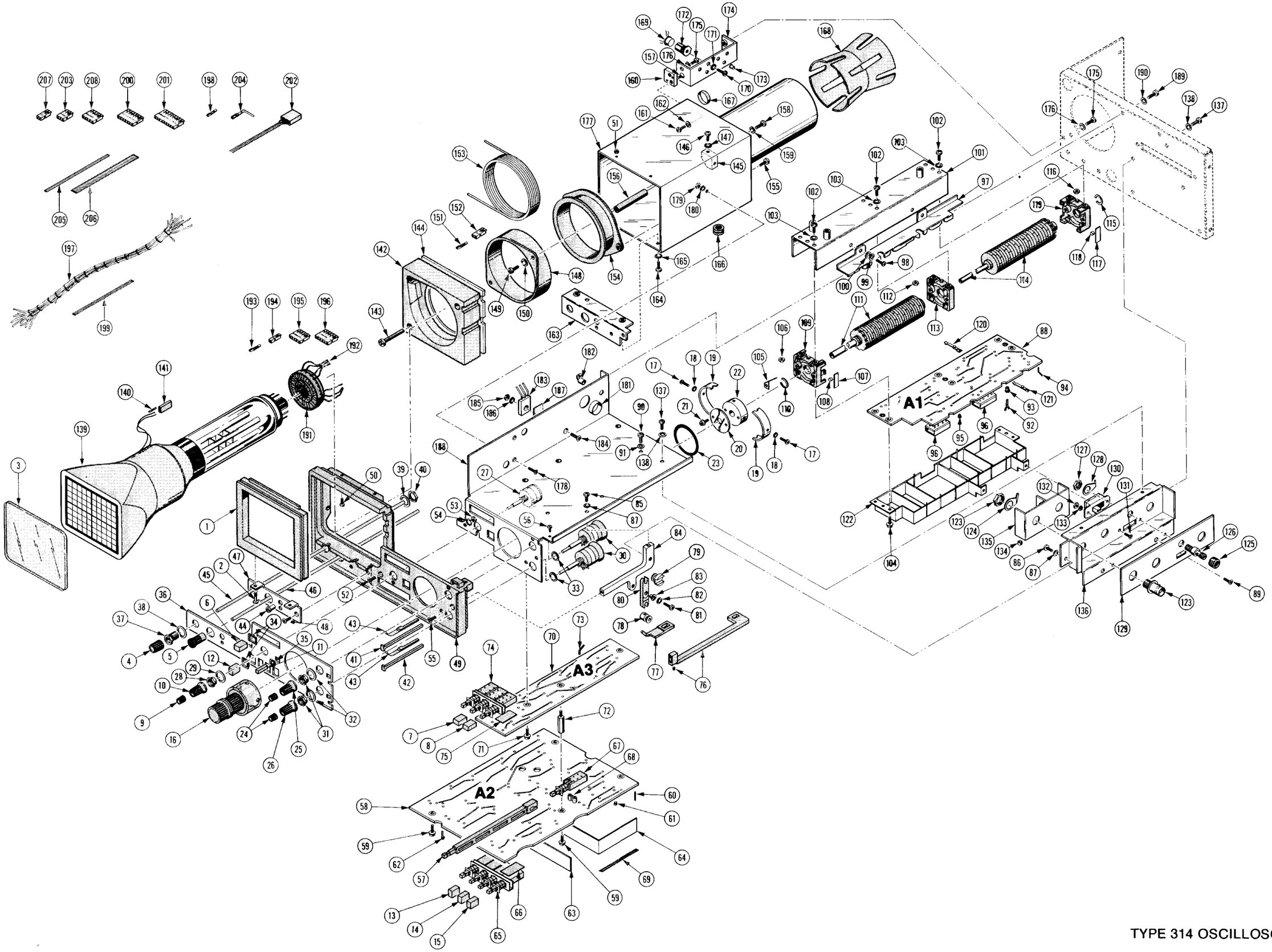
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-74	337-2150-00			1		SHIELD,ELEC:POWER SUPPLY	0000M	337-2150-00
						(ATTACHING PARTS)		
-75	211-0101-00			5		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
-76	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-77	211-0007-00			2		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-78	210-0004-00			5		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-79	----- -----			1		CKT BOARD ASSY:INTERFACE(SEE A8 EPL)		
						(ATTACHING PARTS)		
-80	361-0704-00			3		SPACER,CKT BD:0.188 HEX X 0.504" L,BRS	0000M	361-0704-00
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-81	131-0589-00			9		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-0608-00			24		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-82	131-0590-00			15		. CONTACT,ELEC:0.71 INCH LONG	22526	47351
-83	136-0514-00			1		. SOCKET,PLUG IN:MICROCIRCUIT,8 CONTACT	82647	C93-08-18
-84	136-0252-04			34		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-85	131-1662-00			1		. CONN,RCPT,ELEC:15/30 CONTACTS	0000M	131-1662-00
						(ATTACHING PARTS)		
-86	211-0014-00			2		. SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
-87	210-0004-00			2		. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-88	210-0994-00			2		. WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5714-147-20N
-89	220-0737-00			2		. NUT,PLAIN,HEX:0.188 HEX X 0.252 L,BRS	0000M	220-0737-00
						- - - * - - -		
-90	361-0705-00			3		SPACER,CKT BD:6 MM OD X 6 MM LONG	0000M	361-0705-00
-91	----- -----			1		CKT BOARD ASSY:POWER SUPPLY(SEE A7 EPL)		
-92	131-0589-00			3		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-93	131-0608-00			4		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-94	136-0252-04			18		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-95	136-0263-03			15		. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	00779	86250-2
-96	210-1058-00			1		. WASHER,FLAT:0.125 ID X 0.438 INCH OD	80009	210-1058-00
-97	214-1611-00			2		. HEAT SINK,ELEC:0.280 ID,W/ 4-40 THREADS	05820	260-4T5E-C4631
-98	----- -----			1		. SWITCH,SLIDE:POWER,SELECT(SEE S605 EPL)		
-99	344-0255-00			4		. CLIP,ELECTRICAL:FUSE MOUNT	80009	344-0255-00
-100	131-0707-00			8		. CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-101	352-0169-02			1		. CONN BODY,PL,EL:2 WIRE RED	80009	352-0169-00
-102	352-0161-02			1		. CONN BODY,PL,EL:3 WIRE RED	80009	352-0161-02
-103	352-0164-02			1		. CONN BODY,PL,EL:6 WIRE RED	80009	352-0164-02
-104	407-1616-00			1		BRACKET,HEAT SK:	0000M	407-1616-00
						(ATTACHING PARTS)		
-105	211-0007-00			2		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-106	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-107	211-0101-00			2		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-108	384-1331-00			1		EXTENSION SHAFT:0.124 OD X 9.35 INCH LONG	0000M	384-1331-00
-109	376-0051-00			1		CPLG,SHAFT,FLEX:FOR 0.125 INCH DIA SHAFTS	80009	376-0051-00
	213-0022-00			4		. SETSCREW:4-40 X 0.188 INCH,HEX SOC STL	74445	OBD
-110	354-0529-00			1		RING,STOPPER:8 MM OD X 6 MM LONG	0000M	354-0529-00
	213-0075-00			1		. SETSCREW:4-40 X 0.094 INCH,HEX SOC STL	000BK	OBD
-111	384-1330-00			1		EXTENSION SHAFT:0.125 OD X 9.260 INCH LONG	0000M	384-1330-00
-112	214-2227-00			1		ADAPTER,SW ACTR:PLASTIC	0000M	214-2227-00
-113	376-0092-01			2		CPLG HALF,SHAFT:W/RING	80009	376-0092-01
	213-0048-00			2		. SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	74445	OBD
-114	----- -----			1		SWITCH,TOGGLE:POWER,DC(SEE S603 EPL)		
-115	----- -----			1		SWITCH,TOGGLE:POWER,AC(SEE S600 EPL)		
-116	407-1612-00			1		BRACKET,SWITCH:POWER	0000M	407-1612-00
						(ATTACHING PARTS)		
-117	211-0121-00			2		SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-118	386-3204-00			1		PLATE,SLIDE SW:BLACK PLASTIC	0000M	386-3204-00
-119	136-0490-00			1		JACK,TIP:BANANA JACK ASSY	80009	136-0490-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	136-0491-00			1		JACK,TIP:BANANA JACK ASSY	80009	136-0491-00
						(ATTACHING PARTS FOR EACH)		
-120	210-0465-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-121	210-0223-00			1		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
						- - - * - - -		
-122	352-0409-00			1		HOLDER,TIP JACK:BLACK PLASTIC	0000M	352-0409-00
						(ATTACHING PARTS)		
-123	213-0107-00			1		SCR,TPG,THD FOR:4-40 X 0.25 INCH,FLH STL	93907	OBD
						- - - * - - -		
-124	343-0088-00			1		CLAMP,LOOP:0.062 INCH DIA	80009	343-0088-00
-125	----- -----			1		CKT BOARD ASSY:HV AND UNBLANK(SEE A6 EPL)		
						(ATTACHING PARTS)		
-126	211-0116-00			2		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-127	361-0706-00			3		SPACER,CKT BD:0.188 HEX X 2.382 INCH L,BRS	0000M	361-0706-00
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-128	131-0589-00	300000	300650	15		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
	131-0589-00	300651		16		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-129	131-0608-00			12		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-130	136-0252-04	300000	300650	27		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
	136-0252-04	300651		44		. SOCKET,PIN TERM:0.188 INCH LONG	22526	75060
-131	214-0579-00			3		. TERM.,TEST PT:BRS CD PL	80009	214-0579-00
-132	344-0255-00			2		. CLIP,ELECTRICAL:FUSE MOUNT	80009	344-0255-00
-133	----- -----			2		. RES.,VAR:FOCUS AND INTEN(SEE R698,R703 EPL)		
-134	407-1610-00			1		. BRACKET,VAR RES:PLASTIC	0000M	407-1610-00
-135	386-3205-00			1		PLATE,MOUNTING:POWER SUPPLY	0000M	386-3205-00
						(ATTACHING PARTS)		
-136	211-0101-00			2		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-137	348-0425-00			4		FOOT,CABINET:BLACK,W/CORD WRAP	0000M	348-0425-00
						(ATTACHING PARTS FOR EACH)		
-138	211-0530-00			1		SCREW,MACHINE:6-32 X 1.75 INCH,PNH STL	83385	OBD
-139	210-0802-00			1		WASHER,FLAT:0.15 ID X 0.312 INCH OD	12327	OBD
						- - - * - - -		
-140	200-1774-00			1		COVER,REAR:GRAY	0000M	200-1774-00
-141	----- -----			1		SWITCH,SLIDE:LINE(SEE S602 EPL)		
						(ATTACHING PARTS)		
-142	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-143	210-0054-00			2		WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
						- - - * - - -		
-144	----- -----			1		CAPACITOR:W/HDWR(SEE C600 EPL)		
						(ATTACHING PARTS)		
-145	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-146	210-0004-00			1		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-147	343-0536-00			1		CLAMP,CAPACITOR:0.5 MM THK STL	0000M	343-0536-00
						- - - * - - -		
-148	136-0491-00			1		JACK,TIP:BANANA JACK ASSY	80009	136-0491-00
						(ATTACHING PARTS)		
-149	210-0465-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-150	210-0223-00			1		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-151	210-0895-00			1		WSHR,SHOULDERED:0.375 OD X 0.105 INCH THK	80009	210-0895-00
						- - - * - - -		
-152	407-1615-00			1		BRACKET,CMPNT:OUTPUT JACK	0000M	407-1615-00
						(ATTACHING PARTS)		
-153	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-154	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
						- - - * - - -		
-155	----- -----			1		TRANSFORMER:POWER(SEE T600 EPL)		
						(ATTACHING PARTS)		
-156	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-157	210-0006-00			2		WASHER,LOCK:INTL,0.146 IDX 0.288 OD,STL	78189	1206-00-00-0541C
-158	407-1614-00			2		BRACKET,CMPNT:RETAINING	0000M	407-1614-00
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-159	----- -----			1		SWITCH,SLIDE:LINE VOLTAGE(SEE S601 EPL)		
						(ATTACHING PARTS)		
-160	211-0565-00			2		SCREW,MACHINE:6-32 X 0.250 INCH,TRH STL	83385	OBD
-161	210-0006-00			2		WASHER,LOCK:INTL,0.146 IDX 0.288 OD,STL	78189	1206-00-00-0541C
						- - - * - - -		
-162	161-0071-04			1		CABLE ASSY,PWR:3 CONDUCTOR	80009	161-0071-04
						(ATTACHING PARTS)		
-163	211-0016-00			2		SCREW,MACHINE:4-40 X 0.625 INCH,PNH STL	83385	OBD
-164	210-0004-00			2		WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-165	344-0270-00			1		CLIP,POWER CORD:BLACK PLASTIC	0000M	344-0270-00
						- - - * - - -		
-166	220-0738-00			3		NUT,CKT BD:0.188 HEX X 0.445 INCH LONG,BRS	0000M	220-0738-00
						(ATTACHING PARTS FOR EACH)		
-167	211-0101-00			1		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-168	210-0201-00			1		TERMINAL,LUG:SE #4	86928	A373-157-2
						(ATTACHING PARTS)		
-169	211-0105-00			1		SCREW,MACHINE:4-40 X 0.188"100 DEG,FLH STL	83385	OBD
-170	210-0406-00			1		NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
						- - - * - - -		
-171	210-0201-00			2		TERMINAL,LUG:SE #4	86928	A373-157-2
						(ATTACHING PARTS FOR EACH)		
-172	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-173	348-0067-00			3		GROMMET,PLASTIC:0.312 INCH DIA	80009	348-0067-00
-174	361-0708-00			1		SPACER,CKT BD:0.188 INCH HEX,BRASS	0000M	361-0708-00
						(ATTACHING PARTS)		
-175	211-0101-00			1		SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-176	441-1271-00			1		CHAS,PWR SUPPLY:	0000M	441-1271-00
-177	131-0707-00			27		CONNECTOR,TERM.:0.48" L,22-26AWG WIRE	22526	75691-005
-178	352-0169-00			1		CONN BODY,PL,EL:2 WIRE BLACK	80009	352-0169-00
-179	352-0161-00			1		CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0161-00
	352-0161-02			1		CONN BODY,PL,EL:3 WIRE RED	80009	352-0161-02
-180	352-0163-00			1		CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00
-181	352-0166-00			2		CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-						CABINET		
-1	390-0457-00			1		CABINET,SCOPE:BLUE	0000M	390-0457-00
						(ATTACHING PARTS)		
-2	211-0008-00	300000	300235	4		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	213-0284-00	300236		4		SCREW,CABINET:4-40 X 4.5MM,PH BRZ STL NP	83385	OBD
						- - - * - - -		
-3	348-0080-01			4		FOOT,CABINET:BOTTOM	80009	348-0080-01
-4	334-2378-00			1		PLATE,IDENT:	80009	334-2378-00
	342-0145-00	X300561		1		INSULATOR,PLATE:MYLAR	0000M	342-0145-00
-5	200-1342-00			2		COVER,HANDLE:	0000M	200-1342-00
-6	367-0203-00			1		HANDLE,CARRYING:BLK VINYL	0000M	367-0203-00
						(ATTACHING PARTS)		
-7	212-0004-00			2		SCREW,MACHINE:8-32 X 0.312 INCH,PNH STL	83385	OBD
-8	210-0008-00			2		WASHER,LOCK:INTL,0.172 ID X 0.331"OD,STL	78189	1208-00-00-0541C
-9	210-1144-00			2		WASHER,FLAT:0.156 ID X 1.125 INCH OD	0000M	210-1144-00
-10	386-2181-00			2		PLATE,RING:	0000M	386-2181-00
-11	386-2582-00			4		PLATE,RING:37 MM DIA	0000M	386-2582-00
-12	386-2182-00			4		PLATE,FRICTION:	0000M	386-2182-00
						- - - * - - -		
-13	343-0542-00			2		RETAINER,HANDLE:32.5 MM OD X 11.7 MM L,STL	0000M	343-0542-00
						(ATTACHING PARTS FOR EACH)		
-14	211-0603-00			4		SCREW,MACHINE:6-32 X 0.312 INCH,HEX HD STL	83385	OBD
-15	210-0006-00			4		WASHER,LOCK:INTL,0.146 IDX 0.288 OD,STL	78189	1206-00-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty 1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-					STANDARD ACCESSORIES		
-1	010-6049-11	300000	301094	2	PROBE,VOLTAGE:3.5 FT L,W/ACCESSORIES	80009	010-6049-11
	010-6149-03	301095		2	PROBE,VOLTAGE:P6149,2 METER,10X W/ACCESS	80009	010-6149-03
-2	016-0612-00			1	CASE,CARRYING:SOFT,BLACK VINYL	0000M	016-0612-00
-3	346-0131-00			1	. STRAP ASSY,CRYG:	0000M	346-0131-00
-4	012-0406-00			1	CABLE ASSY,PWR:EXTERNAL DC	0000M	012-0406-00
-5	159-0098-00			2	FUSE,CARTRIDGE:DIN,1.6 A,FAST BLOW	0000M	159-0098-00
	159-0132-00			2	FUSE,CARTRIDGE:0.800A,250V,FAST-BLOW	0000M	159-0132-00
	159-0130-00			2	FUSE,CARTRIDGE:0.315A,250V,FAST-BLOW	0000M	159-0130-00
	159-0131-00			3	FUSE,CARTRIDGE:0.160A,250V,FAST-BLOW	0000M	159-0131-00
	070-1824-00			1	MANUAL,TECH:SERVICE	80009	070-1824-00
	070-1823-00			1	MANUAL,TECH:OPERATORS	80009	070-1823-00
					OPTIONAL ACCESSORIES		
-6	103-0033-00			1	ADAPTER,CONN:BNC TO BINDING POST	95712	2048-2NT34
	016-0297-00			1	VISOR,CRT:	80009	016-0297-00
	378-2016-00			1	FILTER,LT,CRT:BLUE	0000M	378-2016-00
	067-0750-00			1	FIXTURE,CAL:SHIELD	0000M	067-0750-00
	067-0742-00			1	FIXTURE,CAL:EXTENSION CABLE	0000M	067-0742-00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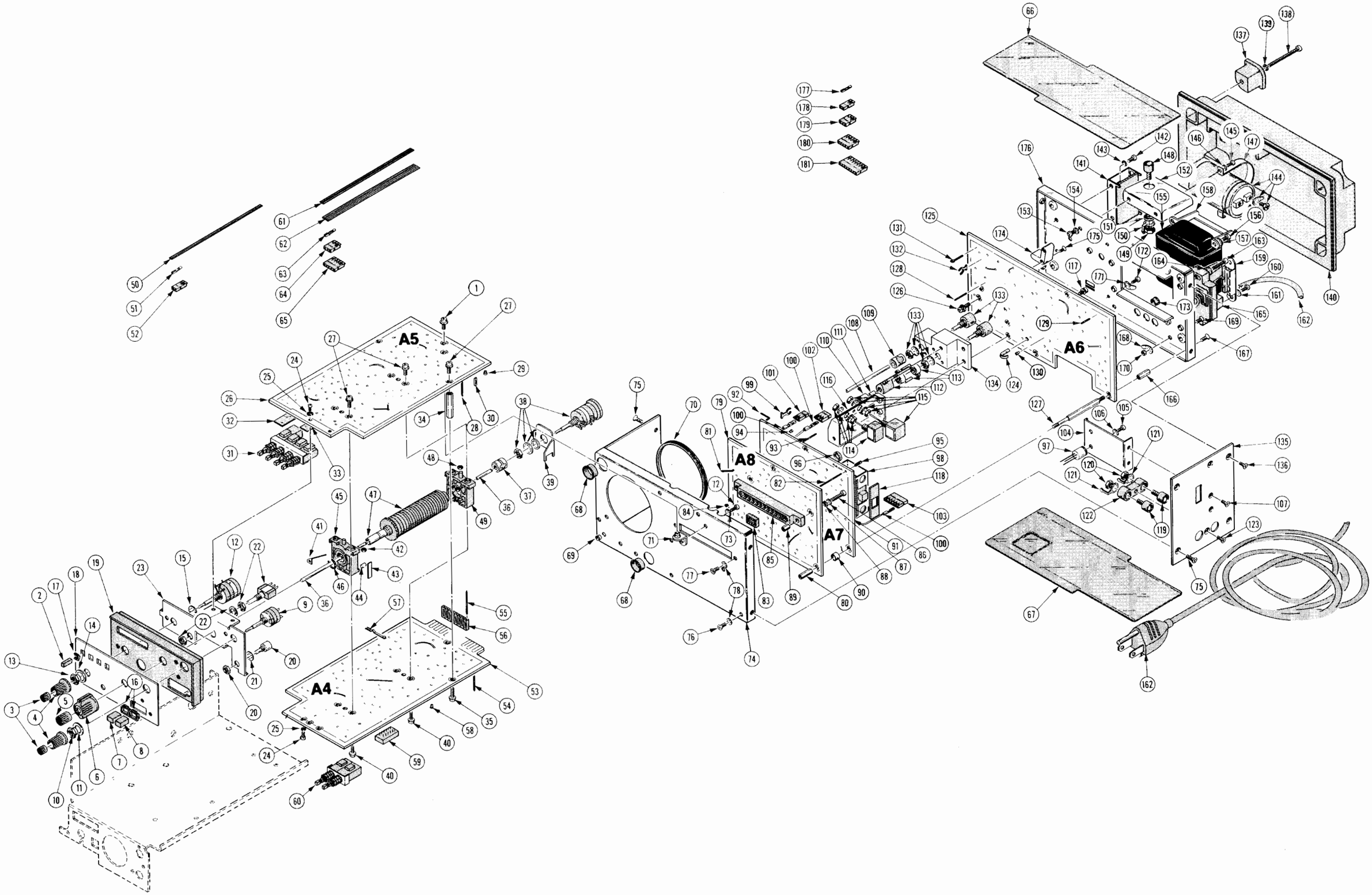
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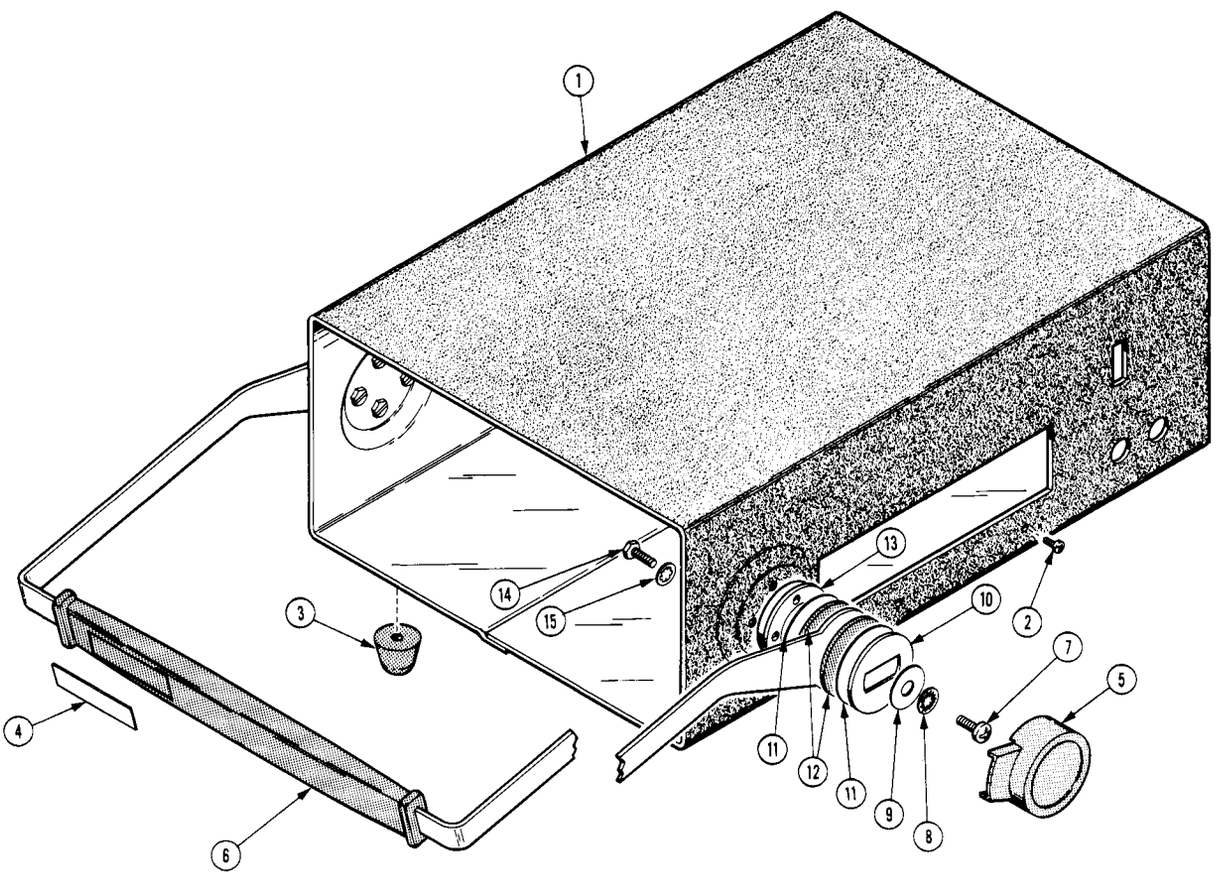
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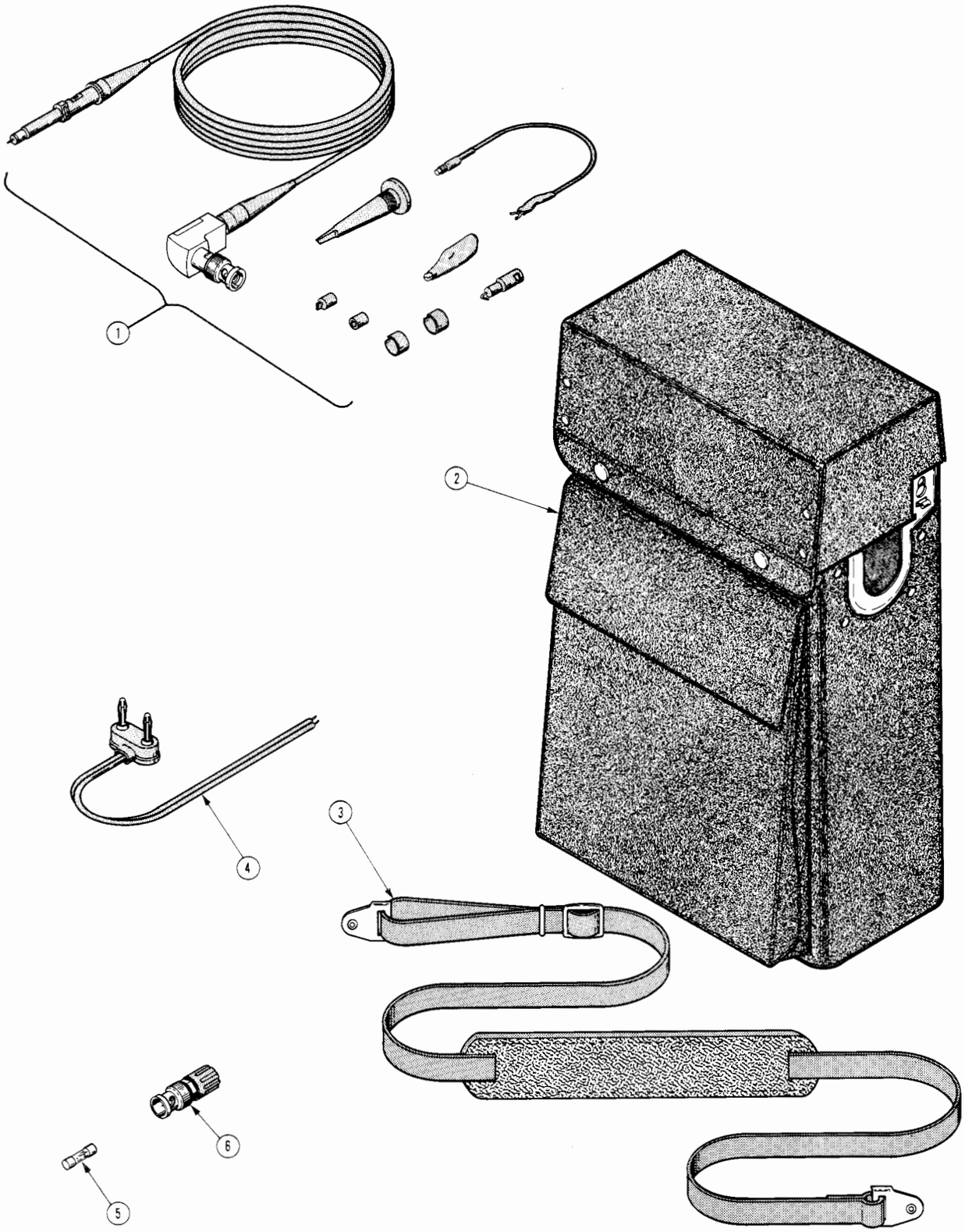
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MANUAL CHANGE INFORMATION

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

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

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime	108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114	Performance of replacement equipment is the same or better than equipment being replaced.	
115		
2101		
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191		
067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180, 180A	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181		181 - Multiple time-marks
184	TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.
2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

TEKTRONIX®
committed to technical excellence

MANUAL CHANGE INFORMATION

PRODUCT 314 SERVICE
070-1824-00

CHANGE REFERENCE M32048
DATE 11-13-78

CHANGE:	DESCRIPTION

EFF SN: 302407

MECHANICAL PARTS LIST CHANGES

FIG. & INDEX #

2-162	161-0033-24	1	CABLE ASSY,PWR:3.18 AWG, 125V, 3 CONDUCTOR
2-165	344-0270-00	1	CLIP,POWER CORD:BLACK NYLON

SEE
OTHER
SIDE